

ABRA

INTERNATIONAL BIO RECOVERY SUMMIT AUGUST 16-19 - 2020
ORLANDO, FLORIDA



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Water Front at City Walk, Orlando Florida

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Bio Recovery Today

Each quarter the BRT Newsletter will provide information on the companies of the month, important upcoming events, and relevant current issues regarding our industry. This issue will share summit takeaways and a preview into the 2020 International Bio Recovery Summit that will be held at the Rosen Shingle Creek Resort in Orlando Fla. There is also a brief article by Scott Vogel regarding the potential exposure to the OSHA HAZWOPER standard 1910.120 and what it means to employers in the United States. In addition we had fantastic paper on Personal Protective Equipment by Pedro Badoni.



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Government Affairs

OSHA HAZWOPER Letter of Interpretation - Review by Scott Vogel

In the Biohazard Mitigation Industry, there are many conflicting points of view regarding the training and certification of those in the industry; therefore, on January 14, 2019, a letter went out to the Occupational Safety and Health Administration (OSHA) asking for clarification. Does OSHA require employers to train employees who perform biohazard remediation according to the training requirements in 1910.120 HAZWOPER Standard? (Occupational Safety and Health Administration [OSHA], 2019)

In researching this question, one Letter of Interpretation regarding the biohazard industry dated May 22, 2007, can be found. OSHA responded to a letter written by Mr. Dave Middleton in regards to the application of OSHA's Bloodborne Pathogens Standard to contractors where a clean-up of blood is conducted following an accident. OSHA's response was what you would expect. They wrote "Yes, the Bloodborne Pathogens Standard would apply to the cleanup work done by your employees. 29 CFR 1910.1030(b) defines "occupational exposure" as "reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials [OPIM] that may result from the performance of an employee's duties."(OSHA, 2007)

Looking into OSHA's Bloodborne Pathogens Standard (29 CFR 1910.1030)(OSHA, 1970) as amended according to the Needle-stick Safety and Prevention Act of 2000, prescribes safeguards to protect workers against the health hazards caused by bloodborne pathogens. The requirements address items such as exposure control plans, universal precautions, engineering and work practice controls, personal protective equipment, housekeeping, laboratories, Hepatitis B vaccination, post-exposure follow-up, hazard communication and training and record keeping.

The Standard places requirements on employers whose workers can be reasonably anticipated to be in contact with blood or other potentially infectious materials (OPIM), such as unfixed human tissues and certain body fluids. Reading further into the Standard, the lack of information and personal protection for those in the biohazard industry responding to incidents like crime scenes, suicides, unattended deaths and accidents causing the release of pathogens just didn't seem like enough. Focusing on the history of the Standard, in 1991, OSHA published the 1910.1030 Occupational Exposure to Bloodborne Pathogens Standard. This Standard was created and published to protect all healthcare workers approximately six million from the risk of exposure to pathogens, focusing mainly on HIV and Hepatitis B viruses in the healthcare setting. Although the Standard was amended in 2000, it still doesn't fit our industry nor did it give us a reliable standard or training platform and information to protect those in the industry.

For the last few years, industry leaders started to look into the 1910.120 Hazardous Waste Operations and Emergency Response (HAZWOPER) standard and started to conclude this was the standard our industry should be following. With so many opinions, negative feedback and disagreements, no true standard requirements could be determined and the major factor was cost.

Now that we understand that OSHA declares and considers biologicals' to be a Hazardous Substance we needed to find out what it declares to be an "Emergency". Within 1910.120, emergency response or responding to emergencies means a response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses for incidental releases of hazardous substances where the substance can be absorbed, neutralized or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emergency responses within the scope of this Standard. Also, responses to releases of hazardous substances where there is no potential safety or health hazard i.e., fire, explosion, or chemical exposure, are not considered to be emergency responses. (OSHA, 1970) "Post Emergency Response" means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated.

Let's talk about "where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emergency responses." This is a statement many people try to use regarding the requirement.

In the industry, we are not employees of those who have contracted us out, therefore, we cannot be declared as maintenance personnel, so we do fall under the Emergency Response or the Post-Emergency Response cleanup activities.

OSHA did put out an article declaring what biologic agents are (Biological Agents, OSHA 1970)

CONCLUSIONS

From the determination of these definitions, the Letter of Interpretation and facts stated within, one can conclude that if a site owner calls you and has an uncontrolled release or exposure risk, this constitutes an "Emergency Response". As an industry, our objective is to mitigate pathogenic exposure risks. Looking at all of this collectively, one can conclude that OSHA 1910.120 and OSHA 1910.1030 are both required as a baseline minimum for all opportunities which meet these definitions. These two baseline standards should be recommended prerequisites for any subsequent third-party certification or niche educational programs. Hopefully, professionals and end-users of these services will see the gap of proper training within our industry before any major problems arise. Please see attached Standard Interpretation from 9/06/2019.

The article is written by Scott W. Vogel, CEO of Emergi-Clean Inc., a family owned and operated business in New Jersey handling Bio Hazard Mitigation for 24 years. Scott is also the director of the East Coast Training Centers for ehs inc., a California based Health and Safety Consulting and Training Company. Scott sits on the government affairs committee for American Bio Recovery Association and Indoor Air Quality Association. For further information you can reach Scott at svogel@emergiclean.com.

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To clarify, this is an informational article and makes general recommendations and is open to public comment. Not currently an official stance of the Association.

A Copy of this Article along with the OSHA LOI can be located on the ABRA Website under the News.

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International Bio Recovery Summit

INTERNATIONAL BIO RECOVERY SUMMIT AUGUST 16-19 - 2020
ORLANDO, FLORIDA



Dates -
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Personal protective equipment and physical protection from biological contamination

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Abstract:

Personal protective equipment (PPE) is a main source of protection. The protective equipment includes respirators, eye protection, hand protection and all the protective clothing.

We need to take in consideration, on a biological contamination incident, that the main routes of exposure are inhalation, dermal contact, ingestion or contact through mucous membranes.

The individuals who are required to wear personal protective equipment, need to know how to use protective equipment properly, be aware of when personal protective equipment is necessary and know what kind of protective equipment is necessary. Also need to understand the limitations of personal protective equipment, put on (donning), adjust, take off (doffing) and maintain protective equipment properly.

Introduction:

Personal protective equipment (PPE) is very important for any emergency responder or worker. The term PPE (Personal Protective Equipment) are designed to shield an individual from chemical, biological, and physical hazards.

Proper selection of PPE must be based upon a careful assessment of two factors:

- The hazards anticipated to be present, or are present at the scene;
- The probable impact of those hazards.

The physical and durability properties for PPE must meet or exceed minimum requirements for operations at a CBRN terrorism incident scene.

The selection of appropriate protective gear is based on the hazards anticipated or recognized. Some pieces of protective equipment have specific standards for manufacture and only those items meeting these standards should be used.

What is biological hazard or biological contamination?

Biological hazards refer to organisms or organic matters produced by these organisms that are harmful to human health. These include parasites, viruses, bacteria and fungi. The harmful effects posed to human health by these biological hazards are mainly of three types - infections, allergy and poisoning.

There are 4 levels of biohazards:

Biohazard Level 1: Agents that pose minimal threat to humans and the environment. Examples include *E. coli*, *Bacillus subtilis* and *Naegleria gruberi*;

Biohazard Level 2: Agents that can cause severe illness in humans and are transmitted through direct contact with infected material. Examples include HIV, hepatitis B and salmonella;

Biohazard Level 3: Pathogens that can become airborne and cause serious diseases. Examples include Tuberculosis and *Coxiella burnetii*;

Biohazard Level 4: Pathogens that pose a high risk of life-threatening disease for which there are no treatments. Examples include the Ebola virus and Lassa virus.



Figure 1 - The standard biohazard symbol is meant to be evocative of danger, and was designed to be memorable but meaningless so that people could be taught what it meant

For a biological agent, the air concentration of particles will depend upon the method used to release the agent, the initial amount of agent in the dispersal device, the particle size and the elapsed time since the release.

When using respiratory protection, the type of respirator is selected based on the hazard and its airborne concentration.

Self-contained breathing apparatus (SCBA), will provide respiratory protection against biological exposures associated with a suspected act of biological terrorism. When site concentrations allow for the use of lower levels of protection, full facepiece air-purifying respirators (APRs) or full facepiece powered air-purifying respirators (PAPRs) may be used.

Protective clothing also is necessary for the response to a suspected act of biological terrorism to reduce exposures to potential dermal, chemical, and physical hazards. Protective clothing must have physical performance properties adequate for the task. The type of protective clothing needed will depend upon the biological agent, concentration and the route of exposure.

Protective clothing ensembles certified for biological agents (e.g. EN 14126), should be the first choice when selecting protective clothing for protection against biological agents.

Method:

Personal Protective Equipment (PPE)

PPE is used as a last line of defense in the control hierarchy of biological agent exposure, where exposure cannot be avoided by other means (e.g. engineering controls). It can also be used as a secondary support to and back-up of engineering control in case of unforeseen failure of engineering control.

Personal Protective Equipment is necessary to reduce the risk of exposure to biological hazards, as well as, training in the proper procedures for donning and doffing PPE. Numerous types of Personal Protective Equipment are available to help prevent exposure. These are the potential routes of exposure:

- a) inhalation (respiratory);
- b) absorption (contact with mucous membranes, skin, open wounds or abrasions);
- c) ingestion and injection.

Suitable Personal Protective Equipment should be used to protect from possible inhalation, ingestion, or skin/eye contact with the biological contamination (microorganisms and their by-products).

The selection of PPE depends on the anticipated exposure, types of microbial contamination, activities to be completed. Everyone shall be properly trained in the PPE being provided, as well proper hazard awareness with respect to the hazard involved. The designated Personal Protective Equipment can consist of the following:

- a) respirator;
- b) eye protection;
- c) non-permeable coveralls including hood and booties;
- d) foot protection;
- e) hand protection;
- f) head protection.

The decision to use PPE as a control measure and its selection needs to be based on a risk assessment that should identify all hazards present and provide a measure of risk. Information should be available on the safe level of the hazards. Since the measure of existing risk and the safe level are known, it should be possible to decide how efficient the PPE needs to be. Physical, thermal and acoustic risks also need to be assessed in the selection of protective clothing in addition to the biological hazards. The PPE should cover all body parts that are at risk.

The risk assessment must focus on which kinds of hazardous biological agents are present, how hazardous are they, and what the routes for exposure are. The hazardousness depends on the effects that the biological organism can cause and the treatability of the effects.

Protection Levels:

Level A: To be selected where the hazards are unknown or unquantifiable or when the greatest level of skin, respiratory and eye protection is required;

Level B: The highest level of respiratory protection is necessary, but a lesser level of skin protection is needed;

Level C: The concentration(s) and type(s) of airborne substances is known and the criteria for using air-purifying respirators are met.

The description of these levels doesn't specify minimum performance criteria of protective clothing and respirators required for specific threats. The use of this general "levels" of protection does not assure that the wearer is adequately protected from CBRN specific hazards. The generic descriptions of the equipment do not fully address the performance of PPE in relationship to specific needs.

Currently, no single personal protective ensemble can protect the wearer from exposure to all hazards. It is important that the appropriate combination of respirator, protective ensemble and other equipment be selected based on a conclusive hazard assessment at the scene.

Protective Ensembles for First Responders to CBRN Terrorism Incidents (based on the protection required for different hazard types (vapors, liquids, and particulates) and airborne contaminant levels):

Class 2 ensembles: are intended for use at terrorism incidents involving vapor or liquid chemical or particulate hazards where the concentrations are at or above IDLH level requiring the use of CBRN compliant self-contained breathing apparatus (SCBA).

Class 3 ensembles: are intended for use at terrorism incidents involving low levels of vapor or liquid chemical or particulate hazards where the concentrations are below IDLH, permitting the use of a CBRN compliant air-purifying respirators (APR) or power air-purifying respirator (PAPR).

Class 4 ensembles: are intended for use at terrorism incidents involving biological or radiological particulate hazards where the concentrations are below IDLH levels permitting the use of CBRN compliant APR or PAPR. The ensembles are not tested for protection against chemical vapor or liquid permeability, gas-tightness, or liquid integrity.

Respiratory Protection

Respiratory Protective Equipment are dedicated to protecting against hazards that may cause serious and irreversible health damage.

Respirators are one of the most important pieces of personal protective equipment when other control systems are not feasible to protect. Respirators cover as minimum the nose and mouth of users and remove contaminants from the air by filtering airborne particles or chemical agents from air.

Particulate respirators can include particular filtering facepiece respirators which are usually suitable for single use and powered air-purifying respirators. The selection of an appropriate respirator depends on the type of particle it is protecting from.

Respiratory Protection Plan:

A respiratory protection program shall be implemented for people who wear a respirator.

The respiratory protection program outlines the written program requirements and shall include:

- a) selection and use of approved respirators;
- b) medical evaluation;
- c) respirator fit testing;
- d) user instruction and training;
- e) cleaning and maintenance program.

Types of respiratory protective equipment:

Respirators - are designed to filter out or clean contaminated air from the atmosphere before it is inhaled by the respirator wearer.

Respirators protect the user in two basic ways. The first is by the removal of contaminants from the air. Respirators of this type include particulate respirators, which filter out airborne particles (Filtering face pieces (FFP), Half or full-face air-purifying respirators (APR) and Powered air-purifying respirators (PAPR)).

Other respirators protect by supplying clean respirable air from another source. Respirators that fall into this category include airline respirators, which use compressed air from a remote source and self-contained breathing apparatus (SCBA), which include their own air supply.

The type of biological hazard, the nature of work and the work environment will determine the choice of respiratory protective equipment. It is extremely important that the respirator should fit the wearer for a good face seal and the user must perform the seal check to ensure that the respirator is worn correctly for the required protection.

a) Filtering face pieces (FFP)

Filtering face pieces or also “disposable respirators”. They have a relatively short life length and are marked FF (face filter) followed by filter protection specifications (P1, P2 or P3), they are classified as FFP1, FFP2 and FFP3 in order of increasing filtration efficiency and should conform to the EN149:2001.

Are the simplest, least expensive and least protective of the respirator types available, only protect against particles. They don't protect against chemicals, gases or vapours and are intended only for low hazard levels.

They can also be classified as Reusable (R) or Non-Reusable (NR). The reusable ones have characteristics that allow them to be more durable, with more cycles of use and they must have resistance superior to the obstruction (EPR marked with the letter D if it complies with the test).

The respirators may incorporate inhalation and exhalation valves or exhalation valve(s) only or have no valves. Where the filtering face piece has no valves, both inhaled and exhaled dangerous substances can pass through the filter material. An example of the filtering face piece is shown in the picture.

Advantages

- Light weight;
- Does not restrict mobility;
- Low cost.

Disadvantages

- Does not supply oxygen;
- Fit testing required;
- Some contaminated air will leak into facepiece;
- Communication can be difficult.



Figure 2 - FFP3

Filter Protection - Filtering Face Piece (FFP)

- 1) FFP1 - Filters about 80% of the dangerous particles. When exposed to a risk situation, the probability of getting infected is about 50%. Not recommended for use in the presence of biological agents;
- 2) FFP2 - Filters about 94% of the dangerous particles. To use in the presence of biological agents of moderate level, with moderate index of resistance to saturation;
- 3) FFP3 - Filters about 99% of the dangerous particles. To use in the presence of biological agents of high level, with high index of resistance to saturation.

b) Half or full-face air-purifying respirators (APR)

It is a type of mask where it is possible to carry out maintenance and cleaning. The filters are coupled to the facepiece and must be changed according to the pre-set plans or according to the manufacturer's instructions. These are reusable devices with exchangeable cartridges or filters.

Half facepiece or Half masks (APR): it is a facial adjustment piece that covers the mouth, nose and chin. The semi-mask is especially suitable for situations where eye protection is not required or where the hazardous working atmosphere may allow the use of separate goggles. Compared to the full-face mask, the semi-mask is a lighter solution but has a lower Protection Factor than the full-face mask.



Figure 3 - Half facepiece

Full Facepiece or Panoramic Mask (APR): it is a facial adjustment piece that covers the mouth, nose, eyes, chin and face. They are especially suitable for situations where a higher Protection Factor is required and, due to the hazards of the local atmosphere, the facial and / or ocular protection is necessary.



Figure 4 - Full facepiece

When using APRs, air is drawn into the respirator facepiece by inhaling through filters or cartridges. APRs shall not be used in oxygen-deficient atmospheres or in other atmospheres that are deemed immediately dangerous to life or health (IDLH) due to high concentration of contaminants, unquantifiable levels of contaminants or contaminants that are not able to be purified out of the air.

Advantages

- Comparatively light weight;
- Does not restrict mobility;
- Relatively low cost.

Disadvantages

- Does not supply oxygen;
- May only be used when air contaminant level is below the concentration limits of the filter(s);
- Fit testing required;
- Some contaminated air can leak into facepiece;
- Half mask models do not provide adequate eye protection;
- Communication can be difficult.

Types of Filters - Half or full-face air-purifying respirators (APR):

Filters Particles (P1, P2 and P3) - Protection against particles only (solid or liquid). They are marked with the letter "P" and are identified in the equipment through the white color.



Figure 5 - Filters Particles (P1, P2 and P3)

Gas and Vapours Filters - Protection against gases and vapours only. The classification of the filters is done according to the type of contaminant for which the filter is suitable, being assigned a color code.



Figure 6 - Gas and Vapours Filters

Combined Filters - Combined protection against particles, gases and vapours. Gas or multi-type gas filters incorporating a particle filter.



Figure 7 - Combined Filters

c) Powered air-purifying respirators (PAPR)

Powered Air-Purifying Respirators are battery-powered devices that use a blower to pull air through attached filters (for particles) or cartridges (for gases or vapours) to clean it before delivering it to the breathing zone of the wearer.

The benefits of PAPRs include a low breathing resistance with a high level of protection. PAPRs can be used to

protect against gases, vapours, or particles, if equipped with the appropriate cartridge, canister, or filter.

PAPRs are generally more protective than non-powered half mask respirators because the blower creates positive pressure inside the facepiece under most work conditions, which reduces inward leakage of potentially contaminated air.

Respirators provide varying levels of protection based on how well they seal to the face. They are divided into classes; with each respirator class assigned a protection factor to help compare its protective capabilities with other respirators for a properly fitted and trained user. An assigned protection factor (APF) is a unitless number generated by dividing the airborne concentration of the contaminant outside the respirator by the airborne concentration of that agent inside the respirator wearer's facepiece, hood, or helmet.

A half facepiece PAPR has an APF of 50, and a full facepiece PAPR has an APF of 1,000. A PAPR may have a tight-fitting half or full facepiece or a loose-fitting facepiece, hood, or helmet.

Advantages

- Provides greater protection;
- More comfortable to wear and to breathe;
- Air delivery to facepiece mask ensures that leakage of contaminated air is usually outward;
- Fit testing not required;
- Various chemical cartridges or canisters available to eliminate chemicals including organic vapors and acid gases.

Disadvantages

- Noisy;
- Battery dependente;
- Is not a true positive-pressure device;
- Communication can be difficult.



Figura 8 - Powered air-purifying respirators (PAPR)

d) Self-contained breathing apparatus (SCBA)

Independent of ambient atmosphere and have the function of providing air not coming from the surrounding atmosphere.

They isolate the user from ambient air and provide breathable air suitable for safe breathing. They protect against lack or excess of O₂.

Self-contained breathing apparatus consist of a full-face mask fitted with a demand valve and supplied with clean air from vessels of compressed breathable air. Both negative and positive demand types are available.

Open-circuit compressed-air devices (exhaled air is discharged to the atmosphere) typically lasts about 60 minutes and is widely used by industry and emergency staff. Closed-circuit compressed-oxygen devices (carbon dioxide in the exhaled air is removed by an adsorbent and the cleaned air is topped up with oxygen and recirculated) can last for more than two hours.



Figure 9 - Self-contained breathing apparatus

Advantages

- Provides highest level of respiratory protection;
- Improved mobility over Supplied-Air Respirators;
- Provides both respiratory and eye protection.

Disadvantages

- Heavy to wear;
- Limited oxygen supply limits duration of use;
- Fit testing required;
- Communication can be difficult.

Protective Clothing

Protective clothing includes protective coverall (with attached hood), gown, apron, head and shoe covers.

Should be waterproof or impervious to liquids to protect the body from contamination by blood, droplets or other body fluids and prevent these contaminants from getting into the body through open wounds or contaminating the worker's own clothing, thus reducing the chance of spreading of pathogen and cross-infection.

Protective clothing is disposable in most cases though some can be reused after decontamination.

Standard protective clothing should be chosen (for example, EU EN 340) and should fit the wearer and should not hamper movement.

Protective clothing should be checked before use and replaced if damaged.

Biologically contaminated protective clothing should be disposed of in specially designed rubbish bag marked with "biological hazard" warning and label. Seal the bag and place it in designated location for special disposal.

There are six basic types of protective clothing against chemical and microbiological hazards: 1) gas-tight, 2) air-fed non-gas-tight suits, 3) suits against pressurised liquids, 4) suits against sprayed liquids, 5) suits against solid particles, and 6) suits offering limited protective performance against liquid chemicals.

Furthermore, several subtypes exist. Within each type, the efficacy against different chemicals, microbes, and mechanical strength varies depending on the structure of the clothing and material properties. Clothing types 3, 4, and 6 may cover the user's body only partially.

 leak tightness and efficacy increases	CPC type and purpose	Standard
	Type 1 gas-tight suit	EN 943-1
	Protection against hazardous gases, liquids, aerosols, and solid particles	EN 943-2
	Type 2 air-fed non-gas-tight suits	EN 943-1
	Protection against hazardous gases, liquids, aerosols, and solid particles	
	Type 3 liquid-tight suit	EN 14605
	Protection against pressurised liquids	
Type 4 spray-tight suits	EN 14605	
Protection against sprayed liquids		
Type 5 suits against solid particles	EN ISO	
Protection against dusts and solid particles	13982-1	
Type 6 suits offering limited protective performance against liquid chemicals	EN 13034	
Protection against e.g. minor splashes of irritant chemical		

a) Type 1 | EN 943-1 & 2

Gas Tight Chemical Protective Clothing: Protective clothing against liquid and gaseous chemicals, aerosols and solid particulates.

Complete suits (integrated with boots and gloves, sealed to the suit). They may include Self-contained breathing apparatus (SCBA) inside (Type 1A), SCBA outside (Type 1B) or have positive pressure inside the suit (Type 1C) provided by an external air system – air line.

Type 1: gas-tight chemical protective suit.

Type 1a: gas-tight chemical protective suit with a breathable air supply, independent of the ambient atmosphere, e.g. a self-contained, open-circuit, compressed-air breathing apparatus, worn inside the chemical protective suit.

Type 1b: gas-tight chemical protective suit with an independent breathable air supply, e.g. a self-contained, open-circuit, compressed-air breathing apparatus, worn outside the chemical protective suit.

Type 1c: gas-tight chemical protective suit with a breathable air system, providing positive pressure, e.g. an air line.



NOTE: Maximum level of protection. Recommended for high levels of exposure to chemical and biological contaminants (CBRN) in confined spaces.

b) Type 2 | EN 943-1

Non Gas Tight Chemical Protective Clothing: Suits which retain positive pressure to prevent ingress of dusts, liquids and vapours.

Type 2: non-gas-tight chemical protective suit. A non-gas-tight chemical protective suit with a breathable air system providing positive pressure.

They do not provide protection against gases. They have positive pressure inside, and the air is supplied by an external system, blocking the entry of particles, liquids or vapors.



c) Type 3 | EN 14605

Liquid Tight Suits: Suits which can protect against strong and directional jets of liquid chemical.

Full-body protective clothing with jet-tight connections between the different parts of the clothing (Type 3: liquid-tight clothing) and, if applicable, with liquid-tight connections to component parts, such as hoods, gloves, boots, visors or respiratory protective equipment, which may be specified in other European standards. Examples of such clothing are one-piece coveralls or two-piece suits, with or without gloves, hoods, visors, integrated socks and boot covers.

**d) Type 4 | EN 14605**

Spray Tight Suits: Suits which offer protection against saturation of liquid chemicals

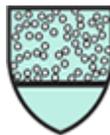
Full-body protective clothing with spray-tight connections between the different parts of the clothing (Type 4: spray-tight clothing) and, if applicable, with spray-tight connections to component parts, such as hoods, gloves, boots, visors or respiratory protective equipment, which may be specified in other European standards. Examples of such clothing are one-piece coveralls or two-piece suits, with or without gloves, hoods, visors, integrated socks and boot covers.

covers.



NOTE: Recommended for high levels of exposure to chemical and biological contamination in open or unconfined spaces. Possible use in CBRN interventions, however their exposure and saturation to the contaminant is limited.

e) Type 5 | EN ISO 13982-1



Dry Particulate Protection: Suits which provide protection to the full body against airborne solid particulate.

Specifies the minimum requirements for chemical protective clothing resistant to penetration by airborne solid particles (Type 5). These garments are full-body protective items covering the trunk, arms and legs, such as one-piece coveralls or two-piece suits, with or without hoods, visors and foot protection. Requirements for component parts, such as hoods, gloves, boots, visors or respiratory protective equipment, may be specified in other European standards.



f) Type 6 | EN ISO 13034



Reduced Spray Suits: Suits which offer limited protection against a light spray of liquid chemicals.

Specifies the minimum requirements for limited-performance, limited-use and reusable chemical protective clothing. Limited-performance chemical protective clothing is intended for use in cases of potential exposure to light sprays, liquid aerosols or low-pressure, low-volume splashes, which do not require a complete liquid permeation barrier (at molecular level). The scope of this standard covers both chemical protective suits (Type 6) and partial body protection garments (Type PB [6]).

Chemical protective suits (Type 6) cover and protect at least the trunk and the limbs, e.g. one-piece coveralls or two-piece suits, with or without hoods, integrated socks or boot covers.

Partial body protection garments, e.g. coats, aprons, sleeves, etc. of similar limited performance (Type PB [6]), cover and protect specific parts of the body and are not subjected to the whole-suit test.



Additional Protective Clothing Standards



EN 14126 - Protective clothing against infective agents (“Type” prefixed with “-B” indicates approval to this European Norm).

Protective Clothing against infective agents has two main functions: to prevent infective agents from reaching the (possibly injured) skin and to prevent the spreading of infective agents to other people and other situations, e.g. eating or drinking, when the person has taken his protective clothing off.

In many work situations i.e. microbiological laboratories; the infective agents can be contained, and the risk of exposure limited to the occurrence of an accident.

However, in other types of work i.e. sewage & wastewater treatment, caring for infected animals, emergency clean-up; the organisms cannot be contained, exposing the worker continuously to the risk of infection by biological agents. In these situations, the biological agents the worker is exposed to may not be known.

Micro-organisms are a very heterogeneous group in that they come in all shapes and sizes, and their living conditions, survival abilities etc. vary widely. A distinction is made between four risk groups according to the risk of infection for humans. Details of these risk groups, along with their containment measures are found in European Directive 2000/54/EEC (on the protection of workers from the risk related exposure to biological agents at work).

EN14126:2003 Due to the heterogeneity of micro-organisms, it is not possible to define performance criteria of protective clothing on the basis of risk groups, nor on the type of micro-organism. Also, it may not be possible to define exactly the organisms the worker is exposed to. Hence the test methods in EN14126:2003 focus on the

medium containing the micro-organism, such as liquid, aerosol or a solid dust particle.

In accordance with the requirements of EN14126:2003 protective clothing should be certified as Category III and subjected to 5 test methods specified in the standard. The corresponding protective clothing “Type” is then prefixed with the letter “B” (e.g. Type 3-B) and the biohazard symbol is displayed.



Hands Protection

All glove selection must be preceded by risk assessment. The main concerns are what glove type to wear and how to don and remove gloves safely to prevent cross contamination. Where there is a risk of exposure to potentially infectious material, disposable gloves should be worn.

Gloves must be appropriate for use, fit for purpose and well-fitting to avoid interference with dexterity. They should not cause friction, excessive sweating, finger and hand muscle fatigue or tear easily. The supply and choice of the correct size of glove is important. All gloves should be CE marked (EN 374) for use with biological agents. The use of gauntlet-style (long arm) gloves to cover the forearm may be necessary in certain situations and should be considered within risk-assessment procedures.

A double-gloving strategy may be considered in particularly high-risk situations. This allows for removal and replacement of the outer gloves, if contaminated, while still retaining skin protection and should be used to increase the level of protection.

In order to increase the degree of protection in the area of the hands and wrists, it is recommended to isolate, using resistant and waterproof plastic tape, the inner pair of gloves with the end of the disposable suits, thus ensuring full protection, avoiding exposure of the wrist area to the contaminated environment.

Levels of personal protective equipment based on the degree of protection provided (each level consists of a combination of the protective respiratory equipment and clothing):

Level A: consists of a self-contained breathing apparatus (SCBA) and a totally encapsulating protective suit (Type 1). Level A personal protective equipment provides the highest level of respiratory, eye, mucous membrane, and skin protection.

Level B: consists of a positive-pressure respirator (self-contained breathing apparatus (SCBA) or supplied-air respirator) and nonencapsulated protective suit, gloves, and boots. Level B PPE provides the highest level of respiratory protection with a lower level of skin protection.

Very similar to Level A, the Level B suit is extremely protective, and the difference is that these suits contain less skin and outer body protection compared the abovementioned level. These are utilized when the wearer may require less skin protection but still a very high level of respiratory protection.

Level C: consists of an APR (Half or full-face air-purifying respirators) and nonencapsulated protective suit clothing, gloves, and boots. Level C personal protective equipment provides the same level of skin protection as level B, with a lower level of respiratory protection. Level C PPE is used when the type of airborne exposure is known to be guarded against adequately by an APR. This is the most commonly used suit.

Level D: consists of standard work clothes without a respirator. In hospitals, level D consists of surgical gown, mask, and latex gloves (universal precautions). Level D provides no respiratory protection and only minimal skin protection.



Results:

The use of adequate PPE should protect individuals involved in biological events from hazards effecting the respiratory system, skin, eyes, face, hands and the body. No single combination of protective equipment and clothing can protect against all hazards. Thus, PPE should be used in conjunction with other protective methods, including exposure control procedures and equipment.

There are many types of protective equipment, each with specific applications and use requirements.

The onsite incident coordinator should define the PPE ensemble required based on the conditions at the biological incident.

Discussion:

Decisions about PPE use must consider the safety hazards limitations (restricted movement due to weight, restricted vision due to visual field limitations and difficulty communicating due to face protection), the psychological stressors limitations (psychological stress, heat stress and risk of dehydration) and the management requirements limitations (need for a management program that ensures effective use of PPE).

Conclusion:

Personal protective equipment is extremely important, is designed to provide protection from serious injuries or illnesses resulting from contact with biological contamination or other hazards.

The use of adequate PPE should protect individuals involved in biological events from hazards effecting the respiratory system, skin, eyes, face, hands and the body. No single combination of protective equipment and clothing can protect against all hazards. Thus, PPE should be used in conjunction with other protective methods, including exposure control procedures and equipment.

Recommendations:

Each person needs to know how to use the correct PPE, how to donning and doffing and also how do choose the correct PPE.

Any fail in this process, can cause injuries on the person.

Acknowledgements:

PPE – Personal protective equipment

References:

CDC – www.cdc.gov

OSHA – www.osha.gov

ACT – www.act.gov.pt

DGS – www.dgs.pt

DEATHCLEAN – www.deathclean.com

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RAPID RESPONSE BIO-CLEAN

Rapid Response Bio Clean is owner operated with 20 years' experience in construction, restoration, and cleaning. At its core, the job they perform is the cleanup, removal, and disinfecting of biological and chemical materials from a contaminated property and restoring it to its pre-incident state. They feel they perform a service to those individuals related to the tragic event or accident by allowing them the chance to begin the healing process knowing their property will be returned to its previous state.

When talking to Lance Hamel with Rapid Response he had this advice for people entering the industry, "I think people come into our industry thinking only about cleaning up the typical scenes you see on TV.

New companies should think about all of the other needs a bioremediation company can service. We do all types of jobs like removing sharps from elevator pits to cleaning spoiled food from the back of trucks when their refrigeration fails.

Every day we are being asked to do things I would of never thought there was a need for. Those odd jobs get us in the door with large companies and give us an opportunity to build a relationship with them." To learn more about Rapid Response Bio-Clean feel free to check out their website :

https://rapidresponsebioclean.com/about_us/index.htm

Location: Portland Oregon

Phone: (503) 421-5148

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