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Rialtais Áitiúil agus Oidhreachta
Department of Housing,
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Good Practice Note 5.2

Protecting Firefighters from the Products of Combustion

Working in Training Environments

Prepared by the National Directorate for Fire & Emergency Management

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Section 1. Introduction

1. This good practice note focuses on managing the products of combustion in fire services training environments. An additional good practice note (GPN 5.1) has been prepared for operational fire services work, and should be read in conjunction with this guide.

2. This document reviews the hazards and risks associated with the exposure of firefighting personnel, to potentially harmful airborne contaminants from the products of combustion, when undertaking training. It sets out good practice for fire services to mitigate the toxic impacts, for firefighters when working under training conditions. This will typically occur during attendance at Breathing Apparatus Initial Wearers and Refresher courses, Compartment Fire Behaviour Initial Wearers and Refreshers courses, and other training involving products of combustion. The provisions in this document apply equally to those personnel who instruct and deliver the training at the Learning & Development Centres and **any reference to firefighters should be read as including instructors/trainers and support staff.**

3. Potentially harmful contaminants present themselves to firefighters, primarily via airborne in the products of combustion, when undertaking training, but it is recognised that the nature of the contaminants is likely to be less harmful than those encountered when working at operational incidents, given the controlled nature of training activities. .

4. Notwithstanding the controlled nature of training environments, it is still important to recognise the potential harmful effects that such training can have on firefighters themselves. Exposure to the unique hazards present from toxic smoke inhalation in training can lead to both immediate and long-term health consequences, and firefighters are generally subject to longer, and possibly higher, levels of exposure due to the typically condensed and intensive nature of training. Understanding and addressing these harmful effects is crucial to ensuring the health and safety of our operational firefighters.

5. Research[1] highlights that fire contaminants are directly linked to and can increase the risk of cancer and other diseases. This guidance provides advice to fire services, and those operating learning and development centres, in the pre-planning, the provision of suitable equipment/PPE and operating principles and practice, that will protect firefighters from the products of combustion while undergoing training.

6. It is acknowledged that there are differing levels of equipment and infrastructure in the various learning and development centres in Ireland and this guidance is based on what is reasonably practicable, given what is in place in these centres. There is no obligation on learning and development centres to provide a complete set of PPE at the centres for use by visiting students, but facilities for initial off-gassing of equipment and PPE, and for the washing and drying of students PPE will be provided.

7. It is acknowledged that many learning and development centres will operate with visiting and

external instructors and it is essential that all such instructors follow the established procedures and practices of the centre. It is recommended that every centre have its decontamination procedures clearly set out and communicated to all students and instructors through its joining instructions and/or handover documentation.

Section 2. Products of Combustion

1. The role of firefighters will inevitably bring them into direct contact with fires and the products of combustion, which contain many toxins. Fires produce a cocktail of toxic, irritant and carcinogenic chemicals – the composition of which varies depending on the specific materials burning and the fire conditions. They can be released in the form of particulates which will include aerosols, dusts, fibres, smoke and fumes or gases and vapours.

2. Some of the materials produced in fire (e.g. carbon monoxide, hydrogen cyanide and acid gases) have immediate adverse effects on health after only a single or short exposure (e.g. asphyxiation). This is known as acute toxicity.

3. The toxins that derive from the pyrolysis of fuels and the complex combustion process (e.g. polycyclic aromatic hydrocarbons, volatile organic compounds) have much longer-term adverse effects on health, causing conditions which are more complex and can develop more slowly e.g. cancer, cardiovascular (related to the circulatory system which comprises the heart and blood vessels) and neurological (nervous system) diseases. This is known as chronic toxicity. Repeated exposure to even very small amounts of chronic toxicants over time increases the likelihood of developing long-term health conditions.

4. The products of combustion produced under training conditions are typically less unpredictable than those encountered under operational conditions given the controlled nature of the fuels being burned in the training centres. Notwithstanding this, the products of combustion produced at the learning and development centres are still toxic and demand the same level of caution and decontamination as at operational incidents. To best control the products of combustion produced during training;

   (a) It is recommended that only clean pallets (any plastic etc. should be stripped from the pallets), and Oriented Strand Board (OSB) is burned in the training environment.
   (b) Under no circumstances should rubbish, plastics or any other waste material be burned within the training environment.
   (c) Particular consideration should be given as to how the fires within the burn-rooms are started; any accelerants should be kept to an absolute minimum and eliminated if possible.

Section 3. Routes of Exposure

3.1 Direct Inhalation

1. Considered the traditional route of entry for toxins, the frequent use of modern breathing apparatus has greatly reduced the incidents of lung related illnesses among firefighters. Breathing apparatus is now commonly used not just for structural fires but also for vehicle fires, skip fires and many other types of incidents where combustion takes place in open spaces.

2. Breathing in toxic substances or harmful agents present in the air is a common route of entry. The respiratory system allows these substances to enter the lungs and eventually reach the bloodstream. Exposure happens when firefighters do not wear, incorrectly wear or prematurely remove respiratory protection.

3.2 Dermal Absorption

1. Toxic substances can be absorbed through the skin, especially if they come into direct contact with open wounds, cuts, or through prolonged skin exposure. Soot, or other harmful substances present in the smoke can be absorbed through the skin and enter the bloodstream.

2. The skin is the largest organ in the body and recent research has focused on it, as a pathway for toxins to enter the body. While it provides a barrier to many substances entering the body, it is not impervious. Research[1] indicates that increasing skin temperature leads to an increase in skin permeability and hence greater absorption of contaminants, via enhanced blood flow to the surface of the skin, increased skin hydration due to sweating, and the opening of skin pores.

3. The combination of boots, base layers and well-fitted structural firefighting kit provides a level of protection to the majority of the body. Research[1] has indicated that the face, jaw, neck, throat and hands are vulnerable to direct absorption and are areas of the body that require cleaning post exposure.

4. First generation anti-flash hoods were designed to limit the effects of elevated temperatures on exposed skin in the head and neck. Designs have now evolved into what are known as ‘particulate blocking’ anti-flash hoods, that while unable to be completely gas tight, have reduced the amount of toxins that can pass through, yet still fulfill the requirement to protect against elevated temperatures.

3.3 Ingestion

1. Ingestion through the gastro-intestinal tract occurs when a toxicant is swallowed. Exposure to contaminants via ingestion may occur when food or drink is contaminated with fire effluents, e.g. if eating/drinking with soiled hands. In addition, when fire gases or particulates have entered the upper respiratory tract via inhalation, they may be carried via mucous and saliva into the digestive system and absorbed into the body.

3.4 EXPOSURE ENVIRONMENTS

1. A non-exhaustive list of examples where firefighters, *are at increased risk of exposure to harmful contaminants* while undertaking training are as follows;

   (a) Firefighters working in live fire environments, internally or externally
   (b) Not cleaning exposed areas with decontamination wipes
   (c) Carrying unbagged contaminated fire kit in own, or fire service, vehicle to or from training
   (d) Eating, drinking or smoking/vaping with unwashed hands whilst wearing, or after de-robing PPE, that may be contaminated
   (e) Inadequate wearing or use of PPE while handling or servicing contaminated BA equipment
   (f) Inadequate wearing or use of PPE while undertaking cleaning of contaminated PPE and other equipment
   (g) Inadequate wearing or use of PPE while working in contaminated environments when setting up training exercises.
   (h) Inadequate wearing or use of PPE while working in contaminated environments when making up or cleaning down facilities after training exercises.
   (i) Not changing out of dirty PPE or station wear
   (j) Not showering at the training centre after being exposed to harmful contaminants during training.

Section 4. Contamination

1. Good Practice note 5.1 focuses on the presence of harmful substances firefighters encounter during and after operational incidents. These broader contamination risks for firefighters include exposure to various hazardous materials such as:

   (a) Smoke and Combustion Byproducts

   Toxic gases and particulates, such as carbon monoxide, hydrogen cyanide, and formaldehyde, are present in smoke from burning materials.

   (b) Hazardous Chemicals

   Chemical spills or leaks from industrial facilities, vehicles, or storage units can expose firefighters to hazardous substances.

   (c) Biological Agents

   Exposure to pathogens or biohazards at medical emergencies, road traffic collisions, domestic house fires and waste-related facilities. This list is not exhaustive.

   (d) Asbestos and Heavy Metals

   Older Structures, particularly older roofing, which may release asbestos particles and/or other hazardous materials such as heavy metals like lead, zinc and cadmium (to name but a few) when damaged by fire ground activities or fires.

   (e) Waterborne Contaminants

   Contaminated firefighting runoff water may pose health and environmental threats particularly when working close to water embankments or flooded areas.

2. The types of contamination outlined above, outside of the products of combustion, are covered in the various SOGs, already issued by the NDFEM in areas such as Rescues and Attendance at Flooding (SOG 2.08), Rescues from Water (SOG 2.11), Hazardous Materials Incidents (SOG 7.00 – 7.09), Asbestos Incidents (SOG 5.11) and Working on, in or Near Water (SOG 5.16).

3. As mentioned previously the products of combustion produced under training conditions are typically more predictable than those encountered under operational conditions given the controlled nature of the fuels being burned in the learning and development centres. Notwithstanding this, the products of combustion produced at the centres are still toxic and demand the same level of caution and decontamination as at operational incidents.

4.1 Direct Contamination

When firefighters come into direct contact with hazardous products of combustion during training. Such exposure can happen through:

(a) Contact with toxic smoke and other airborne particles while attending training.

Without proper protection, the permeation of contaminants occurs when these substances penetrate structural fire kit or dermal absorption to exposed skin.

(b) Breathing Contaminated Air

Inhaling smoke or airborne particles that contain harmful substances can lead to respiratory contamination.

4.2 INDIRECT (CROSS) CONTAMINATION

1. This takes place when contaminants are transferred from one surface or individual to another. Examples include:

(a) Personal Contact

Without proper decontamination firefighters can transfer contaminants through touch e.g. touching their face, communicating with others, or handling equipment, increases the risk of spreading harmful substances.

(b) Contaminated PPE and Equipment

If firefighters do not follow proper decontamination protocols, they are at risk of transferring contaminants to themselves or others.

(c) Personal and Fire service vehicles

Firefighters often bring contaminated PPE back to their home fire station inside an enclosed vehicle. If the PPE is not decontaminated or isolated from the occupants of the vehicle, this can lead to contamination of the vehicle impacting the health of all occupants.

(d) Learning and Development Centre Areas

Dirty PPE which is not isolated can lead to contamination of communal areas such as welfare areas, training rooms and appliance bays.

4.3 LEVELS OF CONTAMINATION

1. The levels of contamination from combustion products during training is affected by several factors:

(a) Fire Size and Duration

Larger and longer-duration fires typically produce more smoke and byproducts, increasing the potential levels of contamination.

(b) Materials Being Burned

Different materials release various toxic substances when they burn. Synthetic materials, plastics, and other chemical-based products can produce more hazardous smoke than natural materials like wood. To best control the products of combustion produced during training, it is recommended that only clean pallets, and Oriented Strand Board (OSB) is

burned in the training environment.

(c) Temperature

Increase temperature increases the levels of permeation.

(d) Proximity and Exposure Time

Firefighters working close to the fire source or staying longer in affected areas are more likely to experience higher contamination levels.

(e) PPE

Proper use of personal protective equipment, including breathing apparatus, reduces direct exposure to smoke and particulates.

(f) Ventilation

Controlled ventilation can help disperse contaminants; however, little or no ventilation will lead to higher concentrations of toxic smoke and gases.

(g) Weather Conditions

Wind speed and direction can disperse or concentrate smoke in particular areas, affecting contamination levels nearby and downwind affecting firefighters and other emergency service personnel not directly involved in the fire/training.

4.4 PERSONAL PROTECTIVE EQUIPMENT

1. PPE is a combination of garments and equipment designed to protect firefighters from the hazards which they may encounter at operational incidents and in training environments.

(a) Firefighting Structural PPE

This current standard is EN 469 (2020)[2], which focuses on thermal and physical protection, while working inside buildings. Features like pockets and loops, while functional, can accumulate contaminants, and without an effective inspection and cleaning routine, these harmful substances may persist on the gear. Additionally, as PPE ages, it's protective abilities diminish, making it easier for contaminants to penetrate the materials. Regular maintenance and updates to firefighting PPE are essential to ensure safety and effectiveness.

(b) Fire Helmet

The current standard is EN 443 (2008)[3], which considers criteria such as impact, thermal, electrical, head and face protection. The design of helmets allows for contamination to accumulate on both the outside and inside surfaces. Consideration should be given post fire to decontaminate helmets by thoroughly cleaning the inside cradle and outside shell.

(c) Anti-Flash Hood

The current standard is EN 13911 (2017)[4] and may also conform to NFPA 1971 (2018)[5],

which considers the effect of severe heat posed by fire gases. Anti-flash hoods are in direct contact with the skin and dermal absorption around the skin/neck area is considered much quicker than absorption in other areas of the body. Particulate blocking flash hoods should be worn with the fire kit ensemble. They are not required to be worn on the fireground unless the firefighters are wearing breathing apparatus (BA) or a risk assessment requires their need. When they are worn and not under air they should be '*pulled down*' round the neck (rather than the traditional 'rolled down'), thus minimising contamination of the inside of the flash hood, prior to it being pulled up on to the head.

(d) Firefighting Gloves

The current standard is EN 659 (2003)[6], which considers thermal and physical protection. Gloves are subjected to the most regular wear and tear thus allowing for contaminants to be easily transmitted by direct contact or indirect (cross) contamination. Poor habits such as placing gloves inside of helmets post operational attendance allow for cross contamination from hand to head. Additional consideration should be given to wearing undergloves or applying barrier cream.

(e) Firefighting Boots

The current standard is EN 15090 (2012)[7], which consider thermal, impact and physical protection. Boots are often overlooked but are the greatest source of cross contamination from the immediate contaminated training environment to learning and development centre communal areas and vehicles. Most boots are leather in design and as such tears in boots will contain contaminants. Boots should not be worn in the centre's communal areas.

(f) Base Layers

The base layer's (i.e. any clothing beneath structural PPE), primary function is to wick moisture away from the skin, regulate body temperature, and provide an additional layer against heat and friction from outer garments. Fabrics that should be considered include inherently flame-resistant fibres which maintain comfort, manage sweat, and resist ignition. Materials to avoid are common synthetics (polyester, nylon, polypropylene) since they can melt or drip under extreme heat, causing burns. Consideration should be given to garments certified to EN ISO 11612:20158 for heat & flame resistance and EN 1149-5:20159 for antistatic protection. All those attending at learning and development centres with a live fire environment should be provided with appropriate base layers by their own Fire Authority.

(g) Respiratory Protective Equipment

Firefighters shall match their level of respiratory protective equipment (RPE) to the level of risk present. For lower-risk tasks such as cleaning and handling of contaminated BA sets, firefighting hose, or soiled PPE, the minimum requirement is an FFP3 filtering half-facemask compliant with EN 149:2001+A1:2009, providing protection against fine particulate matter. Where the level of risk increases due to the presence of higher concentrations of airborne

particulates and soot, such as during cleaning of training rigs, removing of carbonised waste material, or preparing and setting up training exercises, then firefighters shall wear a full-face respirator (conforming to EN 136 Class 2 or higher) fitted with an appropriate particulate filter to protect both the respiratory system and eyes. In any situation where harmful gases may be present, firefighters will resort to the highest level of protection and wear full breathing apparatus (BA).

4.5 FIREFIGHTING EQUIPMENT

There are numerous pieces of equipment used during training, particularly in the areas and structures where firefighting activities are undertaken. This primarily includes hose, branches, thermal imaging cameras, radios and breathing apparatus. The main visible contamination should be cleaned thoroughly after use using water and any brushes etc. BA sets and PPE should be off-gassed after each wear in a pre-designated area, and BA sets should be subsequently wiped down. On completion of training the more significantly contaminated equipment, mainly BA sets, should be cleaned wearing suitable PPE and then bagged/boxed for transport back to the home station in accordance with the principles highlighted in GPN 5.1, and as per the Fire Authorities' policy

Section 5. Mitigating the Risk

Fire fighters face significant health risks due to the byproducts of smoke and combustion encountered during training involving live fires. These byproducts contain toxic substances that, if not adequately decontaminated, can continue to adhere to PPE and fire ground equipment, persisting for extended periods and posing a continuous threat to health. This guidance reflects a structured approach to mitigating the risk as much as is reasonably practicable.

5.1 Minimising Firefighter Exposure

The initial management of contamination at the learning and development centre is critical to limiting the exposure of contaminants to firefighters. There are practical control measures which can be followed to reduce exposure levels such as:

(a) Personal Protective Equipment (PPE)

(i) Undamaged, well-fitted PPE, including helmets, gloves, fire-resistant clothing, and boots.

(ii) Ensure that BA is worn at all times when exposed, or potentially exposed, to harmful contaminants to prevent inhalation of toxic gases and particles.

(b) Decontamination Procedures

(i) Implement on-site decontamination protocols to remove soot and debris from PPE and equipment.

(ii) Use decontamination wipes or wet cloths to clean skin and exposed areas as soon as possible.

(iii) Develop a recordable maintenance, inspection and cleaning process of PPE and equipment after each training use.

(c) Washing and Hygiene Practices

(i) Provide facilities for showering and changing clothes immediately after exposure, in order to minimise the spread of contaminants beyond the operational service.

(d) Training and Education

(i) BA and CFB training programmes to focus on decontamination procedures post incident.

(e) Filling of Sets

(i) Filling of sets to be undertaken using appropriate PPE e.g. P3 masks and Nitrile Gloves

The structured approach is to minimise exposure to contaminants through appropriate pre-planning, considering the actions before, during and after a training session

5.2 Pre-Planning

5.2.1 Learning and Development Centre Layout

1. The layout of the learning and development centre should be clearly delineated with appropriate signage, as much as practicable, for the areas where dirty or contaminated equipment or PPE is permitted. All centres should progress to clearly indicate the clean and contaminated areas and

consider external washing facilities in centre yards for clean down of PPE and equipment.

2. Learning and development centres should have appropriate separation and signs/colour coding of areas with traffic light system to clearly denote contaminated (red), transition (yellow), and clean (green) spaces within the building. The Red Zone contains spaces most likely to be contaminated such as BA fill and washing areas The Yellow Zone creates transition spaces between red and green zones where contamination control takes place. The Green Zone houses clean spaces such as eating, administrative and public areas.

3. The Yellow Zone acts as a "filter" between areas where contaminants can be found and uncontaminated areas. This transition zone provides a place for personnel and gear to be decontaminated while providing a buffer to keep the contaminants from crossing over into areas where participants operate, thus minimising exposure. It is recommended to divide the centre into three hazard zones. It is acknowledged that the layout of centres varies significantly across the country and any guidance on zoning will have to be tailored locally. Notwithstanding this, the following may provide some assistance in 'mapping' training centres .

Hot (Red) Zone:

4. These are designated for everything contaminated that needs to be decontaminated and are primarily operational areas. Ideally, there should be a decontamination at source policy, but the red area has a medium risk of cross contamination or exposure to carcinogens. If leaving a red area, firefighters should ideally not be able to enter a green area without passing through a transitional zone (yellow) with the opportunity to wash and change clothes. Areas that may be considered for inclusion in the red areas are the following:

(a) BA cylinder fill room
(b) BA and ancillary equipment washrooms
(c) Off gassing area

Warm (Yellow) Zone

5. This is the transitional space between red zones and green areas where course participants and staff can clean and remove contamination. The risk of exposure to contamination or carcinogens is low. Firefighting kit can be worn in this area if suitably clean. Areas that may be considered for inclusion in the yellow areas are the following:

(a) WC/showers
(b) Briefing/debrief room
(c) Lockers
(d) Laundry
(e) In-use kit room
(f) Drying room / cabinet
(g) General equipment store

(h) Cleaners' store

Cold (Green) Zone

6. These are the clean areas within a centre where food is prepared or consumed or where clean tasks are carried out. I.e. office tasks. No firefighting kit is to be worn and there should be no risk of exposure to contamination from carcinogens. Contaminated and equipment should never enter this. Areas that may be considered for inclusion in the green areas are the following:

(a) Public entrance
(b) Reception
(c) Public WC
(d) Personnel main entrance
(e) Meeting rooms and offices
(f) Training room
(g) Mess area / kitchens
(h) IT Comms rooms

7. Zones should be clearly identifiable to learners not regularly training at the centre. This may be by way of colour banding to the top 300mm of each room. Alternative zone identification may be considered such as appropriately coloured furniture. In addition, door signage should be fitted to further assist the learner in identifying the transition requirements from one zone to the next (See Appendix 2)

8. Learning and development centres should be equipped with adequate welfare facilities such as shower, and PPE washing and drying facilities to assist in decontamination procedures.

9. This guidance advocates the principle of eliminating contamination close to the source and keeping it outside the centre , as far as practicable. Hence, the layout of the centre should keep the red (contaminated) areas to an absolute minimum.

10. Where some existing centre layouts may not currently facilitate physical separation internally, they should adhere to the important principles of segregation of contaminated equipment and PPE. In training centres with limited internal space, the principle of keeping the entire centre as a clean area should be considered. This would require putting decontamination arrangements externally or rooms not internally accessible within the facility.

5.2.2 Preparation for Training

11. There should be a regular PPE maintenance regime in place to ensure that it is clean and ready for use in training . All PPE should fit correctly and not be excessively loose, ensuring an overlap between the tunic and the bunker pants when worn. Periodic inspection should be carried out of all PPE and all defects remedied and recorded.

12. Initial decontamination (gassing off) of contaminated equipment should be carried out in open

areas where fresh air passes through, as close to the source of contamination as possible (while in clean air). These arrangements will prevent cross-contamination to unaffected areas. This will require provision for BA wearers to doff contaminated PPE, prior to returning to the main training building.

(a) Instructors should review procedures for decontamination in use at each centre at the pre-course meeting. These procedures should be provided by the centre.
(b) At the beginning of the course, all participants should be given guidance on the procedures for decontamination at each centre. These arrangements should be closely monitored to ensure strict adherence.

13. The following should be planned for:

(a) Have the necessary equipment at the training site for the initial cleaning of contaminated items. These items, some of which will be supplied by the centre, and some by the attending authority, may include (list non-exhaustive):
    (i) Soft head brushes
    (ii) Decontamination skin wipes
    (iii) P3 respirator masks
    (iv) Disposable nitrile gloves (or similar)
    (v) Roll of soluble large laundry bags (may not be suitable for damp/ wet PPE)
    (vi) Roll of large clear plastic bags for bagging equipment & PPE
    (vii) Heavy duty industrial wipes
    (viii) Spare flash hoods & firefighting gloves
    (ix) 2 to 4 pairs of long-sleeved tops, bottoms & slippers (consider alternative PPE)

5.3 DURING TRAINING

1. Each BA wear set-up area should always be in clean air. Wind direction may need to be considered to ensure this. Certain wears will require students to change cylinders and recommit to a structure to complete further tasks. Before re-committing to the fire risk area, decontamination of the head, neck and hands with wipes is recommended – this does not apply if the student does not come out from under air. Wearers should wear a P3 respirator mask and disposable nitrile gloves while changing the cylinder.

2. For wears inside the contaminated training building/BA house:

(a) BA entry control and incident command points should be sited out of products of combustion.
(b) Students, trainers and/or course assistants that are not actively involved in the wear should avoid contact with products of combustion.
(c) Participants need to be aware of the limitations of P3 respirator masks, as they are designed only for blocking particles and will not provide adequate protection against airborne toxic gases.
(d) Participants that require the use of welfare facilities, during a wear, must ensure that they

thoroughly clean hands and face and neck beforehand, out of area where the risk of contamination exists.

5.4 After the Wear

1. The key principle in minimising the level of personal exposure, is the cleaning of equipment/PPE (as much as is practical) at the training location, before returning to the classroom and welfare facilities. Research[1] has shown that the release of toxins (*known as off-gassing*) continues for some time after a fire has been considered extinguished.

2. Once the lead wear instructor has deemed the wear to be over, the collective process of decontamination should commence and include the following:

   (a) Establish the doffing area using a ground sheet.
   (b) Participants (students and instructors) should don P3 respirators, disposable gloves
   (c) BA sets and cylinders used should be wiped down with heavy duty industrial wipes before being sent for re-fill.
   (d) Firefighter trousers, tunic and gloves should be removed and allowed to 'gas-off' for 10 to 15 minutes (defined in ISO 23616:2024).
   (e) Boots should be washed using an appropriate boot washer.
   (f) Helmets should be wiped down (inside and out) with heavy industrial wipes before being brought back into the training building.
   (g) Flash hoods should be doffed and sent for washing
   (h) Head, face, neck, jaw, throat and hands to be thoroughly cleaned using decontamination wipes.
   (i) All contaminated disposable equipment such as wipes, nitrile gloves respirators etc. should be disposed of in an appropriate manner.
   (j) Once the gassing off period has been completed, firefighter trousers, tunics and gloves may be carried (using disposable nitrile gloves) into a well-ventilated drying area.
   (k) It is essential that participants shower as soon as possible on returning to the training building and in all instances within an hour ('Shower within the hour').

5.5 On Completion of the Course

1. Arrangements should be made for the safe transport of equipment that has been used during the BA course. Although initial decontamination will have taken place at the centre, some further cleaning is likely to be required. The following steps should be followed.

   (a) BA sets should be transported in accordance with GPN 5.1.
   (b) Fire fighter PPE (tunic, trousers, flashhoods, gloves and undergarments) should be transported in tied water-soluble bags that are then placed into ordinary plastic bags.
   (c) Contaminated helmets and boots should also be bagged for transport.

2. At no time should firefighters carry contaminated items with the smell of smoke in vehicles to or

from learning and development centres, unless placed in appropriate bags/boxes.

3. The process on arrival back at the fire authority should include the following:

   (a) Arrangements should be made to complete the cleaning process and priority given to undertaking as much of this work in open air.
   (b) It is important to protect areas of exposed skin and airways when cleaning soiled PPE/equipment. Those carrying out this work should wear disposable gloves and P3 respirator masks as a minimum.
   (c) Where cleaning takes place at sinks or work tops, clean them down afterwards.
   (d) Base layers requiring laundering to be replaced and arrangements made for washing same.
   (e) Do not return to canteens, dormitories etc. (clean areas) in dirty clothing.
   (f) PPE and equipment (particularly BA) should be deep cleaned and thoroughly decontaminated after every training period, to avoid a build-up of toxic contaminants.
   (g) Regular rehydration should continue for days after the course

4. It is important that every fire service puts in place a procedure for the appropriate cleaning of PPE. The general considerations for the decontamination of PPE/clothing at the fire station as follows:

   (a) All articles of clothing and/or equipment that were exposed to contaminants should be properly cleaned as specified in the appropriate standard e.g. ISO 23616[11] (2024).
   (b) Thorough, routine cleaning should include the PPE interiors. Thus, until the interior of PPE has also been cleaned and dried, the gear should be considered out of service.
   (c) Slightly contaminated PPE e.g. with a slight *smell of smoke** but with no visible soiling, should hung in a well-ventilated area away from clean PPE e.g. an outdoor covered area, or well-ventilated outhouse.
   (d) Following fire incidents, cleaned PPE ensembles should be hung on racks to reduce drying times and to allow for continued gassing-off. Fans may facilitate this process.

   * Note: Smell of smoke can to some degree be subjective but is a broad indicator of some contamination.

5. The overall control measures to mitigate exposure for firefighters is provided in ***Appendix 2 of GPN 5.1***, which details the various considerations in fire services for the various stages of contamination control.

5.6 Course Assistants

1. Due to their regular and ongoing service, course assistants are at an increased risk of exposure to dangerous contaminants. This risk must be controlled to eliminate potential exposure, as far as is reasonably practicable. Although it is not possible to plan for the dynamics of each learning and development centre, for exercises that require the burning of products of combustion, the following principles should be adhered to:

   (a) While loading the crib (before lighting the fire), course assistants must wear full faceP3 mask and gloves.

(b) If course assistants are required to add fuel to the fire during the wear, they must wear full firefighter PPE (tunic, trousers, helmet, boots and gloves) and wear BA.

(c) Escape sets may be used for this purpose. As an alternative, instructors under air wearing full firefighter PPE could also add fuel to the fire. Good communication between the instructors and course assistants will be required.

2. If course assistants have been exposed to the fire by loading fuel during the wear, decontamination procedures outlined in 5.4 should be implemented. They are as follows:

(a) Participants (students and instructors) should don P3 respirators and disposable gloves.

(b) BA sets and cylinders used should be wiped down with heavy duty industrial wipes.

(c) Firefighter trousers, tunic and gloves should be removed and allowed to gas off for 10 to 15 minutes (defined in ISO 23616:2024).

(d) Boots should be washed using an appropriate boot washer.

(e) Helmets should be wiped down (inside and out) with heavy industrial wipes.

(f) Flash hoods should be doffed and sent for washing.

(g) Head, face, neck, jaw, throat and hands to be thoroughly cleaned using decontamination wipes.

(h) Once the gassing off period has been completed, firefighter trousers, tunics and gloves may be carried (using disposable nitrile gloves) into a well-ventilated drying area.

(i) It is essential that participants shower as soon as possible on returning to the training building and in all instances within an hour (‘Shower within the hour’).

Section 6. Post Training Decontamination

1. Regular decontamination practices during training aid in preventing the transfer of harmful substances to other areas within the learning and development centre or vehicles, reducing the risk of secondary exposure for firefighters, support staff, and the public. Regular washing and decontamination of PPE and equipment significantly reduces the potential for long-term health problems associated with exposure to smoke byproducts, thus improving overall firefighter health and well-being.

2. Effective decontamination procedures will extend the life cycle of PPE and equipment by preventing the buildup of corrosive and damaging substances. This results in cost savings for the fire service in the long run and ensures better functionality and performance, allowing firefighters to carry out their duties effectively and efficiently during emergency situations.

6.1 Personal Protective Equipment

1. The fire authority should have arrangements in place for the cleaning and decontamination of PPE, which can be self-managed or contracted to a specialist third party. The maintenance/care program should ensure that all firefighter PPE is maintained, repaired when necessary and decontaminated according to the manufacturer's specification. The system should include the following principles:

   (a) Full inspection of PPE for any wear or damage and if required sent for repair.
   (b) Each laundering process is logged for each item of PPE, to allow for tracking of care/maintenance for each fire-fighter.
   (c) Professionally decontaminated from harmful agents including a facility to remove heavily soiled garments.
   (d) Use laundering practices that are recommended by the manufacturer, to remove as much contamination as is reasonably practicable.
   (e) Prevent cross-contamination in the local cleaning and professional decontamination processes, to have regard to environmental protection (e.g. wastewater and air).
   (f) Reproofing agent used, as specified by the manufacturer after the designated number of washes.

6.2 Firefighting Equipment

1. The fire authority should have arrangements in place for the cleaning and decontamination of fire services equipment used during live fire training. The maintenance/care program should ensure that all firefighting equipment, in particular breathing apparatus sets, is maintained, repaired when necessary and decontaminated according to the manufacturer's specification. The system should include the following principles:

   (a) Full inspection of equipment for any wear or damage and if required sent for repair.
   (b) The laundering process is logged for each piece of equipment, to allow for appropriate

tracking of care/maintenance.

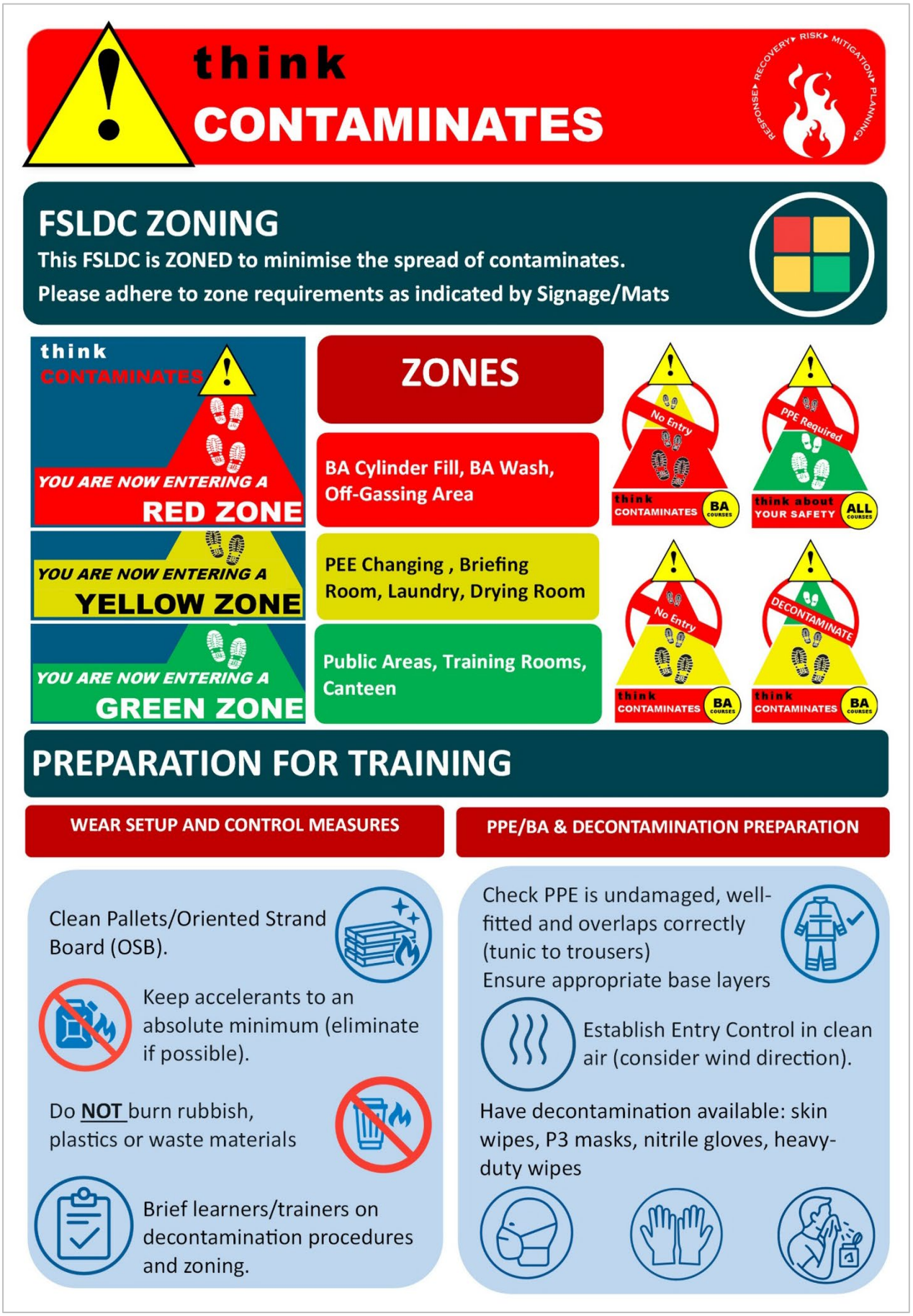
(c) Decontaminated from harmful agents including a facility to remove heavily soiled materials.

(d) Firefighting equipment should be decontaminated before return to operational service.

Section 7. References

1. University of Central Lancashire (2020) Interim Best Practice Report - Minimising firefighters' exposure to toxic fire effluents.
2. EN 469 (2020) Protective clothing for firefighters - Performance requirements for protective clothing for firefighting activities.
3. EN 443 (2008) Helmets for firefighting in buildings and other structures
4. EN 13911 (2017) Protective clothing for firefighters - Requirements and test methods for fire hoods for firefighters.
5. NFPA 1971 (2018) Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting.
6. EN 659 (2003) +A1:2008 (Main) Protective gloves for firefighters
7. EN 15090 (2012) Footwear for firefighters
8. EN ISO 11612 (2015) Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements
9. EN 1149-5 (2018) Protective clothing. Electrostatic properties Material performance and design requirements
10. ISO 23616 (2024) Cleaning, inspection and repair of firefighters' personal protective equipment (PPE)
11. NFPA 1851 (2020) Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting

Appendix 1. Primary Control Measures



COURSE ASSISTANTS - FIRE LOADING

BEFORE IGNITION - CRIB LOADING





Don full face P3 Respirator Mask, Gloves & Safety Boots

DURING THE WEAR - LIVE FIRE LOADING

Full PPE must be worn

Breathing Apparatus/Short Duration Sets must be worn





EXPOSED TO PRODUCTS OF COMBUSTION?

Decontamination Procedures Apply

BA DISCIPLINE

Wear BA at all times when exposed or potentially exposed to products of combustion



BA Entry Control to be located in Clean Air

Observers should avoid contact with products of combustion





Do not remove respiratory protection until in clean air.

Decontaminate before using welfare facilities



CHANGING BA CYLINDERS FOR RE-ENTRY

Recommitting to the Fire Risk Area



Clean head/face/neck/jaw/ throat/hands with decontamination wipes.



Don P3 respirators and disposable nitrile gloves





Change BA Cylinder

FFP3 MASKS



Block Particulates ONLY.
NO PROTECTION TO TOXIC GASES OR OXYGEN DEFICIENT

CROSS-CONTAMINATION

1. **Avoid Touching Face/Neck with contaminated Gloves**
2. **Keep dirty gloves/flash hoods away from helmet interior**
3. **Maintain clean/dirty separation between zone (RED, YELLOW, GREEN)**

AFTER THE WEAR

DECONTAMINATE AT THE TRAINING LOCATION • OFF-GASSING CONTINUES AFTER EXPOSURE

DECON AT SOURCE (CONTROLLED DOFFING)

Start decontamination at the training location before returning to classrooms/ welfare areas.



Establish a controlled doffing area using a ground sheet.



Don P3 respirators and disposable gloves





Wipe down BA sets and cylinders before re-fill.



SHOWER WITHIN THE HOUR

Not showering Increases your risk of exposure to harmful contaminants

OFF-GASSING, CLEANING & HYGIENE



Remove trousers/tunic/gloves and allow to off-gas for 10–15 minutes

Wash boots





Wipe/Wash helmets inside and out

Doff flash hoods for washing





Clean head/face/neck/jaw/ throat/hands with decontamination wipes.

Dispose of contaminated wipes, gloves and respirators appropriately.





Keep contaminated kit out of GREEN Zones.

Do **NOT** eat or smoke until decontaminated



ON COMPLETION OF THE COURSE

1. **Bag ALL contaminated PPE & BA for transport**
2. **Do NOT carry smoky/contaminated items in vehicles unless in appropriate bags/boxes.**
3. **Contaminated PPE should NOT be brought home for washing**





think CONTAMINATES



Template is available on SharePoint in MS Publisher for local amendments

Appendix 2. FSLDC Signage

Appendix 2.1. FSLDC Floor Mats



Diagram 1. FSDLC Zoned Floor Mats

Appendix 2.2. FSLDC Door Signage



Diagram 2. FSLDC Door Signage 140mm Tall

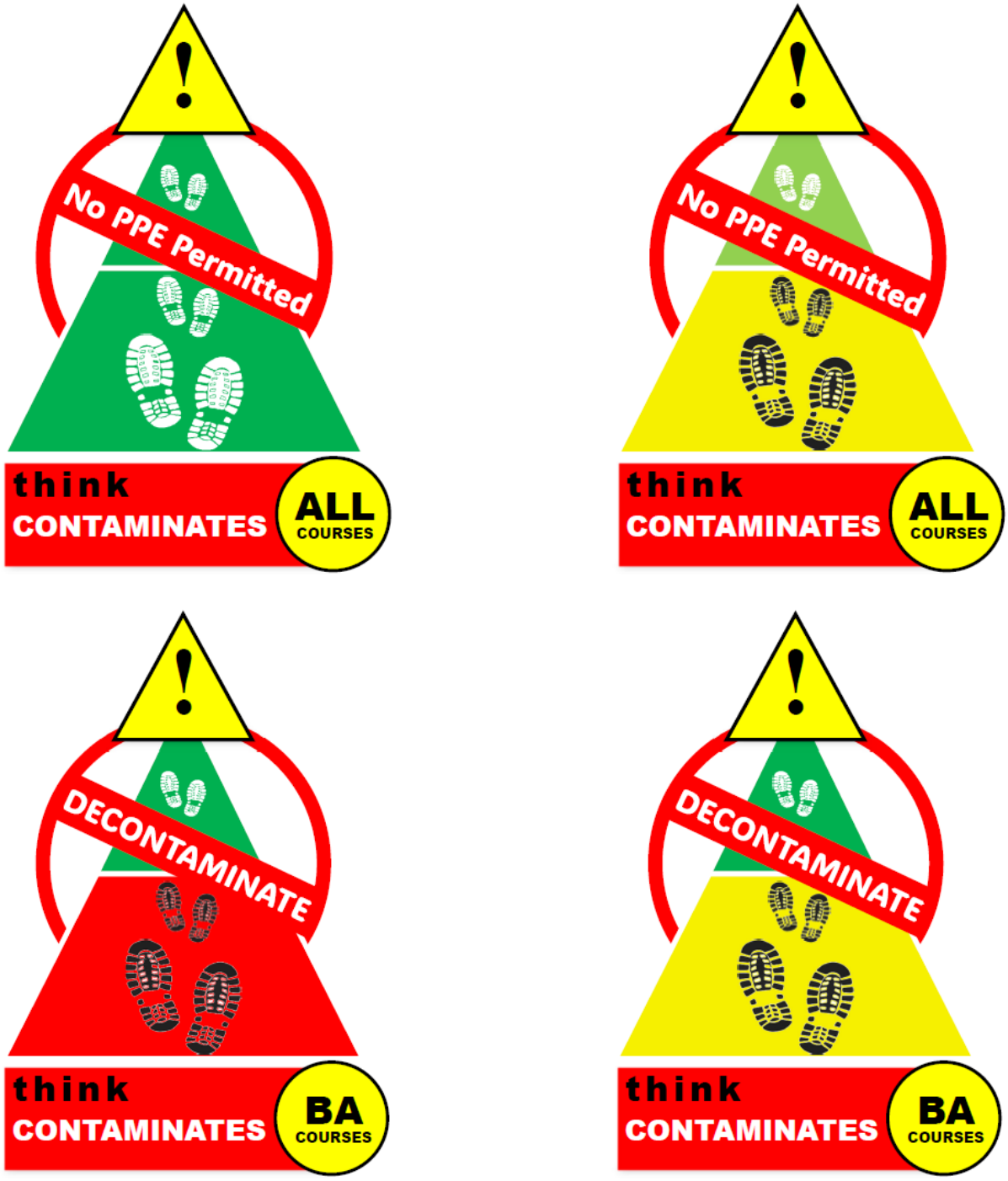


Diagram 3. FSLDC Door Signage 140mm Tall



Diagram 4. FSLDC Door Signage - 140mm Tall

Appendix 3. Risk Assessments

Risk Assessment Summary Sheet							
Title:	**GPN 5.2 - Protecting Firefighters from the Products of Combustion - *Working in Training Environments***						
Doc. Code:	GPN5.2-RA-01	**Issue Date:**	June 2026	**Version:**	1.0	**Developed by:**	Project Implementation Group

Activity	Hazard	Risk Group	CONTROL MEASURES	Responsible Person(s)
Training Environment Activity	Contamination within and around the Training Building during a BA Wear	A **Likelihood** 2 / **Severity** 4 **Risk Rating BEFORE Controls** **8 (Med)**	• Wear PPE & respiratory protection appropriate to the risk • Only burn clean pallets and OSB and keep accelerants to a minimum • Each BA wear set-up area should always be in clean air. Wind direction may need to be considered to ensure this • Where appliances are in use they should be parked upwind and close cab windows • BA Entry Control & IC Command points to be located outside of smoke • While loading the crib (before lighting the fire), course assistants must wear full faceP3 mask and gloves • If course assistants are required to add fuel to the fire during the wear, they must wear full firefighter PPE (tunic, trousers, helmet, boots and gloves) and wear BA. • Students, trainers and/or course assistants that are not actively involved in the wear should avoid contact with products of combustion. • Participants that require the use of welfare facilities, during a wear, must ensure that they thoroughly clean hands and face and neck	All **Likelihood** 1 / **Severity** 4 **Risk Rating AFTER Controls** **4 (Low)**

Activity	Hazard	Risk Group	CONTROL MEASURES	Responsible Person(s)
			beforehand, out of area where the risk of contamination exists. • Do not carry contaminated or bagged equipment in the crew cab	

Activity	Hazard	Risk Group	CONTROL MEASURES	Responsible Person(s)
Training Environment Activity	Contamination following a BA Wear	A **Likelihood** 2 / **Severity** 4 **Risk Rating BEFORE Controls** **8 (Med)**	• Participants (students and instructors) should don P3 respirators, disposable gloves • BA sets and cylinders used should be wiped down with heavy duty industrial wipes before being sent for re-fill. • Firefighter trousers, tunic and gloves should be removed and allowed to 'gas-off' for 10 to 15 minutes (defined in ISO 23616:2024). • Once the gassing off period has been completed, firefighter trousers, tunics and gloves may be carried (using disposable nitrile gloves) into a well-ventilated drying area. • Dirty PPE or clothing not to be worn in canteens, lectures rooms etc • Shower as soon as possible ('Shower within the Hour') • Eat, drink only after showering	IC **Likelihood** 1 / **Severity** 4 **Risk Rating AFTER Controls** **4 (Low)**
Training Environment Activity	Contamination on Completion of Course	A **Likelihood** 2 / **Severity** 4 **Risk Rating BEFORE Controls**	• Transport BA sets in accordance with GPN 5.1 • Transport Fire fighter PPE (tunic, trousers, flashhoods, gloves and undergarments) in tied water-soluble bags that are then placed into ordinary plastic bags. • Dirty & clean PPE/ Clothing not to be stored together	All **Likelihood** 1 / **Severity** 4 **Risk Rating AFTER Controls**

Activity	Hazard	Risk Group	CONTROL MEASURES	Responsible Person(s)
		8 (Med)	• Bag contaminated helmets and boots for transport • Launder and deep clean equipment on return to home Fire Station in accordance with Fire Authority policy.	**4 (Low)**

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