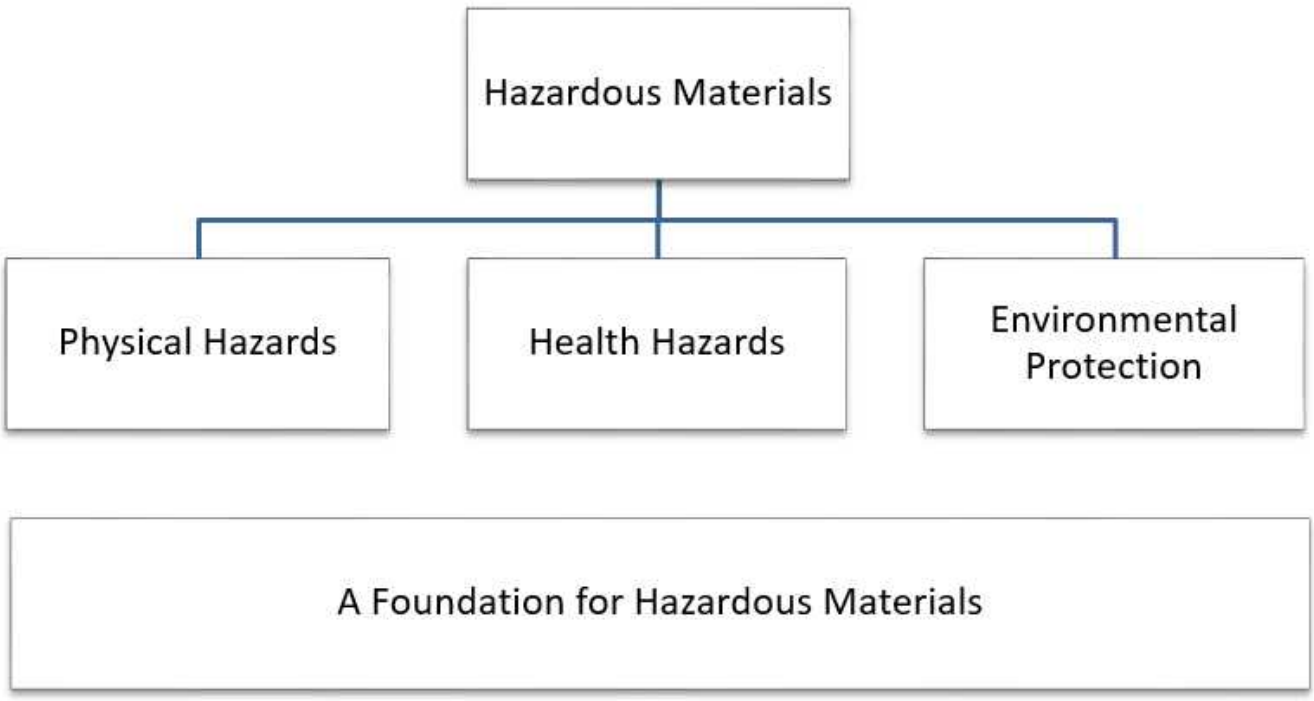
National Operational Guidance

Introduction

This section of guidance examines the hazards encountered by fire and rescue service personnel, other responders and members of the public at hazardous materials incidents. It contains hazard and control measure knowledge relevant to generic hazardous materials incidents, rather than specific types of incident such as a spillage of a corrosive acid. Material specific guidance is covered in the National Operational Guidance for Physical hazards and for Health hazards.

The fire and rescue service responds to a wide range of incidents involving hazardous materials that have the potential to cause harm to firefighters, other responding agencies, the surrounding community, animals and the environment. They may be called specifically to deal with emergency spillages or releases, or they may encounter hazardous materials at fires and other emergency incidents.

This guidance does not give information on the specific hazards and control measures relating to environmental protection. Although they are integral to any hazardous materials response, they are covered separately in National Operational Guidance: Environmental protection.



The operational principles for resolving hazardous materials incidents are essentially the same for accidental, deliberate, malicious or terrorist events. However, terrorist or Chemical, Biological, Radiological, Nuclear (Explosive) events (CBRN(e)) require a more specific response because of:

- Increased security measures
- Increased risks to fire and rescue service personnel
- Complexity of multi-agency working
- Potential for multiple events caused by secondary devices
- Potential for perpetrators to use virulent agents that may be both persistent and difficult to identify
- Potential to change, remove or conceal safety signage and material information
- Potential to select locations that exploit the characteristics of the agent
- Need to exchange information with off-site intelligence and scientific advisers
- Potential for increased public exposure

Relevant knowledge

The term 'Hazardous materials' (also referred to as a HazMat or as dangerous/hazardous substances or goods) means solids, liquids, vapours or gases that can harm people, animals, other living organisms, property or the environment. They include materials that are:

- Toxic
- Radioactive
- Flammable
- Explosive
- Corrosive
- Oxidisers
- Asphyxiates
- Biohazards

It also includes materials with physical conditions or other characteristics that render them hazardous in specific circumstances, such as compressed gases and liquids, hot or cold materials. Other organisations and agencies may use more technical and specific definitions because of their own requirements, but the above definition is the most appropriate for fire and rescue services on which to base their risk assessments and planning assumptions.

A clear distinction relating to hazardous material operations that needs to be understood before using this guidance is the difference between 'contamination' and 'exposure':

Contamination occurs when a substance adheres to or is deposited on people, animals, equipment or the environment, creating a risk of exposure and possible injury or harm. Contamination does not automatically lead to exposure but may do so.

Exposure occurs when a harmful substance enters the body through a route, for example, inhalation, ingestion, absorption or injection, or when the body is irradiated.

Due to the technical nature of hazardous materials operations, fire and rescue services must ensure their responders have access to the appropriate advice, equipment, skills, knowledge and understanding to maintain safety.

Specific hazardous materials roles may also be required in fire and rescue services to support and manage their hazardous materials response. These may include a hazardous materials adviser (HMA), decontamination director, mass decontamination subject matter adviser (SMA) or tactical adviser (TacAd). The number, type and specification of these roles will vary according to the fire and rescue service's risk profile, risk management plan, equipment and appliances.

It should be noted that the term hazardous materials adviser (HMA) is a generic description for anybody with enhanced knowledge of emergency hazardous materials operations used by a fire and rescue service to provide independent specialist advice to the incident commander. It includes such roles as the hazardous materials officer, hazardous materials and environmental protection officer/adviser (HMEPO, HMEPA) and scientific adviser. Their primary functions are to:

- Gather, filter and interpret technical information on hazardous materials for the incident commander
- Assess the risks posed by emergency hazardous materials incidents
- Provide hazardous materials advice on the development of an incident plan which may be at a tactical or strategic level

Hazardous materials incidents are predominantly accidental, frequently involve human error, natural or technological causes. The fire and rescue service will usually lead on this type of incident.

The key difference between a hazardous materials incident and a CBRN(e) event involving deliberate, criminal, malicious or murderous intent is that the latter is declared by the police, who will co-ordinate the multi-agency response. Many possible scenarios could lead to an incident being identified as a suspected or confirmed CBRN(e) event.

If during an incident, the release or spill of hazardous materials is confirmed as accidental then the incident will be reclassified as one involving hazardous materials. Incidents involving biological infections that are not spontaneous are also classified as hazardous materials incidents. The challenges posed and the response requirement for deliberate CBRN(e) and accidental HazMat incidents differ, but are similar or the same in many respects. For that reason, some of the information contained within this document is equally applicable to both situations and can be implemented for all levels of incident. Similarities in response include:

- The requirement for a broad response process involving numerous organisations working together to bring the incident to conclusion
- Multi-agency decision making to enable the development and implementation of integrated response plans
- The need to protect the safety of emergency responders to enable them to carry out those plans

Initial operational response (IOR)

The guidance for initial operational response (IOR) is applicable to all hazardous materials incidents. CBRN(e) incidents are exceptional in their nature and so guidance has been created in the light of developments in scientific understanding and lessons learned from exercises and real incidents. It is based on initial operational response to a CBRN incident published by the Home Office.

The focus of the initial operational response to a suspected or confirmed CBRN(e) incident is to save as many lives as possible. To do this, the emergency services must be aware of their roles and responsibilities and what they can do to save lives in an effective and timely way.

The response to any incident begins with the very first call to the emergency services. However, the role of the call handler, supervisor or first responder is even more important when identifying a potential CBRN(e) incident as it will be crucial to provide correct and simple advice to the caller, while at the same time dispatching or mobilising the right resources, with sufficient information, to the right location as quickly and as safely as possible.

Advice given to the public by fire control room staff and first responders should take the form of three key actions:

- Remove yourself from the immediate area
- Remove outer or affected clothing
- Remove the substance

First responders arriving at the scene must then work together quickly and efficiently to save life. This will begin with the initial operational response (IOR).

The IOR is the start of a contamination incident response and is an extension of the 'Step 1-2-3 Plus -Safety Triggers for Emergency Personnel' process. The non-specialist first responder(s) are expected to begin life saving activities within 15 minutes of arrival at a scene and to manage the scene until further assistance arrives.

The first responders should work together quickly and efficiently to save lives, including conducting a joint understanding of risk (JUR) to inform multi-agency decision making, achieve a safe multi-agency response and deliver an effective resolution to the incident for the public and emergency responders.

Specialist operational response (SOR)

Under certain circumstances the initial operational response (IOR) may move to an advanced specialist operational response (SOR), passing over all current information from the scene. The IOR may be required to stay at the scene if requested.
The specialist operational response are CBRN(e) specialist responders who arrive at the scene later to instigate command, control, co-ordination and perform necessary tasks within the contaminated (hot or warm) zone.

Research has indicated that a rapid response is critical to save lives following a CBRN(e) incident. Specific actions, including removing casualties from an area of gross contamination and removing their outer clothing during the first 15 minutes can save life and can be achieved without putting emergency service responders at undue risk of exposure.

Further information on the transition from an initial operational response to a specialist operational response can be found in Responding to a CBRN(e) event: Joint operating principles for the emergency services, JESIP, 2016.

Chemical, Biological, Radiological, Nuclear, and Explosive: CBRN(e)

CBRN(e) terrorism is defined as “the actual or threatened dispersal of CBRN materials (either on their own or in combination, or with explosives) with deliberate criminal, malicious or murderous intent”.

CBRN terrorist attacks may depend on an explosive device for dispersal. Much of the activity to control access to explosive materials complements the government’s work to control access to CBRN(e) materials.

Fire and rescue services do not engage directly with or undertake actions involving explosives in this context. The support mechanisms they provide and the expectations on them have led to the CBRN title being changed to CBRN(e): Chemical, Biological, Radiological, Nuclear (Explosives). Fire and rescue service crews are likely to be the first emergency resource deployed to a CBRN(e) incident. First (initial) responders are unlikely to be trained in specialist CBRN(e) response or have

access to CBRN(e) specific personal protective equipment (PPE).

There may be a significant number of casualties. The casualties may deteriorate rapidly or suffer life threatening effects if they are not evacuated from the contaminated environment quickly. Prompt actions and clinical interventions, however basic, provided as part of the initial operational response (IOR) by first responders or soon after can reasonably be expected to improve patient outcomes and reduce the number of fatalities.

Incident commanders should consider the potential for further scenes to be identified and that the specialist operational response (SOR) resources may be called on to support the police. Competing demands on the specialist resources means that their use may need to be prioritised until further support arrives.

There are distinct differences between the responses to a hazardous materials incident and a CBRN(e) attack, consideration should be given to the following when responding to a CBRN(e) incident:

- The potential for further attacks and the involvement of other devices
- The need for the early collection and effective exploitation of forensic data
- The potential opportunity to apprehend perpetrators at or close to the scene

Due to these differences, the response to a CBRN(e) will involve an immediate, co-ordinated, multi-agency response, which may require:

- Concurrent investigations
- Access to specialist advice
- A clear and consistent media and public reassurance strategy and customised procedures
- Plans, training and equipment to protect responders
- Help in detection or categorisation of the substance involved
- Evacuation of the public
- The decontamination of those contaminated and the management of fatalities

Emergency services CBRN(e) response framework

The emergency services and other responder organisations have an agreed framework in place on which to base robust, efficient and effective planning to respond to suspected or confirmed CBRN(e) incidents.

The specific aims of the framework are to ensure that responders can:

- Minimise loss of life and injury to the public (i.e. management of casualties at the scene) and the risk to other emergency responders
- Make the scene safe and secure (i.e. creation of an outer and inner cordon) to protect the population and preserve any evidence at the scene
- Support and enable the handover of wider investigation activities, including forensics
- Support and enable the handover to wider consequence management (e.g. off-site casualty management)
- Support and enable handover to wider recovery clean-up activities

Strategic objectives for a combined response to a CBRN(e) incident

Irrespective of the responsibilities of individual organisations and agencies responding to the incident, the strategic intention is to co-ordinate effective multi-agency activity to:

- Preserve and protect lives
- Mitigate and minimise the impact of an incident
- Inform the public and maintain public confidence
- Prevent, deter and detect crime
- Assist in the early return to normality (or as near to it as can reasonably be achieved)

Additional objectives from these principles are to:

- Ensure the health and safety of all those responding to a CBRN(e) incident
- Safeguard the environment
- Enable judicial, public, technical or other enquiries to take place
- Evaluate the response and identify lessons to be learned

There are seven key criteria for the development of an effective response and these should be considered by fire and rescue services when developing their plans:

- ROBUST – prepared for the worst
- PROPORTIONATE – informed by risk
- FLEXIBLE – will work or can be easily adapted to work in a wide range of circumstances
- SCALABLE – can cope with small, medium and large incidents
- INTEROPERABLE – response organisations working effectively together
- EFFECTIVE/TIMELY – the right activities, when needed
- REALISTIC – that it can be achieved

There may be a requirement for specialist resources to carry out scene assessment and hazard monitoring activities as part of an ongoing emergency services and wider community safety plan once life-saving activity has been completed. Where this is the case, any further deployments into hazard zones will be carefully planned and subject to deliberate allocation of tasks against specific objectives.

For future information see: Defence Chemical Biological Radiological and Nuclear Centre

Foundation material

Foundation material to enable fire and rescue service personnel to develop competence in

hazardous materials operations includes:

A foundation for hazardous materials, 2018, NOGP

The environmental protection handbook for the fire and rescue service, 2013, EA

Initial operational response to a CBRN incident, 2015, Home Office

Responding to A CBRN(e) Event: Joint Operating Principles for the Emergency Services, First Edition, September 2016

The Dangerous Goods Emergency Action Code List, 2017, NCEC, TSO.

The emergency response guidebook 2016 (ERG), 2016, US Department of Transportation

Legislation

A hazardous materials response can be complicated by numerous pieces of legislation and regulation. In the main, these are the responsibility of those who produce, transport, use or store the substances. However, some do relate directly to the fire and rescue service:

Fire and Rescue Services Act

Fire (Scotland) Act

Fire and Rescue Services (Northern Ireland) Order

Fire and Rescue Services (Emergencies) (England) Order

Fire and Rescue Services (Emergencies) (Wales) Order

Fire (Additional Function) Scotland Order

Fire and Rescue Services (Emergencies) (Northern Ireland) Order

The Civil Contingencies Act

The Civil Contingencies Act (Contingency Planning) Regulations

The Civil Contingencies Act (Contingency Planning) (Scotland) Regulations

The Civil Contingencies Act (Contingency Planning) (Amendment) Regulations

The Health and Safety at Work etc. Act

Health and Safety at Work (Northern Ireland) Order

Management of Health and Safety at Work Regulations

Management of Health and Safety at Work Regulations (Northern Ireland)

The Personal Protective Equipment at Work Regulations

Personal Protective Equipment at Work Regulations (Northern Ireland)

Personal Protective Equipment Regulations

The Dangerous Substances and Explosive Atmospheres Regulations

Dangerous Substances and Explosive Atmospheres Regulations (Northern Ireland)

Confined Spaces Regulations

Confined Spaces Regulations (Northern Ireland)

The Provision and Use of Work Equipment Regulations

Provision and Use of Work Equipment Regulations (Northern Ireland)

Control of Substances Hazardous to Health Regulations (COSHH)

The Control of Asbestos Regulations

The Control of Asbestos Regulations (Northern Ireland)

Control of Lead at Work Regulations

Control of Lead at Work Regulations (Northern Ireland)

The Ionising Radiation Regulations (IRR)

Ionising Radiations Regulations (Northern Ireland)

The Radiation (Emergency Preparedness and Public Information) Regulations

Radiation (Emergency Preparedness and Public Information) Regulations (Northern Ireland)

The Control of Major Accident Hazards Regulations (COMAH)

Control of Major Accident Hazard Regulations (Northern Ireland)

Notification and marking of sites regulations (NAMOS)

Water Industry Act

Water Resources Act

Water Act

Water Act (Scotland)

The Water and Sewerage Services (Northern Ireland) Order

The Groundwater Regulations

Environmental Protection Act

Special Waste Regulations

Hazardous Waste (England and Wales) Regulations

Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations

The Environmental Damage (Prevention and Remediation) (England) Regulations

The Environmental Damage (Prevention and Remediation) (Wales) Regulations

Environmental Liability (Scotland) Regulations

The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland)

The Groundwater Regulations (Northern Ireland)

The Environmental Information Regulations

The Environmental Information (Scotland) Regulations

The Pipelines Safety Regulations

Pipelines Safety Regulations (Northern Ireland)

The Air Navigation Order

The Air Navigation (Dangerous Goods) (Amended) Regulations

The following legislation and regulation place duties and responsibilities on the hazardous materials industry:

ADR (European agreement concerning the International Carriage of Dangerous Goods by Road)

RID (European agreement concerning the International Carriage of Dangerous Goods by Rail)

ADN (European agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)

Dangerous Goods Regulations - International Air Transport Association (IATA)

International Maritime Dangerous Goods (IMDG) Code

Registration, Evaluation, Authorisation & restriction of Chemicals Regulations (REACH)

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (CDG)

European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLB)

Radioactive Material (Road Transport) (Great Britain) Regulations (RAM Road)

Packaging Labelling and Carriage of Radioactive Materials by Rail Regulations

Explosive Regulations

The Dangerous Goods in Harbour Areas Regulations

NOTE. It is important for fire and rescue services to have personnel with specialist knowledge about hazardous materials to ensure that legal provisions designed to keep the community and responders safe are recognised, understood and maintained.

Responsibility of fire and rescue services

Fire and rescue services are responsible, under legislation and regulations, for developing policies and procedures and to provide information, instruction, training and supervision to their personnel about foreseeable hazards and the control measures used to mitigate the risks arising from those hazards.

This guidance sets out to provide fire and rescue services with sufficient knowledge about the potential hazards their personnel could encounter when attending incidents. Fire and rescue service should ensure their policies, procedure and training covers all of the hazards and controls contained within this guidance.

Risk management plan

Each fire and rescue authority must develop their strategic direction through their risk management plan. To determine the extent of their hazardous materials capability, strategic managers will consider their statutory duties and the foreseeable risk of hazardous materials

emergencies occurring in their area.

Work to identify specific hazardous materials risks and prepare operational plans should be carried out with regard to all stakeholders, including local emergency planning groups and the fire and rescue service's risk management plan.

Personnel who may be exposed to hazardous materials must be provided with suitable and sufficient information, instruction and training on:

- Possible risks to their health
- Precautions that must be taken
- Proper use of control measures

Hazard - Inaccurate situational awareness: Hazardous materials

Hazard Knowledge

Hazardous materials have many properties and behaviours that can make an incident more dangerous. It is therefore vital to recognise their presence as soon as possible to prevent harm from occurring. Responders may encounter this hazard at:

- Incidents where hazardous materials are known or suspected to be involved before arrival
- Incidents where hazardous materials are encountered during operations

The mobilisation and initial response phase of a hazardous materials incident is critical to achieving and enhancing the safety of responding resources. Failure to consider local weather conditions, specialist advice and information from any pre-planning can have a detrimental effect on the usefulness of the resources deployed. In some cases, this may result in responders being exposed to a hazardous material.

Responders should be vigilant on approach to a hazardous material incident. They should confirm any available risk information which may be available in addition to information provided during mobilisation and ensure this correlates with what they are observing on the incident ground.

CBRN(e) incidents

Casualties of a CBRN(e) attack are likely to be traumatised, either by witnessing the incident and the effect it is having or because of being contaminated themselves. A traumatised casualty may act in an unexpected way. For example, they may be completely unresponsive to commands or unaware of danger even though they are conscious and able to walk; they may walk into the path of an oncoming vehicle without perceiving the danger they are in.

Perpetrators have previously used the tactic of planting secondary devices which may have greater impact than the original device. The incident commander must remain alert to the fact that secondary devices have been used by terrorist organisations to target emergency service personnel. They should ensure that an assessment of secondary threats to the rendezvous point (RVP) that should focus on the elimination, as far as reasonably practicable, of any identifiable threats, which may not be definitive.

Even when the police have declared an area (including the RVP) safe, personnel should be aware of their surroundings, remain vigilant and ensure that their safety is not compromised.

In a suspected or confirmed CBRN(e) incident it is unlikely that it will be possible to identify the contaminant until detection identification and monitoring (DIM) equipment can be deployed. However, the signs and symptoms of the casualties will give an effective indication of the toxicity of the agent and whether it acts through inhalation or skin exposure.

The physical state of the material (solid, liquid, gas or vapour) will affect the risk to responders. Structural firefighting PPE will not provide significant protection against toxic liquids or powders, so direct contact with potential contaminants in solid or liquid form must be avoided. Multiple immediate fatalities attributable to poisoning are indicative of exposure to a contaminant that acts through inhalation.

The environment in which the hazardous material has been released will also vary according to the extent of the hazard and the degree of risk. Volatile vapours will disperse much more readily in open air, reducing the risk for emergency responders. A release within a building or underground may lead to higher concentration levels and the vapour may be slower to disperse.

It may initially be difficult for first responders to recognise that they are responding to a potential or suspected CBRN(e) incident. Information from members of the public or other responders already at the scene will be vital for the effective management of the response in those early stages and for the safety of personnel as they start to arrive. Fire control room will play a key role in the passage of safety-critical information as resources are mobilised and it is essential that any information gathered or received is shared with all those responding as quickly as possible.

Early indication of the scale of the incident and confirmation of some of the key information which points to the fact that responders are dealing with a suspected CBRN(e) incident will be critical to the fire and rescue service and other agencies as they prepare to respond or enhance their initial response to the incident. Information needs to be gathered and shared with multi-agency partners as a matter of urgency.

Control measure - Site-Specific Risk Information

(SSRI)

Control measure knowledge

Fire and rescue authorities must make arrangements to obtain necessary information for the purposes of:

- Extinguishing fires and protecting lives and properties from fires in its area (relevant fire and rescue service legislation for England, Scotland, Wales and Northern Ireland)
- Rescuing and protecting people from harm at road traffic collisions in its area (relevant fire and rescue service legislation for England, Scotland, Wales and Northern Ireland)
- Dealing with any other emergency function other than fires and road traffic collisions in its area (relevant fire and rescue service legislation for England, Scotland, Wales and Northern Ireland)

UK legislation sets the requirement for site-specific assessment. Collating and disseminating SSRI involves a number of tasks:

- Selecting premises to be inspected
- Assessing the nature and magnitude of the risk
- Considering a proportionate response
- Recording significant findings
- Making sure information is available in a useable form

A site-specific assessment takes account of current legislation on inspection information and includes information on preplanning firefighting tactics.

Tunnels and underground structures

The planned operational response to underground incidents should be sufficient to allow relevant safe systems of work to be implemented.

During any construction process, it will be necessary to review the Site-Specific Risk Information (SSRI) and emergency response plans so that any changes that will affect the existing risk information and guidance can be reflected throughout the project.

Pre-planning should be carried out jointly with other responder agencies that have knowledge of the environment, including volunteer rescue and leisure groups.

Hazardous materials and environmental protection

Fire and rescue services should assess the hazards and risks in their area relating to hazardous materials. This may be site-specific, for example, a factory using acid baths, or it may be generic, for example the local road network carrying hazardous materials.

The plans should also include information on pollution, prevention and control where a risk to the environment is identified at an incident. Although each nature conservation site will have its own environmental damage risks which can be captured with individual operational risk plans, a set of generic action plans will also help to identify generic environmental protection action to be taken in the early stages of an incident. See Section 2.6.5, Environmental Protection Handbook.

In addition to general site-specific information, the following should be considered:

- Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)
- Manufacture and Storage of Explosives Regulations (MSER), enforcement notices, prohibition notices etc.)
- Notification and Marking of Sites (NAMOS) inspections and information
- British Agrochemicals Safety Inspection Scheme (BASIS) inspections and pre-plans
- The asbestos register
- Significant Control of Substances Hazardous to Health (COSHH) assessments
- Control of Major Accident Hazards (COMAH) plans and information
- CBRN(E) site-specific plans

Strategic actions

Fire and rescue services should:

- Develop criteria for the identification of sites requiring Site-Specific Risk Information

- Support the generic information identified for foreseeable risks, which may include a programme to produce Site-Specific Risk Information - the following steps should be taken in achieving this:
    - Identify local sites and their risks
    - Gain local specialist advice from partner agencies and other organisations
    - Consider including salvage and/or disaster plans
    - Ensure that familiarisation visits and exercises involving such premises or sites are carried out
    - Produce suitable templates to record and capture the relevant information
    - Establish a delivery method to present the information in a clear and timely manner
    - Schedule reviews and audits for the validity and accuracy of such information
    - Embed a quality assurance programme
    - Ensure information is made available to operational personnel to help successfully plan for and resolve operational incidents
    - Identify specific operational knowledge, skills and understanding, which may need to be incorporated into local training plans
- Develop mutual understandings with building developers, owners and occupiers on the exchange of information about alterations to any parts of a building which may have effect on firefighting operations.
- Ensure communication systems are in place to inform relevant personnel, stakeholders and

partner agencies.
- Develop systems and processes to embed a culture of risk information gathering, recording and communication.
- Consider the requirement for the provision of specific equipment and training in relation to buildings identified as specific risks within the area of the service.
- Collate and maintain risk information regarding hazardous materials sites within their area or neighbouring fire and rescue service areas where it is foreseeable that their personnel may be required to respond to hazardous materials incidents
- Include environmental risk information within operational risk plans

- Consider introducing operational risk information plans with environmental risk notes for sites of nature conservation that are more susceptible to environmental damage. Where appropriate these plans should include:

    - Environmentally safe areas for deployments and movements of fire service resources
    - Identification of areas that are susceptible to physical environmental damage

- Ensure inaccuracies in risk information are resolved and systems updated post incident

Tactical actions

Incident commanders should:

- Access any operational or site specific risk information (SSRI) and confirm accuracy

- Ensure differences in information are resolved and systems updated following the closure of an incident

Control measure - Emergency response plans

Control measure knowledge

The Civil Contingencies Act (CCA) places a responsibility on Category 1 responders to produce and have in place emergency plans, which may include procedures for determining whether an emergency has occurred.

There is a generic national framework for managing emergency response and recovery, irrespective

of the size, nature and cause of an emergency. It also identifies the various tiers of single and multi-agency management, defining the relationship between them and a common framework within which individual agencies can develop their own plans and procedures.

For further information see Emergency Response and Recovery Guidance (England and Wales), Responding to Emergencies in Scotland and Emergency Planning, Northern Ireland Fire and Rescue Service

Strategic actions

Fire and rescue services should:

- Consider the roles and responsibilities of the fire and rescue service at emergency incidents when developing emergency plans
- Ensure that emergency plans are produced. Plans should be developed in consideration of the following:
    - Anticipation - horizon scanning for risks and potential emergencies
    - Preparedness - a clear understanding of roles and responsibilities and how they fit into the wider, multi-agency picture
    - Subsidiarity - managing operations and making decisions at the lowest appropriate level
    - Direction - establishing a clear and unambiguous strategic aim and objectives
    - Information - information management and appropriate preparatory measures being in place to build situational awareness and the development of a Common Recognised Information Picture (CRIP)
    - Integration - multi-agency involvement, roles and prominence
    - Co-operation - inclusive decision making processes, openness and mutual trust
    - Continuity - using established experience, expertise, resources and relationships to manage and respond to emergencies in the usual way

Tactical actions

Incident commanders should:

- Access any available emergency response plan and implement appropriate predetermined actions

Control measure - Weather information: Hazardous

Control measure knowledge

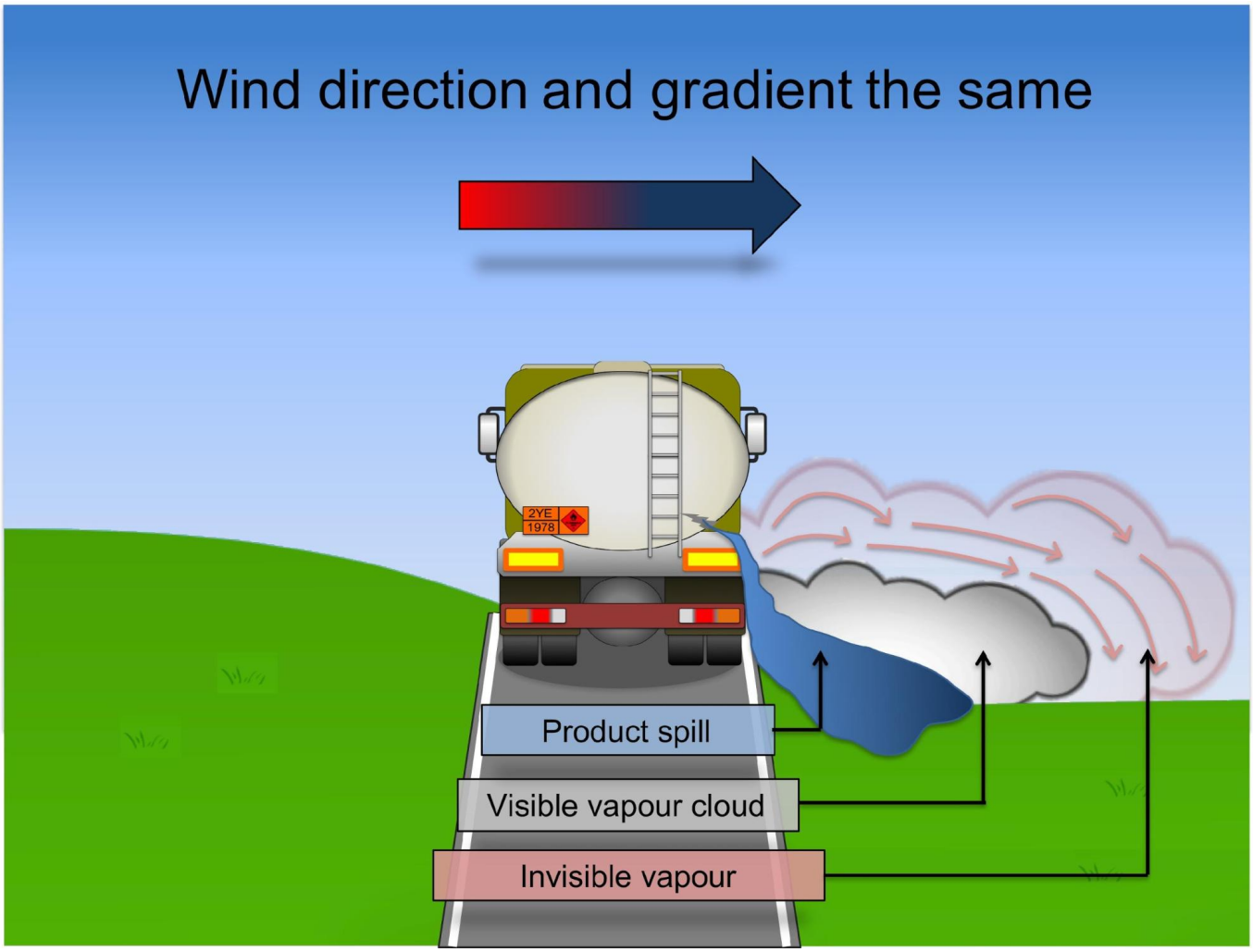
Two major factors that affect the way materials spread following a release are ground slope and weather, predominantly wind. This effect may be increased when an explosive is used as a means of dissemination. Material may initially be expelled in all directions and spread over a wide area from the point of release. The fallout may also include undetonated explosive material.

Vapours will be affected by slope and wind and will travel further and spread more quickly than liquids, which in turn will spread further than solids. For solids, the particle size will affect the spread (e.g. fumes, powder, granules, solid pieces).
Other weather-related factors that can affect hazardous materials incidents are temperature and rain. Temperature is important, particularly where the substance has a melting or boiling point that could be reached during the incident. A change in state of the substance may have a significant impact on tactical options and the risk assessment.

Rain can also have a significant effect as its interaction with some substances can affect their behaviour. For example, vapours that are water-soluble will dissolve in rain, reducing the concentrations of vapours in the air and reducing the distance over which they will be able to cause harm. However, if substances are dissolved in rainwater and then enter drains or a body of water, the pollutants could be dispersed or collect and then flow to other locations. Water-reactive substances that are exposed to rain may cause a change to the incident that may increase the level of hazard.

Weather reporting systems should be accessed through fire control rooms or mobile data terminals to assist decision making on the appropriate direction of an approach to an incident (staying upwind, uphill), to determine initial cordons, RVPs, marshalling areas and potential downwind hazard zones.

Effects of wind and gradient on a release


Wind direction and gradient the same
2YE
1978
Product spill
Visible vapour cloud
Invisible vapour

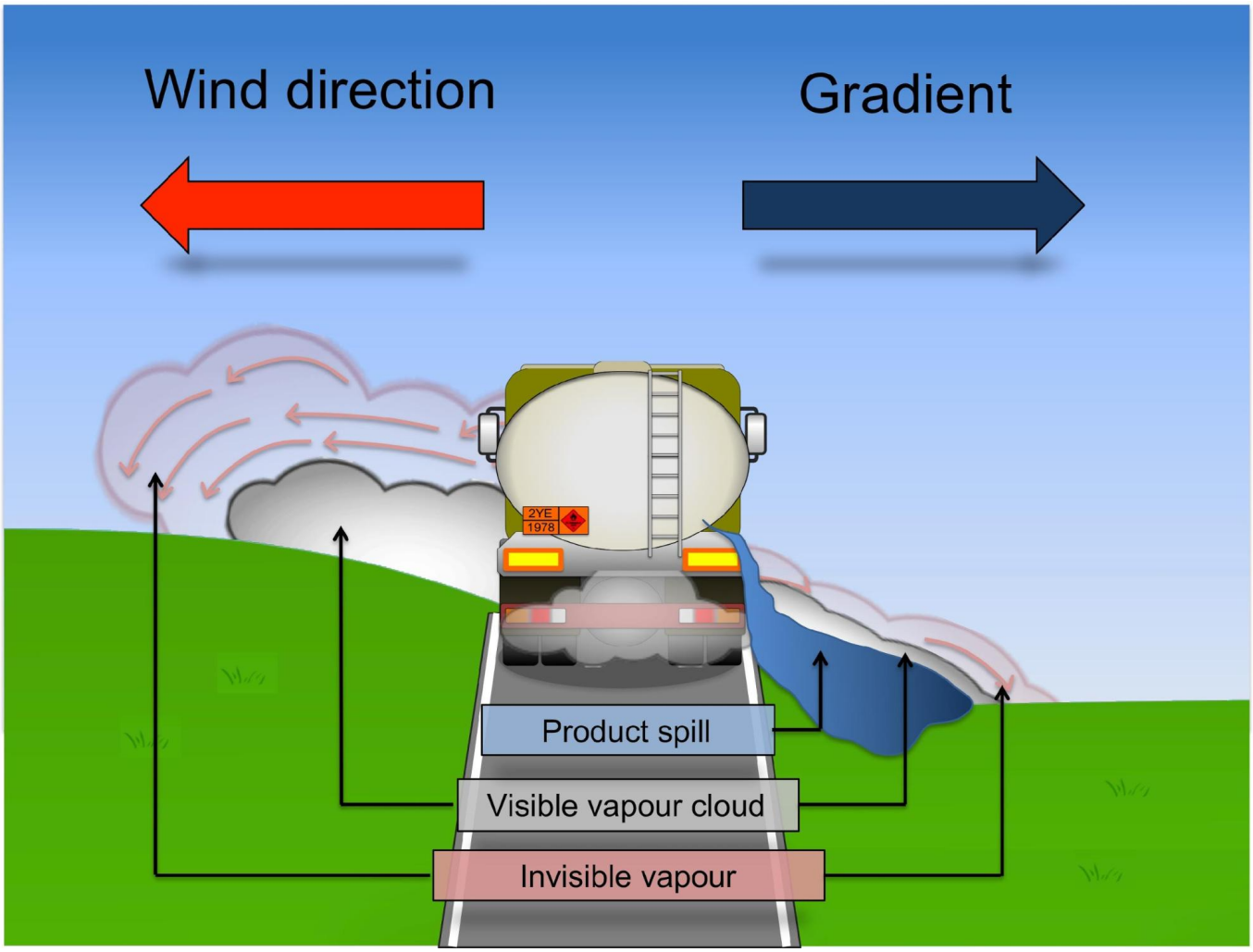


Figure 4: Effect of wind and gradient on a spill

Responders should consider deploying improvised wind monitoring devices. Examples are shown in the following photos.

Strategic actions

Fire and rescue services should:

- Ensure that personnel responding to hazardous materials incidents are provided with the knowledge, skills and understanding they need to determine the effects of weather and topography on a hazardous release

- Have policies and procedures that allow the Met Office Hazard Manager to be accessed by and available to those personnel most appropriate to use the information

- Make provision for contact with the Environment Monitoring and Response Centre (EMARC)

Tactical actions

Incident commanders should:

- Use weather information systems to identify impact of wind, rain and temperature on the incident

- Set up improvised wind monitoring devices to indicate current and changing conditions

Control measure - Safe and controlled approach: Hazardous materials

Control measure knowledge

All responding vehicles should, where possible, approach cautiously and at a slow speed from an upwind, upslope location. Initial responders should be able to anticipate the type, size and potential scope of the hazardous material incident from the initial mobilising instructions. Approaching responders should be aware of potential contamination issues when approaching a hazardous materials incident. The proactive use of information systems, specialist advice, pre-planning arrangements and incident visual indicators will add value to the response and ensure a safe approach can be determined.

Examples of incident visual indicators include:

- Visible smoke and other signs of fire
- Gas and vapour clouds or plumes, unexplained vapour or mist clouds
- Liquid spills, wet areas, patches, puddles, pools and streams or flowing liquids which may indicate the affected area
- Unexplained oily droplets or films on surfaces or water
- Unexplained noise (for example explosions, venting cylinders, site-specific audible warnings), which may indicate a more cautious approach and larger hazard area
- The presence of hazardous materials or equipment not relevant to the occupancy
- Distinct odours (for example bleach, garlic, rotten cabbage, rotten eggs). Being able to smell an unusual or unexplained odour usually indicates being in, or close to, the hot zone. Unexplained smells or tastes that are out of character with the surroundings
- Cryogenic effect of escaping product (for example frosting around defective pipes or a damaged area on a LPG container)
- Damaged containers and packages
- Dead or distressed people

- Individuals showing unexplained signs of skin, eye or airway irritation, nausea, vomiting, twitching, sweating, pinpoint pupils (miosis), runny nose (rhinorrhoea), disorientation, breathing difficulties, convulsions and death
- Biological indicators, such as dead birds, animals, fish, insects, trees and withered plant life or vegetation
- Casualties and other people involved in the incident may physically mark the hazard area or they may be able to describe it based on their experience

It is possible that initial responders could inadvertently drive into or through a contaminated area en route to the scene of the incident. The above factors should be considered when arriving at the incident and initially positioning vehicles. This will:

- Enable visual assessment of the scene (such as plumes, liquid spills)
- Reduce the probability of driving into a hazardous area
- Avoid collisions with casualties, people escaping the release and other members of the public who may be attracted to the incident

The acronym DDOOR highlights the key factors to consider about the potential dispersion plume. It stands for 'downwind, dilution, obstacle, oscillation and retention'. It highlights key factors to remember when dealing with a hazardous release in the urban environment, particularly the effect that the built environment and the wind can have on a dispersion plume.

- Downwind – the largest part of the plume moves downwind, and may become wider and higher
- Dilution – the gas or vapour dilutes as it mixes with the air around it; the concentrations decrease downwind and at the sides and top of the plume
- Obstacles – the plume's movement is strongly influenced by obstacles such as buildings and other structures. Some parts of the plume go up and over the building, while others zigzag along the streets in the downwind direction. The plume may quickly fill street 'canyons'. Some parts of the plume may spread upwind.
- Oscillation – the plume will oscillate; its position and course will not remain constant but vary over time. It will follow different routes downwind, often in response to minor changes in environmental factors.
- Retention – some parts of the plume can be retained, and gradually released later, even after the source has been dealt with

CBRN(e)

Many possible scenarios could lead to an incident being identified as a suspected or confirmed CBRN(e) event. During the approach to a CBRN(e) incident, responders may face three distinct elements of this hazard:

- Airborne contamination
- Secondary devices
- Presence of perpetrators or other terrorists

Where there is any doubt as to whether the incident is deliberate, it should be treated as if it were a

crime scene and, as far as possible, all responders should conduct their tasks with a view to protect the scene and record any evidence that may be present.

Strategic actions

Fire and rescue services should:

- Ensure an effective means of communicating key information to mobilised resources from fire control rooms and all other agencies
- Ensure responders have access to compass aided mapping systems
- Where available, ensure incident commanders receive specific information and instruction on approaching hazardous materials incidents

Tactical actions

Incident commanders should:

- Approach hazardous material incidents at slow speed from upwind and higher-level ground where possible
- Adopt a cautious approach to situational awareness where there are no immediate threats to life
- Consider the potential for secondary devices and share any intelligence with other responder agencies
- When approaching the incident use visual and other incident indicators to inform situational awareness

Control measure - Signs and symptoms of exposure

Control measure knowledge

Symptoms of exposure to hazardous materials can provide important information to responders on the type of hazard and level of risk. Symptoms will also provide responders with key information to determine the priorities in dealing with those who have potentially been exposed. Exposure to chemical hazardous materials will usually lead to the onset of symptoms much quicker than from exposure to biological or radiological materials. At an unknown event, this can be used as an indicator of the type of hazardous material involved.

Important information can be gained from the type of symptoms that are displayed, the number of people exposed and the time from exposure to symptoms becoming apparent.

Four routes of exposure can lead to symptoms developing:

- Ingestion
- Contact with skin or eyes
- Inhalation
- Injection or through cuts

The route through which exposure occurs can also be a significant factor on the speed and type of symptoms displayed. For example, exposure through a cut may mean that some hazardous substances get absorbed into the blood stream more quickly, enabling symptoms to develop rapidly.

Symptoms from hazardous materials will be either acute or chronic:

- Acute: Substances whose effects develop quickly (usually within minutes to days) and worsen with increasing levels of exposure. These hazardous materials also have a level or threshold below which no harm is caused although, for example, in cases of highly toxic substance, this level can be very low.
- Chronic: Substances whose effects develop after significant periods of time and usually following repeated exposure, for example, substances that can cause cancer.

Step 1-2-3 Plus – Safety triggers for emergency personnel

First responders should follow the ‘Step 1-2-3 Plus’ process to judge what actions the situation requires:

Step 1 - One person is incapacitated with no obvious reason:

- Approach using standard protocols

Step 2 - Two people are incapacitated with no obvious reason:

- Approach with caution using standard protocols

Step 3 - Three or more people in close proximity are incapacitated with no obvious reason:

- Use caution and follow step ‘Plus’

Plus - Follow the CBRN First Responder Flow Chart to consider what actions can be undertaken to save life using the following principles:

- **Remove** people from the immediate area to avoid further exposure to the substance
- **Remove** outer clothing
- **Remove** the substance from skin using a dry absorbent material to either soak it up or brush it off. Use wet decontamination when a caustic agent is suspected
- Communicate reassure and advise that immediate medical advice and help is on its way

See Initial operational response to a CBRN incident for the first responder flow chart

Visual indicators

The visual indicators, listed in National Operational Guidance: Hazardous materials – safe and controlled approach will assist responders in ascertaining whether CBRN materials might be present.

Some CBRN materials will not lead to any immediate signs or symptoms but this does not preclude the dangers associated with their ongoing dispersal. It should also be borne in mind that some agents may travel considerable distances.

Multiple individuals may show unexplained signs of skin, eye or airway irritation, nausea, vomiting, twitching, sweating, pinpoint pupils (miosis), runny nose (rhinorrhoea), disorientation, breathing difficulties, convulsions and death.

Strategic actions

Fire and rescue services should:

- Ensure they have policies and procedures that reflect the contents of the CBRN(e) first responder aide-memoire and other relevant publications

- Ensure that documents regarding initial operational response (IOR) are distributed to relevant responding personnel

- Have policies for ensuring that members of the public and personnel from other agencies involved in a potential release are informed of the emergency actions they can take to minimise the impact on themselves

- Ensure staff are aware of the principles of IOR, Step 1-2-3 Plus, "Remove, Remove, Remove" and the CBRN First Responder Flow Chart and that they are incorporated into all policies and procedures which address CBRN(e) incidents

- Ensure that staff have the skills, knowledge and understanding to recognise release indicators and signs and symptoms of exposure to CBRN materials/agents

Tactical actions

Incident commanders should:

- Observe individuals for signs of exposure or contamination and check for consistency against identification

- Consider Step 1-2-3 Plus: Safety Triggers for Emergency Personnel

Control measure - Scene survey: Hazardous materials

Control measure knowledge

The initial scene assessment at a potential hazardous materials incident must be carried out from a place of safety to avoid responders becoming contaminated or exposed to a hazardous material and becoming part of the emergency.

It is necessary to find out what has caused, or is causing, the emergency or event then to estimate foreseeable developments and consequences, who and what will be adversely affected. To assist with this, responders should consider retrieving hazard and incident information from:

- Placarding and signage. For example, UN hazard warning labels, ADR (Accord européen relatif au transport international des marchandises Dangereuses par Route) placards, Notification and Marking of Sites (NAMOS) signs and Classification, Labelling and Packaging (CLP) labels.
- The Dangerous Goods Emergency Action code List (EAC)
- The Globally Harmonised System (GHS)
- United Kingdom Hazard Information System (UKHIS)
- Workplace exposure limit signs
- Safety Data Sheets (SDS)
- Transportation documents, for example instructions in writing (IIW)

They should also assess the condition of the containment system, in particular:

- Construction and operation of road, rail and other transport containers

- Construction and use of fixed storage tanks
- Construction and operation of intermediate bulk containers (IBC)
- That pressurised containers are inherently higher risk than non-pressurised
- Type of stressors involved (for example, direct flame impingement, heat, cold, chemical, mechanical, shock, friction)
- The operation of any engineered solutions or safety devices fitted, such as pressure relief valves

As part of their scene survey, incident commanders and other deployed personnel should be vigilant for indications that hazardous materials may be present in unexpected locations. Such instances may include, but are not exclusive to, the following:

Illicit drug laboratories

Clandestine locations may be established to produce illegal substances which could range in size from one room to a sophisticated operation. Indicators may include covered windows, strong odours, refuse containing chemical containers and occupants reluctant to allow entry to responder agencies, or a more formal laboratory setup such as scientific apparatus, beakers, mixing bowls, fans, eye protection, filter paper, scales, etc. Where a more formal laboratory layout has been identified, then this should not be confused with the manufacturing of improvised explosive devices; they share very similar equipment and should be confirmed as soon as possible.

Improvised explosive devices (IED)

Personnel may inadvertently encounter bomb factories whilst responding to other types of incident or could be called to deal with a suspected or confirmed improvised explosive device. An IED can take the form of a packed device, a vehicle or a suicide bomb.

Improvised explosive devices usually comprise of a range of homemade explosives, rather than standard commercial or military grade explosives. The main types are:

- Ammonium nitrate-based
- Sugar chlorate
- HMTD (Hexamethylene triperoxide diamine)
- TATP (Tricacetone triperoxide peroxyacetone)

These mixes can be highly unstable and may be sensitive to friction and heat, with the potential to self-heat (known as thermal runaway). Where personnel encounter an improvised explosive device during an incident it is imperative that the device is not touched in any way and the scene secured and evacuated.

During a scene survey certain material may be identified which would indicate or confirm the presence of an improvised explosive device, such as:

- Chemicals containing chlorates, ammonium nitrate, acetone (solvent/nail varnish remover), Acid (drain cleaner, battery acid), hydrogen peroxide (hair bleach) etc.
- Bomb making equipment, including detonators (improvised, such as bulbs), power sources

(such as batteries), simple switches plus wiring and fragmentation material (such as ball bearings, nuts, bolts and nails)
- Bomb making paraphernalia or literature such as text books, notes, extremist material, academic material or scientific publications
- A similar laboratory setup to illicit drugs

Individual Chemical Exposure (ICE)

These are events where an individual uses a chemical or a mixture of chemicals with the intent to self-harm, predominantly by ingestion or inhalation. They commonly occur in sealed or partially sealed environments such as vehicles, residential bathrooms, hotel rooms and other enclosed areas where a small amount of gas can quickly reach lethal concentrations.

It is important to note that the signs or indicators of individual chemical exposure may not be immediately obvious. However, there may be certain indications during a scene survey that could help confirm it such as:

- The signs and symptoms being displayed by casualties and their severity
- Casualties or emergency responders experiencing breathing difficulties or irritation to the eyes and nose
- The event taking place in an unusual location such as a vehicle parked in a beauty spot or remote rural area or a small enclosed room
- Information received (e.g. from a witness) that a person at the scene may be in possession of chemicals or that there is some history or intelligence that suggests the person has attempted to self-harm on a previous occasion
- Warning notes or safety data taped to vehicle or building windows or doors
- Duct tape, plastic or towels used to cover air vents windows and/or doors to produce a sealed environment
- Vehicle occupants appearing unconscious or unresponsive
- Presence of a ‘suicide bag’ or hood at the scene
- Suspicious (possibly spilled or empty) containers or cylinders
- Unexplained vapour in the air or a strong chemical smell such as the smell of rotten eggs, bitter almonds, garlic or decaying fish
- The presence of a barbecue within a sealed or partially sealed environment
- Disabled smoke or carbon monoxide alarms

White powder or suspicious substance incidents

A ‘white powder’ incident can actually be a powder of any colour. It is a suspicious unidentified powder that is known to be neither explosives nor drugs. A suspicious substance is an unidentified solid, liquid, gel, crystal, organic or granular material not believed to be explosive or drugs.

The role of the fire and rescue service at these incidents is to support the police service by providing a range of resources and personnel to perform the detection, identification and monitoring of the substances. If at any point during the process it is suspected that the item or substance may be explosive in nature or may in fact be some form of incendiary or improvised explosive device (IED), guidance for explosives or IEDs should be followed and the information

communicated to update the joint understanding of risk. This will allow the threat assessment for the incident to be updated.

Following the request to attend an incident, the nature and seriousness of the circumstances will determine the level of specialist assets that a fire and rescue service may deploy. Early multi-agency information sharing is essential, particularly between other emergency services who may also be preparing for a response to the incident or have prior knowledge of the incident. It may be beneficial to deploy a National Inter-Agency Liaison Officer (NILO) to provide advice (either at the scene or remotely) on the capacity and capability to support incident resolution.

The police will co-ordinate any multi agency response and ensure that a suitable environment exists before the fire and rescue service or ambulance service provide their respective specialist capabilities. The police will also co-ordinate the threat assessment as they have the capability to access, analyse and disseminate information and intelligence.

Forensic management of incident scenes will need to be considered before the deployment of multi-agency resources where criminal intent or terrorism is suspected, though maintaining any lifesaving activity is the highest priority. Some individual police forces use their own detection, identification and monitoring (DIM) capability (sometimes in conjunction with fire and rescue services) to carry out initial scene assessment under police supervision to mitigate the risk of forensic evidential loss.

Strategic actions

Fire and rescue services should:

- Provide personnel that deal with hazardous material incidents with specialist information, instruction and training on the process of identifying hazardous materials
- Ensure that personnel can identify illicit drug laboratories, improvised explosive devices, individual chemical exposure and suspicious packages

Tactical actions

Incident commanders should:

- Ensure that a hazardous materials scene survey is carried out at the earliest opportunity
- Gather incident information from a suitable safe distance based on hazard assessment
- Recognise indicators that hazardous materials may be present in unexpected places (e.g. Drug labs, IEDs, ICE)

Control measure - Responsible person: Hazardous materials

Control measure knowledge

Due to the dangerous nature of hazard materials there are many laws, acts and regulations which govern their manufacture, transportation and use. Depending on the location, nature and quantity of the hazardous materials, responders may have a responsible person to liaise with either remotely or at the scene. Interaction with the responsible person may improve situational awareness and create a more complete understanding of the incident for all responders. Key questioning may ascertain:

- Whether there is an immediate risk to life
- The extent of the incident
- Properties and quantities of hazardous materials involved
- Actions already taken
- Whether on-site emergency plans have been activated
- Existence and operation of any engineered solutions
- Existence of any safety devices and their operation

Strategic actions

Fire and rescue services should:

- Maintain a contact list of appropriate responsible persons to assist at hazardous materials incidents

Tactical actions

Incident commanders should:

- Identify and contact the responsible person to understand incident factors and history

Control measure - Multi-agency working: Hazardous materials

Control measure knowledge

Due to the complexity of hazardous materials incidents it is essential that the incident commander works with all appropriate agencies when attempting to control and contain hazardous material releases. The joint understanding of risk (JUR) is a key component in achieving a safe multi-agency response to deliver a safe resolution to the incident. The specialist knowledge and equipment which the fire and rescue service can provide at hazardous material incidents allows them to inform and advise other multi-agency partners on the significance of any risks, including the extent of cordons and advice to the public.

For further information see The Joint Emergency Services Interoperability (JESIP) Principles for joint working

Strategic actions

Fire and rescue services should:

- Ensure that call handlers and responders receive suitable and sufficient information and instruction to enable them to apply the Joint Decision Model (JDM) in a hazardous material environment to develop a multi-agency joint understanding of risk (JUR)
- Participate in multi-agency CBRN(e) training events and programmes
- Incorporate their multi-agency partners priorities into their own response plans to CBRN(e) and public decontamination

Tactical actions

Incident commanders should:

- Share situational awareness and establish a joint understanding of risk with other agencies
- Consider joint working in hazard areas based on joint understanding of risk

Control measure - Deliberate reconnaissance

Control measure knowledge

Deliberate reconnaissance is defined as the planned, controlled deployment of suitably protected resources working within defined parameters in the inner cordon. These resources will be deployed to specific locations to achieve specific operational objectives.

Operational personnel carrying out deliberate reconnaissance must be competent to wear self-contained breathing apparatus (SCBA). Incident commanders must be able to undertake the joint understanding of risk (JUR) and dynamic risk assessment (DRA) and apply the identified control measures effectively before committing personnel to undertake deliberate reconnaissance activities.

The process of deliberate reconnaissance is a systematic process which may be carried out by either a single or multi-agency specialist team of responders to ensure that the best available information and intelligence is gathered following the trigger event. These resources will be deployed to specific locations to achieve specific operational objectives and the information they provide will inform the command decision making process. The resource should be agile, flexible and scalable and will be used to potentially:

- Confirm or deny the presence of material
- Identify the contaminant
- Identify the footprint of the contamination
- Inform command assessment decisions
- Aid scene management
- Identify avoidance routes into the target area
- Identify potential sources of evidence and intelligence

Initially, these responders may also be able to promptly assess the requirement for further specialist responders to the scene and to establish whether the incident should be scaled up or down.

Strategic actions

Fire and rescue services should:

- Ensure their policies and procedures contain information relating to deliberate reconnaissance

Tactical actions

Incident commanders should:

- Consider carrying out deliberate reconnaissance based on a joint understanding of risk (JUR)

Control measure - Detection, Identification and monitoring: Deliberate reconnaissance

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Control measure knowledge

Deliberate reconnaissance is the planned and controlled deployment of a single or multi-agency specialist team of responders, working within defined parameters in the hazard area. It is carried out in order to:

- Enable the observation of behaviours and symptoms in casualties
- Assist in identifying the substances involved
- Ensure that the best available information and intelligence is gathered

Specialist advice or assistance may be sought from:

- The National CBRN(e) Centre
- The Defence Science and Technology Laboratory (Dstl)
- The Atomic Weapons Establishment (AWE)
- Explosive Ordnance Disposal (EOD)

These specialist resources can be deployed to specific locations in order to achieve operational objectives; the information they gather will inform the command decision-making process. The specialist resources can be used to:

- Establish the presence and probable type of hazardous substances
- Determine if the hazardous substance is from an unintentional hazardous material release or an intentional CBRN(e) event
- Determine the risks from the hazardous substance
- Provide information to assist in establishing the hazard area
- Advise on methods of mass decontamination
- Aid scene management, including the demarcation of cordons, zones and sectors and the identification of safe routes into the hazard area

- Advise and assist with the implementation of safe systems of work, including appropriate levels of personal protective equipment (PPE) and use of monitoring equipment
- Identify potential sources of evidence or intelligence

Strategic actions

National Resilience should:

- Provide appropriate personal protective equipment (PPE) and detection, identification and monitoring (DIM) equipment

Tactical actions

Specialist responders should:

- Wear the appropriate personal protective equipment (PPE)
- Use the appropriate DIM equipment as recorded in the deployment plan
- Carry out deliberate reconnaissance to gather information
- Seek specialist advice or assistance
- Pass the information to the incident commander and other relevant responders and agencies

Control measure - Request National Resilience resources for detection, identification and monitoring (DIM)

Control measure knowledge

The use of detection, identification and monitoring (DIM) equipment may be beneficial, or even

essential, when dealing with some incidents. This may require deliberate reconnaissance; initial responders may not have the capacity, equipment, knowledge and skills to carry this out safely and effectively.

Some fire and rescue services have access to their own scientific support. However, if the incident is a suspected or confirmed CBRN(e) event, scientific support should only be requested through police channels.

National Resilience (NR) responders have access to DIM equipment. The process includes:

- Detection – to detect the presence of a hazardous material
- Identification (or classification) – to identify which hazardous material (or type of material) is present
- Monitoring – to monitor, on a continuous or periodic basis, either qualitatively or quantitatively, the presence or absence of hazardous material

NR DIM advisers will use their equipment to detect, analyse and identify potentially hazardous materials. The resulting information can be used to inform the multi-agency decision-making process.

DIM resources include:

- DIM equipment and vehicles - includes scientific analysis equipment, specialist personal protective equipment (PPE) and decontamination equipment
- DIM advisers – provide a tactical adviser role to the hazardous material adviser or incident commander; they do not carry out a command role
- DIM operators – an optional support role where an individual is trained in the operation and use of some DIM equipment; they may deploy into the hazard area with a DIM adviser to assist with the collecting of samples and carrying out analysis
- DIM support team – suitably-trained personnel to support the DIM adviser, especially when deploying into the hazard area

The DIM team will work with other agencies in order to:

- Maintain the forensic integrity of the incident
- Provide analysis outcomes to inform decisions on necessary clinical measures
- Contribute to the provision of scientific and technical advice
- Reduce the risks to emergency responders, members of the public and the environment
- Reduce the time taken to successfully resolve an incident to minimise social and economic impacts, with consideration for business continuity

Requesting National Resilience response

If the fire and rescue service incident commander believes the NR MD capability is required, they should immediately provide the following information to the National Resilience Fire Control (NRFC):

- The initial location of the rendezvous point (RVP)

- The nature of the incident

The contact to the NRFC will prompt the mobilisation of National Resilience resources from one or more 'hosting' fire and rescue services.

The NRFC should provide an estimated time of arrival; this information will assist the incident commander in determining what level of initial operational response (IOR) is required.

As the incident develops, further information may become available. The incident commander should capture this information using the M/ETHANE model, and provide an update to the NRFC. If a strategic holding area (SHA) or multi-agency strategic holding area (MASHA) is established, this information should also be provided to the NRFC. For further information, refer to Multi-agency strategic holding areas: a guide.

The NR DIM capability is designed to support the requesting fire and rescue service's incident commander in an advisory capacity at hazardous materials incidents, including CBRN(e) events, within the framework of the incident command system. The DIM capability is also used to support mass decontamination or to support decontamination of body bags.

If the police have declared a CBRN(e) event, an initial 200 metre cordon, for members of the public and unprotected emergency responders, should be implemented as a default measure.

Strategic actions

Fire and rescue services should:

- Have systems in place to request DIM resources from the NRFC
- Ensure that personnel understand the use, interpretation and limitations of DIM equipment

Tactical actions

Incident commanders should:

- Request DIM resources from the NRFC if required, using agreed protocols
- Establish the quantity and types of resources being provided and identify suitable locations for them – rendezvous point (RVP), strategic holding area (SHA) or multi-agency strategic holding area (MASHA)
- Establish the estimated time of arrival for the NR resources
- Provide regular updates to NRFC on incident development

- Establish communication with the other agencies to gather information required by the DIM resources on their arrival

- Implement an initial 200 metre cordon, for members of the public and unprotected emergency responders, if the police have declared a CBRN(e) event

Control measure - Detection, identification and monitoring (DIM): Deployment

Control measure knowledge

On arrival at the rendezvous point (RVP), strategic holding area (SHA) or multi-agency strategic holding area (MASHA), the DIM adviser will liaise with the hazardous materials adviser, the requesting fire and rescue service's incident commander, the police on-scene commander and any other relevant agencies. The DIM adviser will need a range of operational information in order to develop the deployment plan.

DIM advisers will carry out a hazard analysis, with the other relevant agencies, taking into account all available knowledge, information and intelligence. This forms the basis of the DIM adviser's deployment plan.

The deployment plan should be agreed with the requesting fire and rescue service's incident commander, the hazardous materials adviser (if applicable) and the police on-scene commander (if appropriate).

Prior to any entry into a hazardous area, the DIM adviser will ensure all agencies are fully briefed on the actions the DIM adviser intends to take.

The team entering the hazard area will normally comprise DIM advisers and a DIM support team. However, the DIM adviser may vary the make-up and size of the team.

The DIM adviser will make the final decision on their own deployment into the hazard area taking into account the available information and intelligence.

Copies of the deployment plan will be retained by the National Resilience (NR) resources and the requesting fire and rescue service, as a record of the deployment plan and activity.

The DIM support team may either be personnel from the requesting fire and rescue service, or NR resources. They will be fully briefed by the DIM adviser prior to deployment; this briefing should include:

- The required operational outcomes
- Their role as the support team
- The location of the task
- Any hazards known or suspected to be present
- Any control measures in place
- The communications available
- What equipment will be used

Operations should, wherever possible, support the preservation of forensic evidence; this could include substances, samples and other information or intelligence. The DIM adviser should liaise with the police on-scene commander about this; the operation may require joint fire and rescue service and police deployments into the hazard area.

Strategic actions

National Resilience should:

- Provide a deployment plan template and information about its use

Tactical actions

Specialist responders should:

- Carry out a hazard analysis to develop the deployment plan
- Complete a deployment plan in liaison with other agencies

Control measure - Detection, identification and monitoring: Provide ongoing detection and monitoring

Control measure knowledge

Detection, identification and monitoring (DIM) equipment can be deployed to provide ongoing detection and monitoring, to provide information to the fire and rescue service incident commander, the police on-scene commander and the hazardous materials adviser.

Ongoing detection and monitoring can inform:

- The extent of the hazard area required
- What levels of personal protective equipment (PPE) should be used
- The tactical plan

DIM equipment can detect and monitor:

- The presence and level of some types of radiation
- The levels of radiation absorbed by fire and rescue service personnel
- Contamination levels within the inner cordon
- Oxygen levels to support breathing when using powered respirator protective suits (PRPS)
- The presence and concentrations of organic vapours
- Wind speed and direction

Strategic actions

National Resilience should:

- Ensure that information about DIM equipment and its application is kept up to date
- Ensure that equipment is calibrated and tested according to the manufacturers' guidelines
- Ensure that any equipment with expiry dates is replenished when required

Tactical actions

Specialist responders should:

- Wear the appropriate personal protective equipment (PPE), as recorded in the deployment plan
- Ensure that equipment deployed is functioning correctly
- Understand the limitations of the equipment and communicate this to the requesting fire and rescue service and other agencies
- Carry out ongoing monitoring and provide information to the fire and rescue service incident commander, the police on-scene commander and the hazardous materials adviser
- Provide advice regarding cordons and safe systems of work

- Contribute to the risk assessment process

- Assist the hazardous materials adviser to interpret information provided by other specialists

Control measure - Detection, identification and monitoring (DIM) decontamination

Control measure knowledge

Detection, identification and monitoring (DIM) advisers should liaise with the requesting fire and rescue service's incident commander to ensure that appropriate decontamination arrangements are available, based on the deployment plan. The arrangements should take into account all knowledge, information and intelligence available.

The firefighter MD structure from the DIM vehicle can be used for decontamination. However, the emergency responder MD structure from a mass decontamination unit (MDU), or a fire and rescue service's own MD structure, may be used if more convenient and appropriate.

In exceptional circumstances, for example if the substance analysis indicates the requirement of an alternative means of decontamination, the DIM adviser should pass this requirement to the requesting fire and rescue service's incident commander.

Arrangements for the decontamination of DIM equipment will be the responsibility of the DIM adviser.

Strategic actions

National Resilience should:

- Provide sufficient and appropriate decontamination facilities for the DIM team

Tactical actions

Specialist responders should:

- Ensure they undergo sufficient and appropriate decontamination
- Request alternative decontamination facilities if required
- Arrange for decontamination of DIM equipment

Control measure - Detection, identification and monitoring: Identify or verify the hazardous substance

Control measure knowledge

The DIM adviser will make arrangements for the required sampling and analysis to be carried out, using the appropriate techniques and equipment. The nature and process of these tasks will depend on:

- The type of substance, if known
- Any intelligence about the incident
- The equipment that is provided for the DIM capability

The procedures for sampling and analysis of substances have been produced for:

- Solids, powders, pastes, gels and non-volatile liquids
- Vapours and gases, including volatile liquids
- Radiological materials
- Biological agents

These are detailed in the National Resilience (NR) DIM procedures. This information should be updated if changes to DIM equipment have an impact on procedures.

The DIM adviser and DIM support team will conduct a continuous risk assessment process throughout their deployment in the hazard area. Any deviations to the operational plan should be recorded as soon as practicable after exiting the hazard area. The DIM adviser will operate all DIM equipment as detailed in the NR equipment information. The DIM support team may be required to carry out monitoring and/or carry equipment as required by the DIM adviser.

Substances should not normally be removed from the hazard area, but if it is essential that samples are moved to another location, this should be recorded.

If further deployments into the hazardous area are required, they should be subject to a risk assessment carried out by the DIM adviser. Such deployments should take into account the findings of the initial analysis, the physical working conditions and the availability of suitable personal protective equipment (PPE).

The task of the DIM adviser is to identify or verify the identity of the substance where possible. The DIM adviser should not be pressured to produce the identification results.

If the DIM adviser is able to identify the substance, this information should be passed as soon as possible to the fire and rescue service's incident commander and the police on-scene commander. However, if it is not possible to identify the substance, its classification (acid, alkali, physical properties) should be determined.

Following this, the information should be passed to the medical responders to assist them in determining the appropriate clinical treatment. When liaising with other agencies, the DIM adviser should state the limitations of any equipment that has been used, where that may impact on the accuracy of analysis results.

If sampling and analysis indicates that the cause of the incident could be a CBRN(e) event, it will lead to a multi-agency response as detailed in the JESIP publication, Responding to a CBRN(e) event: Joint operating principles for the emergency services. If a CBRN(e) event is declared by the police, the National Resilience Fire Control (NRFC) should be notified about its location and what NR DIM assets have already been deployed.

Strategic actions

National Resilience should:

- Ensure that information about DIM equipment and its application is kept up to date
- Ensure that equipment is calibrated and tested according to the manufacturers' guidelines
- Ensure that any detection, identification and monitoring equipment with expiry dates is replenished when required

Tactical actions

Specialist responders should:

- Wear the appropriate personal protective equipment (PPE) as recorded in the deployment plan
- Ensure that Detection, identification and monitoring equipment deployed is functioning

correctly

- Understand the limitations of the detection, identification and monitoring equipment and communicate this to the requesting fire and rescue service and other agencies

- Notify the police on-scene commander if sampling and analysis indicates that the cause of the incident could be a CBRN(e) event

- Notify the police on-scene commander if sampling and analysis indicates that the cause of the incident could be a CBRN(e) event

Hazard - Insufficient resources: Hazardous materials

Hazard Knowledge

A key factor in the successful resolution of any incident involving hazardous materials will be the availability of resources at every stage of the incident. Initially resources may be limited, and this may restrict the ability of the incident commander to deliver a full incident plan. In this event activities should be prioritised based on a risk vs benefit assessment. Sufficient numbers of the correct type of resource should be requested and requirements reviewed as the incident progresses.

The mobilisation of resources should be in line with pre-planned and pre-determined levels of response. The resources mobilised should enable arriving fire and rescue service staff to put safe systems of work in place when they arrive.

Control measure - Additional resources: Hazardous materials

Control measure knowledge

The quantity, nature and extent of additional resources should be based on the identified

foreseeable risk of each fire and rescue service.

Understanding the risk-critical information of hazardous materials sites is beneficial in anticipating the correct level of resources required. Ensuring sufficient numbers of personnel and specialist/non-specialist equipment are available allows initial emergency responders to put safe systems of work in place and start to gain control of the incident.

Sites involved in the manufacture and processing of hazardous materials may have a works fire team or emergency response team who will be able to support the local authority fire and rescue service response to an incident.

Strategic actions

Fire and rescue services should:

- Ensure staff are aware of the resources available to deal with incidents involving hazardous materials

Tactical actions

Incident commanders should:

- Request appropriate specialist resources and equipment for hazardous material incidents
- Identify resources available to take immediate action and request those needed to support the incident plan

Control measure - Specialist resources: Hazardous materials

Control measure knowledge

Detection, identification and monitoring (DIM) equipment

Due to the complexity of hazardous material incidents, the requirement for specialist equipment to assist with the detection, identification and monitoring of an environment will be necessary to ensure a safe conclusion of an incident.

The initial fire and rescue service response to an event may have access to some detection and monitoring equipment to assist in the identification of hazards associated with certain substances, for example radioactive material, carbon monoxide and explosive atmospheres.

Such equipment can confirm the presence of radiation and once this is known, responders can access data sources and specialist advice to inform the assessment of risk.

In some cases, such as gas monitoring, it may be possible to monitor the spread of hazardous materials. This will help maintain safe cordon distances and determine whether intervention techniques are being effective.

National Resilience assets

Personnel should be aware of the specialist capabilities available to their respective fire and rescue service, such as National Resilience assets of mass decontamination units, detection, and identification and monitoring. Personnel should also consider the use of the specialist capabilities that exist within other agencies including CBRN(e) responders and mutual aid from the military.

Specialist equipment

Accessing appropriate and specific equipment to deal with a hazardous material incident can assist in mitigating the effects of the incident. Such equipment can be expensive and difficult to maintain. For these reasons, several organisations may provide the equipment to the fire and rescue service for use in an emergency. This equipment may be supplied before incidents as part of mutual support or be available on request at an incident. For example:

- Site owners/operators
- Environmental agencies
- Highways agencies
- Private fire and rescue services
- Private contractors

The amount and type of equipment will be determined by the risk posed at the hazardous material site. Use of non-fire and rescue equipment should be subject to normal risk assessment procedures.

Strategic actions

Fire and rescue services should:

- Identify and make mutual support arrangements with other organisations who can provide specialist equipment for use at an incident or be made available on request

- Ensure personnel understand the availability of additional specialist equipment and its potential use in a hazardous material incident

- Ensure crews are familiar with specialist equipment provided by external suppliers and its safe use including an understanding of its testing and maintenance regime

- Record the existence of and access to specialist equipment in formal emergency plans and agreements

- Consider the need for ATEX approved equipment at incidents involving flammables, explosives, cylinders and combustible dusts

- Develop and maintain systems to ensure mutual aid agreements are developed on a local, regional and national basis to ensure the access and availability of National Resilience detection, identification and monitoring (DIM) assets and personnel

- Ensure personnel are trained in the deployment, use and interpretation of their detection, identification and monitoring equipment, such as gas monitoring equipment or dosimeters

- Ensure the prior availability and functionality of any equipment through pre-planning

- Identify and be able to mobilise key staff, equipment and vehicles for a CBRN(e) incident, for example, hazardous materials subject matter advisers and decontamination units

Tactical actions

Incident commanders should:

- Request appropriate specialist resources and equipment for the resolution of hazardous material incidents

- Consider requesting specialist resources for detection, identification and monitoring (DIM)

- Consider requesting National Resilience (NR) assets to support the successful resolution of any HazMat incident

Control measure - Specialist advice: Hazardous

Control measure knowledge

To ensure a hazardous materials incident is managed safely, the fire and rescue service will need to ensure that specialist advice is available to support the incident commander and operational crews. The amount, quantity and quality of information will be directed by the nature of the incident and it is crucial that the on-scene commander or fire control room can access the most current information possible.

Specialist hazardous materials advice may be required to:

- Identify the release or spill
- Identify the hazards posed by the release
- Identify or predict physical or chemical reactions
- Assist with the selection of the most appropriate personal protective equipment (PPE)
- Assist with decontamination of people and equipment
- Mitigate further damage to the environment
- Ensure response plans and tactics are appropriate and safe
- Advise on the treatment of people who have been exposed
- Assess wider public safety concerns
- Assist with investigations and debriefings

There is significant capability for both on-site and remote scientific and specialist support for hazardous material incidents, particularly CBRN(e) incidents. Specialist advice may be provided by many sources and there is the possibility of duplicated, confused or even contradictory advice being provided to the incident. There may also be confusion between the scientific advice and responders in terms of language and technical knowledge.

There are a number of fire and rescue service specific resources.

National Resilience Assurance Team

A national cadre of advisers from the fire and rescue National Resilience Assurance Team (NRAT) and National Strategic Advisory Team (NSAT), who provide tactical National Resilience capability advice to the fire and rescue service tactical and strategic commanders. These advisers are also able to provide communication conduits to the National Resilience Fire Control (NRFC) or Home Office Operations Centre where required.

For further information see the National coordination and advisory framework for the fire service in England (NCAF)

Tactical commanders with specific CBRN(e) training

CBRN(e) tactical commanders understand the structures which support the tactical function of the delivery of scientific and operational support to the incident and can assist the on-scene commander in creating, implementing and reviewing an appropriate tactical plan in line with the strategy and parameters determined by strategic command and with due regard for partner agency needs.

CBRN(e) tactical advisers

Tactical advisers have been identified within individual fire and rescue services to provide detailed tactical and capability relevant advice to on-scene incident, operations and sector commanders.

Hazardous materials advisers (HMA)

These officers provide specialist advice to the on-scene commander and where appropriate, tactical and strategic co-ordinating groups. They will liaise with other specialist advisers and emergency services to provide information on:

- The extent of the hazard zones
- Personal protective equipment (PPE) selection and decontamination procedures
- Safe systems of work for those within the 'hot zone'
- The potential for escalation of the incident
- Interpretation of any information from other experts

Where available, the hazardous materials specialist may be supported by a:

- Detection, identification and monitoring (DIM) adviser
- CBRN(e) tactical adviser
- Multi-agency Scene Assessment Team (MASAT)

Police staff with an enhanced level of skill, knowledge and understanding

These include:

- Police CBRN(e) tactical advisers
- Police duty officers at the National CBRN Centre (N CBRN C) Operations Room
- Government Decontamination Service (GDS)

The UK Government Decontamination Service (GDS), is part of the Department for Environment, Food and Rural Affairs (Defra). GDS helps the UK prepare for recovery following a deliberate act involving chemical, biological, radiological and nuclear (CBRN) materials, or an accidental release of hazardous materials (HazMat), by providing a permanent on-call team for advice and guidance following a CBRN or major HazMat incident. Their role includes:

- Providing advice, guidance and assistance on decontamination to responsible authorities in their contingency planning for, and response to, CBRN and HazMat incidents
- Plan and arrange for decontamination operations to be available to the responsible authorities should the need arise
- Responsibility for maintaining and building the GDS framework of specialist providers and

ensuring that responsible authorities have access to them
- Advising central government on the national capability for the decontamination of buildings, infrastructure, transport and open environment

Other specialist service personnel and organisations

- Ambulance services have specialist officers, such as:
  - Hazardous Area Response Team (HART)
  - Medical Emergency Response Incident Team (MERIT)
  - Specialist Operational Response Teams (SORT) etc. who can provide advice on clinical care and decontamination of casualties
- Other specialists or service providers with specific knowledge of CBRN or hazardous materials, for example: scientific advisers, radiation protection advisers etc.
- Other agencies including Environment Agency, Public Health agencies (PHE) etc.
- Non-fire and rescue service personnel with specific knowledge of hazardous materials or individual products/processes, such as scientific advisers or company chemists
- The National Chemical Emergency Centre (NCEC) that provides 24-hour assistance through the CHEMSAFE scheme
- Government agencies, for example:
  - The Met Office
  - Atomic Weapons Establishment (AWE)
  - Defence Science and Technology Laboratory (DSTL)
  - Environmental agencies
  - Public health agencies
- Industry response schemes such as Radsafe or Chlor-Aid

Incident commanders will also be able to access information sources, both printed and in electronic format. Printed information sources include:

- The Dangerous Goods Emergency Action Code List (EAC)
- The Emergency Response Guidebook (ERG)
- Safety Data Sheets (SDS) also referred to as Material Safety Data Sheets (MSDS) and Chemical Safety Data Sheets (CSDS)
- Transportation instructions in writing (IIW)

Electronic information sources include: The Met Office Hazard Manager application, CHEMDATA, Wireless Information System for Emergency Responders (WISER), the ERG application, etc.

All fire and rescue services have access to specialist advice both from their own resources and from external sources, including scientific advisers and public health agencies. These are good sources of specialist knowledge but are not always available immediately on the incident ground.

Strategic actions

Fire and rescue services should:

- Have arrangements to access risk critical information from remote specialists quickly during incidents, for example, Chemdata via vehicle mounted mobile data terminals (MDT)

- Ensure specialist personnel with enhanced skills, knowledge and understanding in hazardous materials operations are available to perform the key role of hazardous materials adviser (HMA)

- Ensure personnel understand the purpose of the hazardous materials adviser role

- Ensure that key dangerous substance information sources are immediately available, reliable and resilient

- Have policies and procedures that identify levels of specialist advice and how this advice can quickly be made available to the incident commander

- Have arrangements to access risk critical information from remote specialists quickly during incidents

- Provide access to enhanced skills, knowledge and understanding in CBRN(e) operations to perform the key advisory roles at incidents

Tactical actions

Incident commanders should:

- Consider requesting the attendance of tactical advisers or subject matter experts

- Consider requesting the attendance of hazardous materials adviser (HMA)

Control measure - Rendezvous points and marshalling areas

Control measure knowledge

Rendezvous points (RVPs) and marshalling areas should be positioned a safe distance from the incident location(s), preferably upwind and uphill, but in a location from which assets can be rapidly deployed forward. This location should be regularly reviewed or if the response transitions to the Specialist Operational Response (SOR).

It is normally the responsibility of the police to establish a RVP, which will be located away from the immediate scene of operations and is where multi-agency assets can be co-ordinated and marshalled prior to their attendance at the incident.

Due to the very nature of the response to a confirmed CBRN(e) incident, rendezvous points and marshalling areas need to be large enough to hold emergency responder resources which may be on or off-site and should be identified and agreed in the planning stage or in consultation with police through mobilising control at the time of the incident.

They should ensure that the designated area is safe for multi-agency partners to attend. Part of that process will usually entail a police search of the RVP and marshalling area for suspicious objects or devices. However, there may be occasions when the police are unable to undertake this task or when appliances already mobile to an incident are stopped or diverted by mobilising control, resulting in them moving to a location which has not been pre-identified and therefore not cleared by police.

The size and location of rendezvous points and marshalling areas are:

- Agreed by all attending agencies
- Far enough away from the immediate scene of operations, but close enough to be effective
- Large enough to contain fire and rescue service resources as well as other responding agencies
- Upwind and uphill from incident site if possible

Strategic actions

Fire and rescue services should:

- Identify and record pre-planned marshalling areas or RVPs for significant risks

Tactical actions

Incident commanders should:

- Consider mobilising to up-wind and upslope rendezvous points (RVPs) for significant incidents

- Identify locations for a rendezvous point (RVPs) and marshalling area and communicate to all responders

- Establish a system for booking assets in and out of the rendezvous point (RVP) or strategic holding area (SHA)

- Establish a safe system of work for moving vehicles into and out of an identified rendezvous point or marshalling area

- ARCHIVED Ensure that an area safety check is carried out whenever attending a rendezvous point (RVP) or marshalling area

Control measure - Request National Resilience resources for mass decontamination (MD)

Control measure knowledge

Mass decontamination (MD) is a planned and structured procedure using purpose-designed National Resilience decontamination equipment. The term refers to the capability of the method, and not the number of people dealt with.

The decision to carry out MD should be taken jointly with the ambulance service and the police. In the absence of the ambulance service and/or the police at an incident, the fire and rescue service incident commander may have to make and manage the decision.

Assisting the ambulance service

The primary responsibility for carrying out triage rests with the ambulance service. However, the fire and rescue service or the police may be able to assist if resources permit.

The ambulance service has statutory responsibility for the management of casualties which includes clinical decision-making around the method of decontamination.

Clinical decontamination is the process used where non-ambulant contaminated casualties are treated by ambulance service personnel, using purpose-designed ambulance service decontamination equipment.

The ambulance service may ask the fire and rescue service to assist them with carrying out clinical decontamination. This assistance may be requested if the ambulance service does not have sufficient resources or equipment for the number of non-ambulant contaminated casualties. The

fire and rescue service assistance could include:

- The delivery of water-based decontamination
- Management of water run-off
- Using the National Resilience (NR) MD equipment to enable ambulant casualties to proceed, usually without physical assistance, through the decontamination process
- Assisting the ambulance service with contaminated casualties, by converting the MD structures to deal with non-ambulant casualties

Requesting National Resilience response

If the fire and rescue service incident commander believes the NR MD capability is required, they should immediately provide the following information to the National Resilience Fire Control (NRFC):

- The initial location of the rendezvous point (RVP)
- The approximate number of casualties

The contact to the NRFC will prompt the mobilisation of National Resilience resources from one or more 'hosting' fire and rescue services.

The NRFC should provide an estimated time of arrival; this information will assist the incident commander in determining what level of initial operational response (IOR) is required.

As the incident develops, further information may become available. The incident commander should capture this information using the M/ETHANE model, and provide an update to the NRFC. If a strategic holding area (SHA) or multi-agency strategic holding area (MASHA) is established, this information should also be provided to the NRFC. For further information, refer to Multi-agency strategic holding areas: a guide.

Details of the multi-agency response for incidents declared by the police as a CBRN(e) event can be found in the JESIP publication, Responding to a CBRN(e) event: Joint operating principles for the emergency services.

The MD response includes facilities for members of the public and for emergency responders. The MD response will also require the response of the detection, identification and monitoring (DIM) capability.

If the police have declared a CBRN(e) event, an initial 200 metre cordon, for members of the public and unprotected emergency responders, should be implemented as a default measure.

Strategic actions

Fire and rescue services should:

- Have systems in place to request MD resources from the NRFC

- Ensure that personnel understand the use and limitations of MD resources

Tactical actions

Incident commanders should:

- Request MD resources from the NRFC if required, using agreed protocols
- Establish the quantity and types of resources being provided and identify suitable locations for them – RVP, SHA or MASHA
- Establish the estimated time of arrival for the NR resources
- Provide regular updates to NRFC on incident development and casualty numbers
- Establish communication with the other agencies to gather information required by the MD resources on their arrival
- Implement an initial 200 metre cordon, for members of the public and unprotected emergency responders, if the police have declared a CBRN(e) event

Hazard - Exposure of responders to hazardous materials

Hazard Knowledge

This hazard deals with control measures to prevent exposure and to manage its occurrence. The optimum situation is to avoid the exposure of responders. Exposure occurs when a harmful substance enters the body through a route, for example, inhalation, ingestion, absorption or injection, or when the body is irradiated.

Where exposure to a hazardous material is suspected, the speed of the response is critical to saving lives. The process of evacuation and early treatment will result in a much-improved situation for responders.

Control measure - Safe and controlled approach: Hazardous materials

Control measure knowledge

All responding vehicles should, where possible, approach cautiously and at a slow speed from an upwind, upslope location. Initial responders should be able to anticipate the type, size and potential scope of the hazardous material incident from the initial mobilising instructions. Approaching responders should be aware of potential contamination issues when approaching a hazardous materials incident. The proactive use of information systems, specialist advice, pre-planning arrangements and incident visual indicators will add value to the response and ensure a safe approach can be determined.

Examples of incident visual indicators include:

- Visible smoke and other signs of fire
- Gas and vapour clouds or plumes, unexplained vapour or mist clouds
- Liquid spills, wet areas, patches, puddles, pools and streams or flowing liquids which may indicate the affected area
- Unexplained oily droplets or films on surfaces or water
- Unexplained noise (for example explosions, venting cylinders, site-specific audible warnings), which may indicate a more cautious approach and larger hazard area
- The presence of hazardous materials or equipment not relevant to the occupancy
- Distinct odours (for example bleach, garlic, rotten cabbage, rotten eggs). Being able to smell an unusual or unexplained odour usually indicates being in, or close to, the hot zone. Unexplained smells or tastes that are out of character with the surroundings
- Cryogenic effect of escaping product (for example frosting around defective pipes or a damaged area on a LPG container)
- Damaged containers and packages
- Dead or distressed people
- Individuals showing unexplained signs of skin, eye or airway irritation, nausea, vomiting, twitching, sweating, pinpoint pupils (miosis), runny nose (rhinorrhoea), disorientation, breathing difficulties, convulsions and death
- Biological indicators, such as dead birds, animals, fish, insects, trees and withered plant life or vegetation
- Casualties and other people involved in the incident may physically mark the hazard area or they may be able to describe it based on their experience

It is possible that initial responders could inadvertently drive into or through a contaminated area en route to the scene of the incident. The above factors should be considered when arriving at the

incident and initially positioning vehicles. This will:

- Enable visual assessment of the scene (such as plumes, liquid spills)
- Reduce the probability of driving into a hazardous area
- Avoid collisions with casualties, people escaping the release and other members of the public who may be attracted to the incident

The acronym DDOOR highlights the key factors to consider about the potential dispersion plume. It stands for 'downwind, dilution, obstacle, oscillation and retention'. It highlights key factors to remember when dealing with a hazardous release in the urban environment, particularly the effect that the built environment and the wind can have on a dispersion plume.

- Downwind – the largest part of the plume moves downwind, and may become wider and higher
- Dilution – the gas or vapour dilutes as it mixes with the air around it; the concentrations decrease downwind and at the sides and top of the plume
- Obstacles – the plume's movement is strongly influenced by obstacles such as buildings and other structures. Some parts of the plume go up and over the building, while others zigzag along the streets in the downwind direction. The plume may quickly fill street 'canyons'. Some parts of the plume may spread upwind.
- Oscillation – the plume will oscillate; its position and course will not remain constant but vary over time. It will follow different routes downwind, often in response to minor changes in environmental factors.
- Retention – some parts of the plume can be retained, and gradually released later, even after the source has been dealt with

CBRN(e)

Many possible scenarios could lead to an incident being identified as a suspected or confirmed CBRN(e) event. During the approach to a CBRN(e) incident, responders may face three distinct elements of this hazard:

- Airborne contamination
- Secondary devices
- Presence of perpetrators or other terrorists

Where there is any doubt as to whether the incident is deliberate, it should be treated as if it were a crime scene and, as far as possible, all responders should conduct their tasks with a view to protect the scene and record any evidence that may be present.

Strategic actions

Fire and rescue services should:

- Ensure an effective means of communicating key information to mobilised resources from fire control rooms and all other agencies

- Ensure responders have access to compass aided mapping systems
- Where available, ensure incident commanders receive specific information and instruction on approaching hazardous materials incidents

Tactical actions

Incident commanders should:

- Approach hazardous material incidents at slow speed from upwind and higher-level ground where possible
- Adopt a cautious approach to situational awareness where there are no immediate threats to life
- Consider the potential for secondary devices and share any intelligence with other responder agencies
- When approaching the incident use visual and other incident indicators to inform situational awareness

Control measure - Cordon controls: Hazardous materials

Control measure knowledge

Initial cordon

An initial inner cordon should be temporarily established by the first emergency responders before any detailed scene assessment has been conducted. It provides a means of controlling, safeguarding and co-ordinating the immediate response and adds an element of control to the incident. It must be flexible so that it can be expanded or reduced if necessary.

The initial cordon is an immediate precautionary measure and must be formed in a position of safety. Unprotected responders must never be deliberately deployed to a position where contamination or exposure is suspected. However, it should be considered as enclosing a potential

hazard area rather than an exclusion zone. Only responders who have been briefed and equipped to deal with the hazards should be allowed to operate inside it.

Where the hazardous materials involved are toxic by inhalation, it may be necessary to extend the initial cordon in the downwind direction to protect people from vapours, gases or dusts. The initial cordon should enclose the area in which people may become incapacitated and unable to take protective action and may incur serious or irreversible acute health effects.

Beyond this area there may still be risk to the public. However, any contamination or exposure is likely to be low level where the public could take their own protective actions such as evacuation or shelter. Public health agencies have responsibility for public safety in the extended downwind area. Areas where non-acute or possibly longer-term health risks may be present should be designated and dealt with by the public health agencies. The initial cordon must be communicated to all first responders, especially oncoming response vehicles.
See Control Measure – Downwind protection zones

Hot zone

This is a contaminated area where the initial release occurs or disperses. It will be the area likely to pose an immediate threat to the health and safety of everybody in it and is the area of greatest risk. It is located inside the inner cordon and is part of the hazard area.

Effective personal protective equipment (PPE) is required when working in the hot zone. Emergency services may have differing specifications for PPE and will decide on the appropriateness of their own equipment. The effectiveness of each type of PPE for the hot zone depends on the type and concentration of the contaminant. Any decisions made should be based on a hazardous materials assessment.

There may be more than one area of release. Material may be spread or channelled, leading to more than one hot zone. Where possible all hot zones should be inside a single inner cordon. Where this is not possible for reasons of scale, location, topography etc., establishing two or more inner cordons should be considered. This may mean treating the cordoned areas as separate incidents with distinct command structures. This is more likely to happen at deliberate CBRN(e) attacks rather than an accidental hazardous materials release or spill.

Warm zone

This is the area uncontaminated by the initial release of a substance. It may become contaminated by the movement of people or vehicles. It is surrounded by the inner cordon and is part of the hazard area but usually contains lower risks than the hot zone.
In the initial stages of an incident, the movement of contamination from the hot zone to the warm zone will be uncontrolled. As soon as practicable, the warm zone needs to be managed and controlled by emergency responders wearing appropriate PPE. The warm zone will later be extended to include the managed area encompassing decontamination. This extended section of the warm zone is called the decontamination area.

At small scale, low risk, low complexity hazardous materials incidents, warm zones may not exist. Responders should not designate them if there is no benefit from doing so.

Cold zone

This is the uncontaminated area between the inner and outer cordon. Key operational command positions and other essential activities will be set up in this area. Police services, in liaison with fire and rescue services and ambulance services, should decide whether members of the public need to be evacuated from the cold zone.

Release of gases, vapours or dusts (Toxic Inhalation Hazard)

Incident commanders should consider the following generic initial cordon distances as a basis for further risk assessment based on the operational circumstances:

Generic initial cordon distance guidance Note: continuous risk assessment should be carried out to ensure that the cordon remains appropriate and proportionate to the risks identified by the incident commander	
Incident type	Initial cordon distance (metres radius)
Explosives - manufacture, storage, transport (NB pre-planning for known sites should include rendezvous points (RVPs) at safe distances)	100m for transport incident HD 1.4 200m for transport incident HD 1.3 600m for transport incident HD 1.1, HD 1.2 and HD 1.5 (or when HD is not known) 100m for registered premises (fireworks only) 200m for incidents at other registered premises 600m for incidents involving licensed storage (under 2000kg) 1000m for incidents involving licensed storage (more than 2000kg)
Explosives -CBRN(E), terrorist (*Consider no fire and rescue service attendance or treat as 'exclusion' distances for fire and rescue service personnel, take guidance from police and explosive ordnance disposal (EOD))	100m for an activated device Unexploded devices:* 100m for a suitcase-sized device 200m for a car-sized device 400m for a lorry (or when size of device is not known)
Cylinders involved in fire (N.B. shielding may reduce distances)	Fireball up to 25m Cylinder may be thrown up to 150m Flying fragments up to 200m

Chemicals being transported	25m for solids 50m for liquids 100m for gases, vapours, particulates
Radiation	Outside buildings: 50m - unshielded or damaged potentially dangerous source 100m - major spill from a potentially dangerous source 300m - fire, explosion or fumes involving a potentially dangerous source 400m or more to protect against an explosion - suspected bomb (exploded or unexploded) Inside buildings: Affected and adjacent areas (including the floor above and below) - damage, loss of shielding or spill of a potentially dangerous source Entire building and outside distances detailed above - fire or other event that can spread a potentially dangerous source materials throughout the building (for example through the ventilation system)

Emergency action codes

The Dangerous Goods Emergency Action Code List (EAC) gives the following information on public safety hazards. An 'E' following the first two characters of an EAC indicates that there may be a public safety hazard outside the immediate area of the incident, and that the following actions should be considered by first responders:

- People should be told to stay indoors, with all doors and windows closed, preferably in upstairs rooms facing away from the incident. They should eliminate all ignition sources and stop any ventilation
- Effects may spread beyond the immediate vicinity. All non-essential personnel should be instructed to move at least 250m away from the incident
- Police and fire and rescue service incident commanders should consult with each other and with a product expert or a source of product expertise
- The possible need for subsequent public evacuation should be considered, but it should be remembered that in most cases it will be safer to shelter-in-place than to evacuate

Further information and guidance on setting cordons for specific substances and types of hazardous materials can be found in the Emergency Response Guidebook (ERG). Setting cordon distances is not a specific science. As soon as reasonably practicable, incident commanders should consult a hazardous materials adviser (HMA), who will have a better understanding of applying the

guidance.

Fire further information see The Dangerous Goods Emergency Action Code List (EAC)

Strategic actions

Fire and rescue services should:

- Ensure personnel have the skills, knowledge and understanding to implement an appropriate initial cordon at hazardous materials incidents

Tactical actions

Incident commanders should:

- Consult specialist advisers to assist with modelling potential hazard areas
- Ensure that appropriate exclusion zones, inner and outer cordons are established and communicated at hazardous materials incidents

Control measure - Carry out atmospheric monitoring

Control measure knowledge

Atmospheric monitoring should be undertaken whenever operations take place in a confined space. Before entry, the atmosphere within a confined space should be tested to check oxygen concentration and/or to check for the presence of hazardous gas, fume or vapour. Atmospheric testing should be carried out by competent personnel aware of the limitations of the equipment in use (e.g. a four-gas monitor may not have a sensor that detects ammonia)

Testing should be carried out where knowledge of the confined space indicates that the atmosphere might be contaminated or unsafe to breathe, or where any doubt exists as to the condition of the atmosphere. Testing should also be carried out if it is known that the atmosphere was previously contaminated and was ventilated as a consequence.

Where the atmosphere in the space may not be safe to breathe, and requires testing, the space

should be constantly monitored, even when the atmosphere is initially found to be safe to breathe. Regular monitoring will be necessary to ensure that any change in the atmosphere while work is being carried out is identified. Where monitoring occurs, the results should be recorded. Testing and monitoring requirements should be defined by a competent confined space supervisor within the safe system of work.

This regular monitoring of the atmosphere in a confined space may be through on-site or fire service monitors used in a fixed location to protect a number of firefighters or, more commonly, through personal/portable monitors carried by individuals. Monitoring equipment should be maintained and recalibrated as required by the manufacturer, and designed to test for atmospheres that represent a hazard to fire and rescue service operations.

Commonly these are:

- Low oxygen atmospheres
- High oxygen atmospheres
- Flammable/explosive atmospheres
- High carbon monoxide atmospheres
- Other gases that present a hazard - including hydrogen sulphide, ammonia and chlorine

Strategic actions

Fire and rescue services should:

- Provide suitable atmospheric monitoring equipment that is capable of being used in a confined space

Tactical actions

Incident commanders should:

- Carry out initial and continuous atmospheric monitoring and use the results to inform the incident plan
- Carry out atmospheric monitoring to identify extent of flammable vapour
- Consider requesting a HMA or DIM resource to provide advice on atmospheric monitoring
- Carry out atmospheric monitoring for the presence of landfill gas, biogas and other hazardous gases

Control measure - Downwind protection zones

Control measure knowledge

Apart from immediate life rescues, hazardous materials incidents possess the ability to affect members of the public not initially involved in the original accident or release. The fact that hazardous materials can move from the scene of origin means there is a potential for members of the public to become exposed to harm sometime after the start of the incident. Fire and rescue services have a responsibility to limit, or prevent further, involvement of the public and actions should be undertaken with this in mind.

There are different ways to determine the effect of a hazardous material over distance. The likelihood is that any solid or liquid will only affect the immediate area unless it is able to access drainage systems or can act in a similar nature to a gas (for example, volatile liquids or powdered solids that can be carried on the wind). It is therefore recognised that the greatest risk is from gases, vapours, aerosols and particulates.

After gathering all available information, it is important to measure or model the potential or actual release zone. This can be done in two ways:

- Direct measurement or observation
- Application of a model

A model is a predicting tool based on data collated prior to the incident which will include a combination of the properties and quantity of the substance involved combined with environmental data such as wind speed and temperature. These models have been tested against experimental data to provide an estimation of hazard zones. There are several models available and they vary in their level of sophistication. The most appropriate model to use will depend on the level of information and time available to assess the hazard area.

Simple models such as the tables included in the Emergency Response Guidebook or Chemdata, require minimal information from the scene and can be applied very quickly. However, the tables consider worst case possible scenarios and therefore could lead to unnecessary disruption. Techniques can be used in conjunction with this information to refine the modelled hazard area to prevent excessive disruption.

The suggested initial cordon distances are based on these models and provide a very simplified initial stand-off distance to keep responders and the public safe.

More complex models are available such as the Aerial Locations of Hazardous Atmospheres (ALOHA) software, which can provide a more precise hazard area. However, the level of information needed to use such modelling software is greater and may not always be available.

For more information see: ALOHA software

To enable accurate modelling, weather effects are important and the Met Office also provides several tools that can be used in conjunction with modelling methods, available through the

Hazard Manager tool on the Met Office website. They are:

- FireMet – This is a weather information system provided by the Met Office. It provides fire and rescue service responders with the latest weather information to help them identify a safe approach when dealing with a major incident
- CHEMET – In an incident involving hazardous chemicals, local fire and rescue services and police services can contact the Met Office Environment Monitoring and Response Centre. For small-scale events, the Centre produces meteorological guidance and a plume prediction as a chemical meteorology report. For larger release events, such as the Buncefield oil depot fire, more sophisticated plume modelling techniques are used

Hazard manager is available to incident command units, mobilising controls and detection, identification and monitoring (DIM) units, as well as the National Co-ordination Centre

The Met Office has highly advanced models to identify hazard areas. These are designed for more long-term spread. For example, the Numerical Atmospheric-dispersion Modelling Environment (NAME) is an atmospheric pollution dispersal model that is a much more sophisticated tool than Chemet for pollution forecasting. It can:

- Simulate the effect of fires
- Forecast air quality up to 36/48 hours ahead
- Consider the chemical involved
- Show deposition, air concentration and height of the plume
- Predict long-standing air pollution problems such as acid rain
- Forecast international movement of pollutants

To apply a model effectively, several factors need to be identified and considered:

- Physical and chemical properties
- Quantity, concentration, release rate and surface area
- Weather and ambient conditions
- Fire or explosion risk
- Topography and site layout (for example slopes, spacing of tanks)
- Method of containment
- Whether the containment system will cope
- That mixtures of hazardous materials are dangerous
- Combinations of additional hazards

Several techniques and pieces of equipment are available to responders to monitor the presence and/or quantity of a range of hazardous materials that may be encountered at incidents. The equipment can be used to identify hazardous areas for both a responder and from a public safety perspective. Where such equipment is deployed, it is important that the user has a thorough understanding of its capabilities and limitations as well as how to operate it in a hazardous environment and how to interpret the information provided.

If applied correctly, these techniques will enable very precise determination of any potential hazard area. This has the advantage over modelling as any good model will include a suitable safety

margin to take account of any unknown variables. This means that a model will always have a greater potential for some unnecessary disruption to the public.

Specialist advice from a hazardous materials adviser (HMA) may be required to interpret downwind protection zones as they can be significantly affected by weather conditions. For example, it is clear that strong winds will cause the hazardous material to travel further from the incident than a light breeze. However, a strong wind will generally cause the material to dilute or disperse much quicker than a light breeze. Weather reporting systems can be used to great effect in predicting the impact of hazardous materials in downwind protection zones.

Modelling software may produce a chart like this:

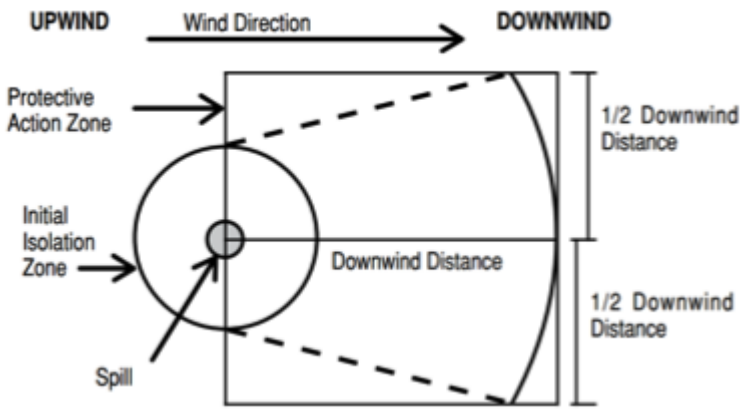

Figure 5: Example of protection zones modelling

Source: Emergency Response Guidebook (ERG)

The area of concern spreads out to form a cone. Members of the public inside this area are potentially at risk. The degree of risk should be assessed by the HMA.

It should be remembered that the two zones – the initial isolation zone and the downwind protection zone – imply two different types of area. An initial isolation zone is more likely to require an evacuation. The downwind protection zone suggests that the public in this area need only to be protected from the release and this may often be considered for a shelter-in-place strategy.

The responsibility for air quality monitoring falls outside of fire and rescue service personnel. The equipment is used by environmental agencies and the data interpreted by public health agencies. For further information see National Operational Guidance: Environmental Protection – Air quality cell function

Strategic actions

Fire and rescue services should:

- Make provision for weather reporting systems to inform downwind protection zones

- Provide specialist personnel and/or hazardous materials advisers (HMA) who understand the software and can interpret the information it provides

- Provide access for fire control room staff and responders to meteorological services and plume modelling such as the Hazard Manager tool provided by the Met Office

Tactical actions

Incident commanders should:

- Obtain advice from the hazardous materials adviser (HMA) on the size of any downwind protection zone

- Predict any likely protection zone based on specialist advice observation or modelling

- Consider the risks in the downwind protection zone, such as buildings with high-risk or high-dependency members of the public

Control measure - Highlight avoidance routes

Control measure knowledge

Before briefing personnel, incident commanders should consider all available sources of information. Team briefings should be based on incident needs and a plan should be constructed to achieve them. Continuous evaluation and review throughout the incident will determine whether the current objectives and subsequent plan are appropriate.

Consider the following sources of information throughout the incident:

- Building and site plans
- Premises information boxes (PIB)
- Responsible Person (or appointed competent person)
- Observation
- External scene surveys of the building and area
- Reconnaissance of the location reported to be involved
- Information from personnel operating in the building and/or risk area
- Witnesses

- Occupiers
- Other agencies

Strategic actions

Fire and rescue services should:

- Ensure that all personnel are aware of the risk and correct procedures for avoidance routes

Tactical actions

Incident commanders should:

- Identify sub-surface voids and highlight avoidance routes at building collapse incidents
- Establish clear routes to the scene of operations and confirm them to all personnel
- Identify any utilities not isolated and communicate to all personnel
- Identify and communicate routes avoiding unsuitable and hazardous areas
- Identify clear avoidance routes to the scene of operations and confirm them to all personnel

Control measure - Personal Protective Equipment (PPE): Hazardous Materials

Control measure knowledge

Fire and rescue services (FRS) should recognise that in line with the concept of the hierarchy of controls in risk management, personal protective equipment (PPE) forms the last line of defence for an individual working in a hazardous environment. Legislative requirements such as the Control of Asbestos Regulations require fire and rescue services to prevent or control the exposure of personnel and others to hazardous substances whilst at work. However, when fire and rescue service personnel attend hazardous materials, there may be few alternatives to using PPE as a risk control, particularly when saving life or preventing damage to the environment. It is therefore vitally important that fire and rescue services understand the advantages and limitations of available PPE ensembles. This can only be achieved by understanding the performance standards and level of protection afforded by PPE ensembles.

Several PPE ensembles are available to fire and rescue service responders. Rarely does one ensemble protect the wearer against all foreseeable hazards. Selecting hazardous materials PPE must be the result of a risk assessment carried out at the scene of operations.

In general, when pre-planning for hazardous materials incidents, PPE should be considered in three distinct areas:

- Respiratory protective equipment (RPE) – to prevent exposure to harmful substances through inhalation and ingestion
- Chemical protective clothing (CPC) – to prevent exposure through skin contact and penetration
- Protection against other foreseeable hazards, for example, fire, extreme heat or cold or projectiles

Structural firefighting PPE should be the common default position for fire and rescue personnel whilst en route and during the initial attendance. Subsequent actions determined by the incident commander, and subject to an appropriate risk assessment, may require crews to wear additional or alternative PPE. The PPE chosen by responders should be suitable and sufficient for the tasks that need to be carried out. There should be a basic analysis of what needs to be done and the hazards that are likely to be encountered.

To select the most appropriate PPE the incident commander will have decided the tasks to be carried out and the hazards that may be encountered. The choice of PPE should consider the joint understanding of risk (JUR) and information available from other responder agencies. They will then choose the ensemble that provides the greatest level of protection against the most dangerous foreseeable hazards. Seven basic factors will generally determine the level and type of protection required by responders:

- Fire – Is fire or a flammable atmosphere present? Most chemical protective clothing (CPC) should not be used in fire situations
- Toxicity – Primarily via inhalation, but also consider ingestion or skin exposure
- Corrosiveness – From weak or strong concentrations of acids or alkalis
- Oxidation – Where there is a reaction with organic materials, producing heat and oxygen
- Temperature – Where the substance is at an extreme of temperature, whether hot or cold
- Biohazards – From pathogens and open cultures
- Radiation (ionising) – Whether involving an unsealed source or not

To determine the level of PPE required at the initial response phase of an incident involving hazardous materials in a transport scenario, reference may be made to the Dangerous Goods Emergency Action Code List (EACs), also known as Hazchem codes. These codes give the emergency services an indication of the actions that may be necessary during the first few minutes of an incident involving dangerous goods should the incident commander consider it necessary to take immediate action.

Additional personal protection (APP) codes give emergency responders more information on appropriate levels of chemical protective clothing. These codes do not appear on vehicle placards or on emergency action code (EAC) cards but are available in the Dangerous Goods Emergency Action Code List (EAC) list, generally through fire control rooms or mobile data terminals.

Initial operational response (IOR)

Operational personnel responding to initial operational response (IOR) incidents must be competent to wear self-contained breathing apparatus (SCBA) and be aware of the requirement for minimum crews of two personnel. They should be rigged in a minimum of structural firefighting PPE and SCBA, and where available, should consider wearing nitrile type gloves (as in road traffic collision protocols) beneath their fire gloves.

The use of structural firefighting PPE and SCBA should only be used during the initial stages of the incident to undertake immediate lifesaving activities, and the incident commander should confirm that there are saveable lives before implementing a rescue plan.

During later phases, activities such as mass decontamination may be necessary. When carrying out such activities, PPE such as gas-tight suits (GTS) and powered respirator protective suits (PRPS), identified in existing guidance should be used.

Operational personnel should be aware of the requirements to limit deployments in the hot zone for a maximum duration of 15 minutes for deliberate reconnaissance activities, and 30 minutes for rescue activities in the hot and warm zones.

PPE for decontamination

All appropriate personnel should be familiar with the requirements for responder decontamination and the safe undressing procedure detailed in the IOR guidance.

The level or type of decontamination selected will vary according to the nature and degree of the contaminants and the resources available. The type selected will dictate the level of PPE required by decontamination operatives.

The minimum level of PPE for decontamination operatives is structural firefighting PPE, SCBA and nitrile gloves. Gas tight suits (GTS) or powered respirator protective suits (PRPS) should be used if required by the hazardous materials assessment.

Strategic actions

Fire and rescue services must:

- Ensure any personal protective equipment (PPE) provided is fit for purpose and complies with current legislation
- Provide a number of generic ensembles of hazardous material personal protective equipment and make them available to responders
- Provide specialist information, instruction and training to staff that deal with incidents involving hazardous material, including CBRN(e), on the selection of personal protective equipment

- Support the incident commander to implement the highest level of PPE available to provide a safe system of work (SSOW) and reduce risk of cross-contamination to decontamination operatives to as low as reasonably practicable

- Ensure that all fire and rescue service personnel fully understand their own service's PPE policies and procedures, and with Initial operational response to a CBRN Incident (Home Office, July 2015)

Fire and rescue services should:

- Ensure personnel are properly trained in the use and limitations of any personal protective equipment (PPE) that is provided

- Ensure procedures are in place for maintaining, cleaning, re-using and/or disposing of personal protective equipment (PPE)

- Ensure they have policies that allow the use, decontamination, maintenance and testing of structural firefighting PPE for performing immediate lifesaving actions at a CBRN(e) incident

Tactical actions

Incident commanders should:

- Ensure all personnel wear PPE according to service risk assessment and procedures for HazMat incidents

Control measure - Respiratory protective equipment (RPE)

Control measure knowledge

Respiratory protective equipment (RPE) is a particular type of personal protective equipment designed to protect the wearer from breathing in harmful substances, or from oxygen-deficient atmospheres, when other controls are either not possible or insufficient on their own.

The two main types of RPE are respirators and breathing apparatus:

- Respirators (filtering devices) use filters to remove contaminants from the air being breathed in. Non-powered respirators rely on the wearer breathing to draw air through the filter
- Breathing apparatus (BA) requires a supply of breathing-quality air from an independent source (e.g. air cylinder)

Where RPE is used, it must be able to provide adequate protection for individual wearers. RPE cannot protect the wearer if it leaks. A major cause of leaks is poor fit; tight-fitting face pieces need to fit the wearer's face to be effective.

Maintenance is a requirement for all RPE, except for disposable (single use) RPE, and should be carried out by properly trained personnel. Thorough maintenance, examination and tests should be carried out at regular intervals in accordance with the manufacturer's instructions.

Face fit testing

Face fit testing is a method of checking that a tight-fitting facepiece matches the wearer's facial features and seals adequately to their face. A fit test should be carried out as part of the initial selection of the RPE and it is good practice to ensure repeat fit testing is carried out on a regular basis.

See: Regulation 7, The Control of Substances Hazardous to Health Regulations 2002 (as amended)

See: HSG53, Respiratory protective equipment at work, 4th Ed. HSE (2013)

Breathing apparatus

Breathing apparatus (BA) enables firefighters to breathe safely in otherwise irrespirable atmospheres. The use of BA as a control measures is likely to be applied as part of the incident plan for any incident involving smoke and fire gases, confined space specified risks and hazardous materials including asphyxiants, dusts, toxic, flammable and explosive substances.

The foundation for breathing apparatus guidance outlines procedures that should be adopted at operational incidents involving the deployment of BA. These procedures allow efficient, effective and safe working practices to be adopted at incidents of all sizes and type where an irrespirable atmosphere presents a hazard to personnel.

See: Foundation for Breathing Apparatus

Strategic actions

Fire and rescue services must:

- Provide employees with suitable respiratory protective equipment that fits the wearer correctly and adequately controls identified risks

- Ensure that personal respiratory protective equipment worn simultaneously is compatible

and does not negatively impact other safety measures

Fire and rescue services should:

- Specify the type of respiratory protective equipment required for hazards identified through risk assessment and communicate to personnel
- Have policies, procedures and guidance for all personnel on the safe use and management of respiratory protective equipment at incidents
- Provide suitable information, instruction and training to all personnel who may be required to wear respiratory protective equipment
- Have suitable arrangements for the provision, testing and maintenance of respiratory protective equipment

Tactical actions

Incident commanders should:

- Ensure that all personnel wear the type of RPE identified by service risk assessments, procedures and training
- Implement BA entry control procedures appropriate to the level of risk identified

Control measure - Emergency exposure procedures

Control measure knowledge

No matter how diligent responders are, it is always possible that personnel will inadvertently be exposed to a hazardous material. This may be because of a deliberate act or an event where there were simply no indications of a release. It could also be because personnel took a calculated risk for some non-life-threatening exposure to save life or prevent the catastrophic escalation of an incident. For these reasons, all responders need to be trained in an emergency exposure procedure. This is a safe system of work that will quickly:

- Remove them from the hazard area

- Remove their personal protective equipment (PPE)
- Remove the contaminant
- Get them medical assistance if required

Strategic actions

Fire and rescue services should:

- Provide an emergency exposure procedure for responders to hazardous materials incidents
- Ensure personnel that respond to hazardous materials incidents are provided with the necessary knowledge, skills and understanding to effectively operate emergency exposure procedures

Tactical actions

Incident commanders should:

- Instigate emergency procedures if personnel or responders are accidentally contaminated or exposed

Control measure - Arrangements to deal with firefighter emergencies

Control measure knowledge

The rescue and recovery of firefighters is challenging. Difficult decisions may need to be made. The situation calls for clear judgement, often while struggling to keep emotions under control.

If the incident commander and other commanders fail to maintain control, it may lead to an outcome with serious health and safety consequences. Crews are likely to place themselves at considerable risk to rescue or recover colleagues.

A situation where a firefighter needs rescuing is very likely to lead to fire and rescue service personnel and others experiencing increased stress. This can affect the way people make decisions and process information. See Personal resilience.

The incident commander's resilience and ability to manage pressure in this situation is critical to

maintain control. Other important factors are maintaining good situational awareness and sharing accurate information such as last known locations and tasks they were undertaking.

After an incident there may be a requirement to investigate its cause. This may be part of a fire and rescue service review to identify the cause of the incident or to look at how effective fire safety measures were. Additionally, it may be part of a criminal investigation by the police. Other agencies may also have a legal requirement to investigate, for example, the Air Accident Investigation Branch, Marine Accident Investigation Branch, Rail Accident Investigation Branch or the Health and Safety Executive.

From the start of an investigation, fire and rescue service personnel should make sure that evidence is not destroyed or disturbed. They should also make observations and notes to help investigators.

The Health and Safety Executive offer guidance on best practice for the investigation of accidents in the workplace. These include the Work Related Deaths Protocol.

Further information is available. See CFOA guide Death in the Workplace: Guidance for United Kingdom fire and rescue services.

Strategic actions

Fire and rescue services must:

- Have policies for firefighter emergencies which incorporate communications, investigation and welfare.

Fire and rescue services should:

- Consider developing procedures for critical incident welfare of affected personnel

Tactical actions

Incident commanders should:

- Establish emergency arrangements appropriate to the size and complexity of the incident
- Maintain effective command and control in an emergency situation and review incident priorities, tactics and resources
- In a firefighter emergency preserve the scene to inform future internal and external investigations

Control measure - Welfare

Control measure knowledge

Adopting appropriate welfare arrangements at operational incidents will assist with the safe and effective management of personnel and provide them with welfare support, whether physical or psychological. By having effective arrangements for the management of welfare and physical wellbeing at incidents, fire and rescue services will support several key elements of the safe person principles.

Consideration should be given to work rotation, rest, recovery and reliefs taking account of activities undertaken and weather conditions. At protracted incidents provision should be made for suitable sanitary conveniences and hygiene facilities; an adequate supply of drinking water should be provided for all personnel.

See: Workplace (Health, Safety and Welfare) Regulations 1992

Strategic actions

Fire and rescue services should:

- Make suitable arrangements to provide welfare for personnel at protracted operational incidents including shelter, drinking water, hygiene and sanitary conveniences.

Tactical actions

Incident commanders should:

- Consider the effects of geography on equipment logistics, casualties and crew welfare
- Provide first aid equipment to crews deployed to areas with no immediate medical assistance
- Consider requesting facilities for the welfare of crews deployed at protracted incidents

Hazard - Inaccurate situational awareness: Release or spill of a hazardous material

Hazard Knowledge

Hazardous materials may be encountered in one of two states:

- Controlled
- Uncontrolled

Fire and rescue services are usually only called to the uncontrolled release or spill of hazardous materials. Uncontrolled hazardous materials have a greater risk of affecting people, animals, infrastructure and the environment. The deliberate controlled release or spill of hazardous materials may be classified as a CBRN(e) incident where the intent is malicious or murderous.

Hazardous materials containers are controlled by legislation to ensure that their construction is appropriate and the materials that they are made from are compatible with their contents. Similar controls exist for materials held in process and static storage as well as items that contain hazardous materials such as batteries. The presence of these containers is a key mechanism to recognise that hazardous materials may be involved at incidents.

The way in which hazardous materials, their containers and any secondary containment interact at an incident can significantly increase the scale and level of harm. It is important that responders understand these interactions so that events can be accurately predicted, and risk controls implemented.

Hazard areas will vary in size depending on the:

- Hazardous materials involved
- Form of the hazardous material (gas, vapour, liquid, solid)
- Concentration
- Whether a leak is continuous or not
- Potential for fire or explosion
- Reaction between release and surroundings
- Pathways, for example, drains
- Vapour clouds that may enter drains

To ensure a safe and effective response to incidents involving hazardous materials, responders should be able to identify or predict the potential impact to provide the best outcomes for people,

infrastructure and the environment.

Factors that affect the impact of the incident in addition to the intrinsic properties of the substance and the effects from the container, are those relating to the location or context of the incident. For example, a significant vapour release in a rural location will have very different implications than the same release in a built-up area.

A release of hazardous materials will only lead to harm if the material affects a receptor. The 'Source – Pathway – Receptor' concept is discussed widely when considering environmental protection (See the Environmental Protection Handbook for the Fire and Rescue Service). However, when considering a hazardous materials incident, the receptor could be responders, people in the local vicinity, the local community, animals or infrastructure as well as the environment.

The impact of a release will also be affected by its size and the direction and way it spreads. It may also be affected by environmental factors, such as the pH of the receiving waterbody or soil. Many factors will affect this spread and a good understanding of these factors is necessary to ensure responders identify the full effects of any incident.

Control measure - Specialist advice: Hazardous materials

Control measure knowledge

To ensure a hazardous materials incident is managed safely, the fire and rescue service will need to ensure that specialist advice is available to support the incident commander and operational crews. The amount, quantity and quality of information will be directed by the nature of the incident and it is crucial that the on-scene commander or fire control room can access the most current information possible.

Specialist hazardous materials advice may be required to:

- Identify the release or spill
- Identify the hazards posed by the release
- Identify or predict physical or chemical reactions
- Assist with the selection of the most appropriate personal protective equipment (PPE)
- Assist with decontamination of people and equipment
- Mitigate further damage to the environment
- Ensure response plans and tactics are appropriate and safe
- Advise on the treatment of people who have been exposed
- Assess wider public safety concerns
- Assist with investigations and debriefings

There is significant capability for both on-site and remote scientific and specialist support for hazardous material incidents, particularly CBRN(e) incidents. Specialist advice may be provided by many sources and there is the possibility of duplicated, confused or even contradictory advice being provided to the incident. There may also be confusion between the scientific advice and responders in terms of language and technical knowledge.

There are a number of fire and rescue service specific resources.

National Resilience Assurance Team

A national cadre of advisers from the fire and rescue National Resilience Assurance Team (NRAT) and National Strategic Advisory Team (NSAT), who provide tactical National Resilience capability advice to the fire and rescue service tactical and strategic commanders. These advisers are also able to provide communication conduits to the National Resilience Fire Control (NRFC) or Home Office Operations Centre where required.

For further information see the National coordination and advisory framework for the fire service in England (NCAF)

Tactical commanders with specific CBRN(e) training

CBRN(e) tactical commanders understand the structures which support the tactical function of the delivery of scientific and operational support to the incident and can assist the on-scene commander in creating, implementing and reviewing an appropriate tactical plan in line with the strategy and parameters determined by strategic command and with due regard for partner agency needs.

CBRN(e) tactical advisers

Tactical advisers have been identified within individual fire and rescue services to provide detailed tactical and capability relevant advice to on-scene incident, operations and sector commanders.

Hazardous materials advisers (HMA)

These officers provide specialist advice to the on-scene commander and where appropriate, tactical and strategic co-ordinating groups. They will liaise with other specialist advisers and emergency services to provide information on:

- The extent of the hazard zones
- Personal protective equipment (PPE) selection and decontamination procedures
- Safe systems of work for those within the ‘hot zone’
- The potential for escalation of the incident
- Interpretation of any information from other experts

Where available, the hazardous materials specialist may be supported by a:

- Detection, identification and monitoring (DIM) adviser
- CBRN(e) tactical adviser

- Multi-agency Scene Assessment Team (MASAT)

Police staff with an enhanced level of skill, knowledge and understanding

These include:

- Police CBRN(e) tactical advisers
- Police duty officers at the National CBRN Centre (N CBRN C) Operations Room
- Government Decontamination Service (GDS)

The UK Government Decontamination Service (GDS), is part of the Department for Environment, Food and Rural Affairs (Defra). GDS helps the UK prepare for recovery following a deliberate act involving chemical, biological, radiological and nuclear (CBRN) materials, or an accidental release of hazardous materials (HazMat), by providing a permanent on-call team for advice and guidance following a CBRN or major HazMat incident. Their role includes:

- Providing advice, guidance and assistance on decontamination to responsible authorities in their contingency planning for, and response to, CBRN and HazMat incidents
- Plan and arrange for decontamination operations to be available to the responsible authorities should the need arise
- Responsibility for maintaining and building the GDS framework of specialist providers and ensuring that responsible authorities have access to them
- Advising central government on the national capability for the decontamination of buildings, infrastructure, transport and open environment

Other specialist service personnel and organisations

- Ambulance services have specialist officers, such as:
    - Hazardous Area Response Team (HART)
    - Medical Emergency Response Incident Team (MERIT)
    - Specialist Operational Response Teams (SORT) etc. who can provide advice on clinical care and decontamination of casualties
- Other specialists or service providers with specific knowledge of CBRN or hazardous materials, for example: scientific advisers, radiation protection advisers etc.
- Other agencies including Environment Agency, Public Health agencies (PHE) etc.
- Non-fire and rescue service personnel with specific knowledge of hazardous materials or individual products/processes, such as scientific advisers or company chemists
- The National Chemical Emergency Centre (NCEC) that provides 24-hour assistance through the CHEMSAFE scheme
- Government agencies, for example:
    - The Met Office
    - Atomic Weapons Establishment (AWE)
    - Defence Science and Technology Laboratory (DSTL)
    - Environmental agencies
    - Public health agencies
- Industry response schemes such as Radsafe or Chlor-Aid

Incident commanders will also be able to access information sources, both printed and in electronic format. Printed information sources include:

- The Dangerous Goods Emergency Action Code List (EAC)
- The Emergency Response Guidebook (ERG)
- Safety Data Sheets (SDS) also referred to as Material Safety Data Sheets (MSDS) and Chemical Safety Data Sheets (CSDS)
- Transportation instructions in writing (IIW)

Electronic information sources include: The Met Office Hazard Manager application, CHEMDATA, Wireless Information System for Emergency Responders (WISER), the ERG application, etc.

All fire and rescue services have access to specialist advice both from their own resources and from external sources, including scientific advisers and public health agencies. These are good sources of specialist knowledge but are not always available immediately on the incident ground.

Strategic actions

Fire and rescue services should:

- Have arrangements to access risk critical information from remote specialists quickly during incidents, for example, Chemdata via vehicle mounted mobile data terminals (MDT)

- Ensure specialist personnel with enhanced skills, knowledge and understanding in hazardous materials operations are available to perform the key role of hazardous materials adviser (HMA)

- Ensure personnel understand the purpose of the hazardous materials adviser role

- Ensure that key dangerous substance information sources are immediately available, reliable and resilient

- Have policies and procedures that identify levels of specialist advice and how this advice can quickly be made available to the incident commander

- Have arrangements to access risk critical information from remote specialists quickly during incidents

- Provide access to enhanced skills, knowledge and understanding in CBRN(e) operations to perform the key advisory roles at incidents

Tactical actions

Incident commanders should:

- Consider requesting the attendance of tactical advisers or subject matter experts
- Consider requesting the attendance of hazardous materials adviser (HMA)

Control measure - Substance identification

Control measure knowledge

The information provided through legislation on hazardous materials containers is a key factor in identifying hazards to responders and the public. Other sources of information should also be considered and their value not overlooked in determining a complete picture of the incident. There are also times when marking, placarding and signs are not present, or are incorrect, damaged or obscured. Examples include during a fire, or where hazardous materials are badly controlled or used illicitly.

In addition to marking and signage, other legislative requirements for the use of substances require sites to keep records of substances held, their hazards and control measures. These requirements mean that sites should have access to Safety Data Sheets (SDS) or Control of Substances Hazardous to Health (COSHH) sheets. This information can provide information about the hazards, health effects, behaviours and control measures. Similar information can be obtained from written and/or electronic data sources such as Chemdata or the Emergency Response Guidebook.

Other sources of information that can assist may be obtained from scientific advisers such as the National Chemical Emergency Centre (NCEC) or other company or product specialists and industry mutual aid schemes, for example Bromaid. This may provide information on a substance, process or premises, or may provide assistance in interpreting information gained.

Signs, labels and other marking system

It is important for responders to recognise signs, labels and other marking systems so that they can gain information regarding the hazards associated with substance safety. These will generally be found on modes of transport or fixed sites.

Transport

The legal framework for the international transport of hazardous materials is set out in the United Nations (UN) model regulations ('Recommendations on the transport of dangerous goods', commonly known as the 'orange book'). These rules are revised every two years and form the basis of the internationally and nationally recognised legislation.

The recommendations are adopted in Europe and consequently in the UK, as ADR (Accord européen relatif au transport international des marchandises Dangereuses par Route) for road transport and RID (Reglement International concernant le transport de marchandises Dangereuses par chemin de fer) for rail transport. Additionally, the UK maintains some deviations from ADR, for example, Hazchem placards. As both marking systems are permitted in the UK it is important for responders to be familiar with both.

The International Maritime Dangerous Goods (IMDG) code contains internationally agreed guidance on the safe transport of dangerous goods by sea, and most commonly relates to the carriage of dangerous goods in freight containers and tank containers. It is primarily used by shipping operators, but it is also relevant to those transporting dangerous goods on journeys involving a sea crossing.

Fixed sites

For static sites, warning signage is governed by the dangerous substances Notification and Marking of Sites) (NAMOS) Regulations. The aim of these regulations is to ensure that firefighters arriving at an incident are warned of the presence of hazardous materials. It is a legal requirement to notify the fire and rescue service about any site with a total quantity of 25 tonnes or more (150 tonnes for ammonium nitrate fertilisers). There is a requirement to place warning signs at access points.

See the Health and Safety Executive website for further details. Dangerous Substances (Notification and Marking of Sites) Regulations (NAMOS)

Labelling of hazardous materials for general use is governed by the Classification, Labelling and Packaging regulations (CLP). These regulations adopt the UN Globally Harmonised System (GHS) on the classification and labelling of chemicals across all European Union countries, including the UK.

Equivalent legislation in Northern Ireland is The Dangerous Substances (Notification and Marking of Sites) Regulations (Northern Ireland).

Under the Control of Asbestos Regulations (CAR), there are specific labelling requirements for asbestos in non-domestic buildings. Responders should recognise these labels.

Containment systems

Hazardous materials containers range in size from small vials and jars used in laboratories through larger packages and transport containers holding many tonnes to site storage tanks and vessels that can hold many thousands of tonnes.

It is important that during incidents, responders can:

- Recognise typical container shapes or types that would indicate the presence of hazardous materials whether in storage, in use or in transit

- Identify the basic design and construction features, including closures for storage, packaging and transportation systems

For further information on substance identification see National Operational Guidance: Health Hazards and National Operational Guidance: Physical Hazards

Strategic actions

Fire and rescue services should:

- Consider developing systems to gather pre-planning information on local risks and incident specific information

- Ensure responding personnel have the necessary instruction and training in the identification of hazardous materials containers

- Provide access to appropriate detection, identification and monitoring (DIM) equipment

- Ensure that Information on the recognition of hazardous materials is immediately available to personnel

- Ensure that responders can recognise signs, labels and other markings on hazardous materials packages

Tactical actions

Incident commanders should:

- Use signs, labels, markings, container types and detection equipment to identify substance
- Identify if containers indicating the presence of general or specific hazardous materials are involved
- Use available fire service or on-site detection equipment to identify the substance involved

Control measure - Identify substance: National resilience

Control measure knowledge

The DIM adviser will make arrangements for the required sampling and analysis to be carried out, using the appropriate techniques and equipment. The nature and process of these tasks will depend on:

- The type of substance, if known
- Any intelligence about the incident
- The equipment that is provided for the DIM capability

The procedures for sampling and analysis of substances have been produced for:

- Solids, powders, pastes, gels and non-volatile liquids
- Vapours and gases, including volatile liquids
- Radiological materials
- Biological agents

These are detailed in the National Resilience (NR) DIM procedures.

The DIM adviser and DIM support team will conduct a continuous risk assessment process throughout their deployment in the hazard area. Any deviations to the operational plan should be recorded as soon as practicable after exiting the hazard area.

The DIM adviser will operate all DIM equipment as detailed in the NR Equipment information. The DIM support team may be required to carry out monitoring and/or carry equipment as required by the DIM adviser.

Substances should not normally be removed from the hazard area, but if it is essential that samples are moved to another location, this should be recorded.

If further deployments into the hazardous area are required, they should be subject to a risk assessment carried out by the DIM adviser. Such deployments should take into account the findings of the initial analysis, the physical working conditions and the availability of suitable personal protective equipment (PPE).

The task of the DIM adviser is to identify or verify the identity of the substance where possible. The DIM adviser should not be pressured to produce the identification results.

If the DIM adviser is able to identify the substance, this information should be passed as soon as

possible to the fire and rescue service's incident commander and the police on-scene commander. However, if it is not possible to identify the substance, its classification (acid, alkali, physical properties) should be determined.

Following this, the information should be passed to the medical responders to assist them in determining the appropriate clinical treatment. When liaising with other agencies, the DIM adviser should state the limitations of any equipment that has been used, where that may impact on the accuracy of analysis results.

If sampling and analysis indicates that the cause of the incident could be a CBRN(e) event, it will lead to a multi-agency response as detailed in the JESIP publication, Responding to a CBRN(e) event: Joint operating principles for the emergency services.

If a CBRN(e) event is declared by the police, the National Resilience Fire Control (NRFC) should be notified about its location and what NR DIM assets have already been deployed.

Strategic actions

National Resilience should:

- Ensure that information about DIM equipment and its application is kept up to date
- Ensure that any equipment with expiry dates is replenished when required

Fire and rescue services should:

- Ensure that equipment is calibrated and tested according to the manufacturers' guidelines

Tactical actions

Specialist responders should:

- Wear the appropriate personal protective equipment (PPE) as recorded in the deployment plan
- Ensure that equipment deployed is functioning correctly
- Understand the limitations of the equipment and communicate this to the requesting fire and rescue service and other agencies
- Notify the police on-scene commander if sampling and analysis indicates that the cause of

the incident could be a CBRN(e) event

- Ensure that the NRFC is notified about a declared CBRN(e) event, its location and what National Resilience DIM assets have already been deployed

Control measure - Identify cause of release or spill

Control measure knowledge

If the correct container has been used and it is intact, the substance is in a controlled state and no risk is posed to people, animals, infrastructure or the environment. Incidents involving hazardous materials are fundamentally driven by containment failure and the way in which failure occurs. This leads to the hazardous materials becoming uncontrolled and introduces risk.

Containment failure can only occur following a stressor being applied to the container. There are a limited number of stressors that can affect containment:

- Thermal
- Chemical/biochemical/photochemical
- Mechanical
- Human or animal

Once containment failure has become inevitable, the way containment fails can also have significant effect on the outcome and scale of the incident. There are a limited number of ways in which a container can breach; these will lead to a specific type of release that will affect the scale and level of risk.

Type of Breach	Potential Release
Catastrophic failure	Full release
Runaway cracking	Violent rupture
Attachments opening up	Rapid release

Punctures	Leak
Splits or tears	Spill

Strategic actions

Fire and rescue services should:

- Ensure personnel who respond to hazardous materials incidents receive specific information, instruction and training on the causes, mechanisms and impact of containment failure

Tactical actions

Incident commanders should:

- Assess the construction, condition and stressors acting on the ineffective containment systems
- Consider the type of stressors involved and the ability of the container to tolerate the stresses on it

Control measure - Estimate quantity of release or spill

Control measure knowledge

At any hazardous materials incident, the level of risk, scale and impact will be affected by the amount of material that is released or spilled in an uncontrolled state.

The actions and tactics adopted should be based on the scale and likely impact of the incident, which will be influenced by the quantity. It is important that responders can rapidly and accurately estimate or determine the quantity of hazardous materials involved.

The size of container involved is a key piece of information in determining the quantity, but responders should also assess the quantity that is uncontrolled, such as the size of the spill, not just the size of container. Material remaining in the container will pose less of a risk in most cases.

Strategic actions

Fire and rescue services should:

- Provide staff with equipment and the necessary skills to quickly and safely estimate the quantity involved

Tactical actions

Incident commanders should:

- Use incident indicators and container volume to estimate the quantity of material involved

Control measure - Assess impact of release or spill

Control measure knowledge

Once the spread and scale of the incident has been determined, it is important to identify who and what is at risk in that area. Hazardous materials can have an adverse effect on:

- People (including emergency responders)
- Animals
- Infrastructure
- Environment

Assessing the likelihood of harm to groups or locations in each of these three areas will develop a risk profile for the incident and enable tactical decisions to be taken based on priorities.
The risk of harm to people will be based on either the potential for release of energy or the intrinsic harmful properties of the substance if individuals are exposed. Responders will need to assess whether people can shelter-in-place as an alternative to evacuation. The assessment should consider:

- Health risks posed by the hazardous materials
- Size of the affected area
- Construction of buildings
- Time of day
- The number, condition and age of occupants
- Weather conditions
- Potential duration of release

- Availability of safe and suitable accommodation
- Availability of responders
- Numbers of personnel and other agencies required to carry out the evacuation
- Risk to responders carrying out the evacuation
- Communicating the evacuation (for example, fixed alarm system, responders with megaphones, door knocking, avoiding panic, radio and TV announcements)
- Safe holding area required for members of the public being evacuated

Risk to infrastructure is mainly concerned with the potential for hazardous materials to degrade, corrode, contaminate or damage the urban environment. For example, they may cause damage to roadways, buildings or other structures. Often the potential for these adverse effects to occur will be based on contact time of the substance and therefore, whilst a lower priority than saving life, early intervention can often prevent major disruption to the community.

Strategic actions

Fire and rescue services should:

- Ensure personnel that respond to hazardous materials incidents are provided with knowledge, skills and understanding to determine the effects of the incident on the environment and local community

Tactical actions

Incident commanders should:

- Assess the impact of hazardous materials on people, animals, infrastructure and the environment

- Consider a shelter-in-place strategy based on the number of people already exposed or potentially at risk

Control measure - Hazardous materials assessment

Control measure knowledge

Given the potential complexity of hazardous materials incidents, it is important to develop a clear and risk assessed response plan. This will ensure important factors are not overlooked and will

help prioritise actions and tactics. Setting objectives is key to this process. Where more than one service or organisation is at the scene, this should be done on a multi-agency basis by establishing a joint understanding of risk (JUR).
Hazardous materials incidents should follow the same dynamic risk assessment (DRA) or analytical risk assessment (ARA) as any other emergency. However, at hazardous materials incidents a specific assessment of the substances and their hazards will need to be carried out to inform the incident risk assessment.
Incident risk assessment considers information from:

- Site-specific premises risk information
- Operational guidance, including those for hazard specific incidents, for example radiation, asbestos and acetylene cylinders.
- Observation of incident circumstances
- Eye witnesses at the time of the incident

The selected safe systems of work (SSoW) should be implemented, developed, maintained and reviewed throughout the life of any incident. There are several risk assessment methods that can be used in the initial and subsequent incident phases.
The process of risk assessment at hazardous materials incidents falls into three distinct phases:

- Initial attendance and risk assessment of time-critical actions
- Secondary actions to stabilise the incident
- Hazardous materials assessment

The hazardous materials assessment process requires personnel who have received specific training on the subject. Responders should be skilled in interpreting the information collected and how it can be applied to create a risk-assessed tactical plan. This should always be based on a dynamic risk assessment.
At larger or more complex incidents the volume and detail of applicable hazardous materials information is likely to be greater. The capacity of personnel to assimilate information will vary in proportion to the nature and size of the incident and the stage the operational response has reached. The ability to scale up the crucial process of hazardous materials assessment may require additional support to ensure the required tasks are completed in a precise, detailed and timely manner.

Strategic actions

Fire and rescue services should:

- Ensure personnel who respond to hazardous materials incidents receive specific information, instruction and training on conducting an initial hazardous materials assessment

- Ensure hazardous materials advisers receive specific information, instruction and training on the conducting a comprehensive hazardous materials assessment

- Consider using consistent systems and formats to record information from all hazardous

materials incidents

- Provide mechanisms to enable the rapid assessment and interpretation of information retrieved from the scene

- Ensure personnel can interpret hazard data systems at scene to enable a suitable and sufficient risk assessment to be completed

- Ensure that any information gathered is treated as confidential unless disclosure is required for legal reasons

Tactical actions

Incident commanders should:

- Use specialist advisers to carry out hazard specific assessments and interpret information and advice

- Make a record of the hazardous materials assessment and incorporate into analytical risk assessment

Control measure - Effective communication: Hazardous materials

Control measure knowledge

Effective communication is a prerequisite for good incident ground command and control, but it is especially important at hazardous materials incidents. Specific actions and tactics need to be considered as an increased amount of information needs to be gathered and analysed, and unique communications issues may be caused by wearing bulky personal protective equipment (PPE) ensembles.
Equipment for use in places in which explosive atmospheres may occur must be selected based on the requirements set out in the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations (EPS) unless the risk assessment finds otherwise.
For further information see Fireground Radios Guidance

Strategic actions

Fire and rescue services should:

- Have access to communications systems that are suitable for use at hazardous materials incidents such as ATEX approved radio equipment
- Provide specific information, instruction and training on hazardous material communication systems
- Provide additional information, instruction and training to personnel who deal with hazardous material incidents on the briefing of personnel who operate in the hazard area

Tactical actions

Incident commanders should:

- Use waterproof chemical/substance information boards to retrieve information from the scene
- Use ATEX approved communications equipment when crews enter any potentially flammable or explosive atmosphere

Hazard - Release or spill of hazardous material

Hazard Knowledge

There is usually more than one way to resolve a hazardous materials incident:

- Do nothing – Consider this option if the risks to responders are high. Ask the questions: is it an emergency? Is it the responsibility of the fire and rescue service? Should the responsible person, owner, consigner, organisation or authority employ a specialist contractor?
- Defensive containment – Can the incident be resolved without committing personnel to the

hazard area?
- Offensive action – Proactive control and/or containment

For specific details on resolving incidents involving physical, health and environmental hazards see the relevant National Operational Guidance documents.

Control measure - Safe and controlled approach: Hazardous materials

Control measure knowledge

All responding vehicles should, where possible, approach cautiously and at a slow speed from an upwind, upslope location. Initial responders should be able to anticipate the type, size and potential scope of the hazardous material incident from the initial mobilising instructions. Approaching responders should be aware of potential contamination issues when approaching a hazardous materials incident. The proactive use of information systems, specialist advice, pre-planning arrangements and incident visual indicators will add value to the response and ensure a safe approach can be determined.

Examples of incident visual indicators include:

- Visible smoke and other signs of fire
- Gas and vapour clouds or plumes, unexplained vapour or mist clouds
- Liquid spills, wet areas, patches, puddles, pools and streams or flowing liquids which may indicate the affected area
- Unexplained oily droplets or films on surfaces or water
- Unexplained noise (for example explosions, venting cylinders, site-specific audible warnings), which may indicate a more cautious approach and larger hazard area
- The presence of hazardous materials or equipment not relevant to the occupancy
- Distinct odours (for example bleach, garlic, rotten cabbage, rotten eggs). Being able to smell an unusual or unexplained odour usually indicates being in, or close to, the hot zone. Unexplained smells or tastes that are out of character with the surroundings
- Cryogenic effect of escaping product (for example frosting around defective pipes or a damaged area on a LPG container)
- Damaged containers and packages
- Dead or distressed people
- Individuals showing unexplained signs of skin, eye or airway irritation, nausea, vomiting, twitching, sweating, pinpoint pupils (miosis), runny nose (rhinorrhoea), disorientation, breathing difficulties, convulsions and death
- Biological indicators, such as dead birds, animals, fish, insects, trees and withered plant life or

vegetation
- Casualties and other people involved in the incident may physically mark the hazard area or they may be able to describe it based on their experience

It is possible that initial responders could inadvertently drive into or through a contaminated area en route to the scene of the incident. The above factors should be considered when arriving at the incident and initially positioning vehicles. This will:

- Enable visual assessment of the scene (such as plumes, liquid spills)
- Reduce the probability of driving into a hazardous area
- Avoid collisions with casualties, people escaping the release and other members of the public who may be attracted to the incident

The acronym DDOOR highlights the key factors to consider about the potential dispersion plume. It stands for 'downwind, dilution, obstacle, oscillation and retention'. It highlights key factors to remember when dealing with a hazardous release in the urban environment, particularly the effect that the built environment and the wind can have on a dispersion plume.

- Downwind – the largest part of the plume moves downwind, and may become wider and higher
- Dilution – the gas or vapour dilutes as it mixes with the air around it; the concentrations decrease downwind and at the sides and top of the plume
- Obstacles – the plume's movement is strongly influenced by obstacles such as buildings and other structures. Some parts of the plume go up and over the building, while others zigzag along the streets in the downwind direction. The plume may quickly fill street 'canyons'. Some parts of the plume may spread upwind.
- Oscillation – the plume will oscillate; its position and course will not remain constant but vary over time. It will follow different routes downwind, often in response to minor changes in environmental factors.
- Retention – some parts of the plume can be retained, and gradually released later, even after the source has been dealt with

CBRN(e)

Many possible scenarios could lead to an incident being identified as a suspected or confirmed CBRN(e) event. During the approach to a CBRN(e) incident, responders may face three distinct elements of this hazard:

- Airborne contamination
- Secondary devices
- Presence of perpetrators or other terrorists

Where there is any doubt as to whether the incident is deliberate, it should be treated as if it were a crime scene and, as far as possible, all responders should conduct their tasks with a view to protect the scene and record any evidence that may be present.

Strategic actions

Fire and rescue services should:

- Ensure an effective means of communicating key information to mobilised resources from fire control rooms and all other agencies
- Ensure responders have access to compass aided mapping systems
- Where available, ensure incident commanders receive specific information and instruction on approaching hazardous materials incidents

Tactical actions

Incident commanders should:

- Approach hazardous material incidents at slow speed from upwind and higher-level ground where possible
- Adopt a cautious approach to situational awareness where there are no immediate threats to life
- Consider the potential for secondary devices and share any intelligence with other responder agencies
- When approaching the incident use visual and other incident indicators to inform situational awareness

Control measure - Highlight avoidance routes

Control measure knowledge

Before briefing personnel, incident commanders should consider all available sources of information. Team briefings should be based on incident needs and a plan should be constructed

to achieve them. Continuous evaluation and review throughout the incident will determine whether the current objectives and subsequent plan are appropriate.

Consider the following sources of information throughout the incident:

- Building and site plans
- Premises information boxes (PIB)
- Responsible Person (or appointed competent person)
- Observation
- External scene surveys of the building and area
- Reconnaissance of the location reported to be involved
- Information from personnel operating in the building and/or risk area
- Witnesses
- Occupiers
- Other agencies

Strategic actions

Fire and rescue services should:

- Ensure that all personnel are aware of the risk and correct procedures for avoidance routes

Tactical actions

Incident commanders should:

- Identify sub-surface voids and highlight avoidance routes at building collapse incidents
- Establish clear routes to the scene of operations and confirm them to all personnel
- Identify any utilities not isolated and communicate to all personnel
- Identify and communicate routes avoiding unsuitable and hazardous areas
- Identify clear avoidance routes to the scene of operations and confirm them to all personnel

Control measure - Cordon controls: Hazardous materials

Control measure knowledge

Initial cordon

An initial inner cordon should be temporarily established by the first emergency responders before any detailed scene assessment has been conducted. It provides a means of controlling, safeguarding and co-ordinating the immediate response and adds an element of control to the incident. It must be flexible so that it can be expanded or reduced if necessary.

The initial cordon is an immediate precautionary measure and must be formed in a position of safety. Unprotected responders must never be deliberately deployed to a position where contamination or exposure is suspected. However, it should be considered as enclosing a potential hazard area rather than an exclusion zone. Only responders who have been briefed and equipped to deal with the hazards should be allowed to operate inside it.

Where the hazardous materials involved are toxic by inhalation, it may be necessary to extend the initial cordon in the downwind direction to protect people from vapours, gases or dusts. The initial cordon should enclose the area in which people may become incapacitated and unable to take protective action and may incur serious or irreversible acute health effects.

Beyond this area there may still be risk to the public. However, any contamination or exposure is likely to be low level where the public could take their own protective actions such as evacuation or shelter. Public health agencies have responsibility for public safety in the extended downwind area. Areas where non-acute or possibly longer-term health risks may be present should be designated and dealt with by the public health agencies. The initial cordon must be communicated to all first responders, especially oncoming response vehicles.
See Control Measure – Downwind protection zones

Hot zone

This is a contaminated area where the initial release occurs or disperses. It will be the area likely to pose an immediate threat to the health and safety of everybody in it and is the area of greatest risk. It is located inside the inner cordon and is part of the hazard area.

Effective personal protective equipment (PPE) is required when working in the hot zone. Emergency services may have differing specifications for PPE and will decide on the appropriateness of their own equipment. The effectiveness of each type of PPE for the hot zone depends on the type and concentration of the contaminant. Any decisions made should be based on a hazardous materials assessment.

There may be more than one area of release. Material may be spread or channelled, leading to more than one hot zone. Where possible all hot zones should be inside a single inner cordon. Where this is not possible for reasons of scale, location, topography etc., establishing two or more inner cordons should be considered. This may mean treating the cordoned areas as separate incidents with distinct command structures. This is more likely to happen at deliberate CBRN(e) attacks rather than an accidental hazardous materials release or spill.

Warm zone

This is the area uncontaminated by the initial release of a substance. It may become contaminated by the movement of people or vehicles. It is surrounded by the inner cordon and is part of the hazard area but usually contains lower risks than the hot zone.
In the initial stages of an incident, the movement of contamination from the hot zone to the warm zone will be uncontrolled. As soon as practicable, the warm zone needs to be managed and controlled by emergency responders wearing appropriate PPE. The warm zone will later be extended to include the managed area encompassing decontamination. This extended section of the warm zone is called the decontamination area.

At small scale, low risk, low complexity hazardous materials incidents, warm zones may not exist. Responders should not designate them if there is no benefit from doing so.

Cold zone

This is the uncontaminated area between the inner and outer cordon. Key operational command positions and other essential activities will be set up in this area. Police services, in liaison with fire and rescue services and ambulance services, should decide whether members of the public need to be evacuated from the cold zone.

Release of gases, vapours or dusts (Toxic Inhalation Hazard)

Incident commanders should consider the following generic initial cordon distances as a basis for further risk assessment based on the operational circumstances:

Generic initial cordon distance guidance Note: continuous risk assessment should be carried out to ensure that the cordon remains appropriate and proportionate to the risks identified by the incident commander	
Incident type	Initial cordon distance (metres radius)
Explosives - manufacture, storage, transport (NB pre-planning for known sites should include rendezvous points (RVPs) at safe distances)	100m for transport incident HD 1.4 200m for transport incident HD 1.3 600m for transport incident HD 1.1, HD 1.2 and HD 1.5 (or when HD is not known) 100m for registered premises (fireworks only) 200m for incidents at other registered premises 600m for incidents involving licensed storage (under 2000kg) 1000m for incidents involving licensed storage (more than 2000kg)

Explosives -CBRN(E), terrorist (*Consider no fire and rescue service attendance or treat as 'exclusion' distances for fire and rescue service personnel, take guidance from police and explosive ordnance disposal (EOD))	100m for an activated device Unexploded devices:* 100m for a suitcase-sized device 200m for a car-sized device 400m for a lorry (or when size of device is not known)
Cylinders involved in fire (N.B. shielding may reduce distances)	Fireball up to 25m Cylinder may be thrown up to 150m Flying fragments up to 200m
Chemicals being transported	25m for solids 50m for liquids 100m for gases, vapours, particulates
Radiation	Outside buildings: 50m - unshielded or damaged potentially dangerous source 100m - major spill from a potentially dangerous source 300m - fire, explosion or fumes involving a potentially dangerous source 400m or more to protect against an explosion - suspected bomb (exploded or unexploded) Inside buildings: Affected and adjacent areas (including the floor above and below) - damage, loss of shielding or spill of a potentially dangerous source Entire building and outside distances detailed above - fire or other event that can spread a potentially dangerous source materials throughout the building (for example through the ventilation system)

Emergency action codes

The Dangerous Goods Emergency Action Code List (EAC) gives the following information on public safety hazards. An ‘E’ following the first two characters of an EAC indicates that there may be a public safety hazard outside the immediate area of the incident, and that the following actions should be considered by first responders:

- People should be told to stay indoors, with all doors and windows closed, preferably in upstairs rooms facing away from the incident. They should eliminate all ignition sources and

stop any ventilation
- Effects may spread beyond the immediate vicinity. All non-essential personnel should be instructed to move at least 250m away from the incident
- Police and fire and rescue service incident commanders should consult with each other and with a product expert or a source of product expertise
- The possible need for subsequent public evacuation should be considered, but it should be remembered that in most cases it will be safer to shelter-in-place than to evacuate

Further information and guidance on setting cordons for specific substances and types of hazardous materials can be found in the Emergency Response Guidebook (ERG). Setting cordon distances is not a specific science. As soon as reasonably practicable, incident commanders should consult a hazardous materials adviser (HMA), who will have a better understanding of applying the guidance.

Fire further information see The Dangerous Goods Emergency Action Code List (EAC)

Strategic actions

Fire and rescue services should:

- Ensure personnel have the skills, knowledge and understanding to implement an appropriate initial cordon at hazardous materials incidents

Tactical actions

Incident commanders should:

- Consult specialist advisers to assist with modelling potential hazard areas

- Ensure that appropriate exclusion zones, inner and outer cordons are established and communicated at hazardous materials incidents

Control measure - Downwind protection zones

Control measure knowledge

Apart from immediate life rescues, hazardous materials incidents possess the ability to affect members of the public not initially involved in the original accident or release. The fact that hazardous materials can move from the scene of origin means there is a potential for members of the public to become exposed to harm sometime after the start of the incident. Fire and rescue services have a responsibility to limit, or prevent further, involvement of the public and actions should be undertaken with this in mind.

There are different ways to determine the effect of a hazardous material over distance. The likelihood is that any solid or liquid will only affect the immediate area unless it is able to access drainage systems or can act in a similar nature to a gas (for example, volatile liquids or powdered solids that can be carried on the wind). It is therefore recognised that the greatest risk is from gases, vapours, aerosols and particulates.

After gathering all available information, it is important to measure or model the potential or actual release zone. This can be done in two ways:

- Direct measurement or observation
- Application of a model

A model is a predicting tool based on data collated prior to the incident which will include a combination of the properties and quantity of the substance involved combined with environmental data such as wind speed and temperature. These models have been tested against experimental data to provide an estimation of hazard zones. There are several models available and they vary in their level of sophistication. The most appropriate model to use will depend on the level of information and time available to assess the hazard area.

Simple models such as the tables included in the Emergency Response Guidebook or Chemdata, require minimal information from the scene and can be applied very quickly. However, the tables consider worst case possible scenarios and therefore could lead to unnecessary disruption. Techniques can be used in conjunction with this information to refine the modelled hazard area to prevent excessive disruption.

The suggested initial cordon distances are based on these models and provide a very simplified initial stand-off distance to keep responders and the public safe.

More complex models are available such as the Aerial Locations of Hazardous Atmospheres (ALOHA) software, which can provide a more precise hazard area. However, the level of information needed to use such modelling software is greater and may not always be available.

For more information see: ALOHA software

To enable accurate modelling, weather effects are important and the Met Office also provides several tools that can be used in conjunction with modelling methods, available through the Hazard Manager tool on the Met Office website. They are:

- FireMet – This is a weather information system provided by the Met Office. It provides fire and rescue service responders with the latest weather information to help them identify a

safe approach when dealing with a major incident
- CHEMET – In an incident involving hazardous chemicals, local fire and rescue services and police services can contact the Met Office Environment Monitoring and Response Centre. For small-scale events, the Centre produces meteorological guidance and a plume prediction as a chemical meteorology report. For larger release events, such as the Buncefield oil depot fire, more sophisticated plume modelling techniques are used

Hazard manager is available to incident command units, mobilising controls and detection, identification and monitoring (DIM) units, as well as the National Co-ordination Centre

The Met Office has highly advanced models to identify hazard areas. These are designed for more long-term spread. For example, the Numerical Atmospheric-dispersion Modelling Environment (NAME) is an atmospheric pollution dispersal model that is a much more sophisticated tool than Chemet for pollution forecasting. It can:

- Simulate the effect of fires
- Forecast air quality up to 36/48 hours ahead
- Consider the chemical involved
- Show deposition, air concentration and height of the plume
- Predict long-standing air pollution problems such as acid rain
- Forecast international movement of pollutants

To apply a model effectively, several factors need to be identified and considered:

- Physical and chemical properties
- Quantity, concentration, release rate and surface area
- Weather and ambient conditions
- Fire or explosion risk
- Topography and site layout (for example slopes, spacing of tanks)
- Method of containment
- Whether the containment system will cope
- That mixtures of hazardous materials are dangerous
- Combinations of additional hazards

Several techniques and pieces of equipment are available to responders to monitor the presence and/or quantity of a range of hazardous materials that may be encountered at incidents. The equipment can be used to identify hazardous areas for both a responder and from a public safety perspective. Where such equipment is deployed, it is important that the user has a thorough understanding of its capabilities and limitations as well as how to operate it in a hazardous environment and how to interpret the information provided.

If applied correctly, these techniques will enable very precise determination of any potential hazard area. This has the advantage over modelling as any good model will include a suitable safety margin to take account of any unknown variables. This means that a model will always have a greater potential for some unnecessary disruption to the public.

Specialist advice from a hazardous materials adviser (HMA) may be required to interpret downwind

protection zones as they can be significantly affected by weather conditions. For example, it is clear that strong winds will cause the hazardous material to travel further from the incident than a light breeze. However, a strong wind will generally cause the material to dilute or disperse much quicker than a light breeze. Weather reporting systems can be used to great effect in predicting the impact of hazardous materials in downwind protection zones.

Modelling software may produce a chart like this:

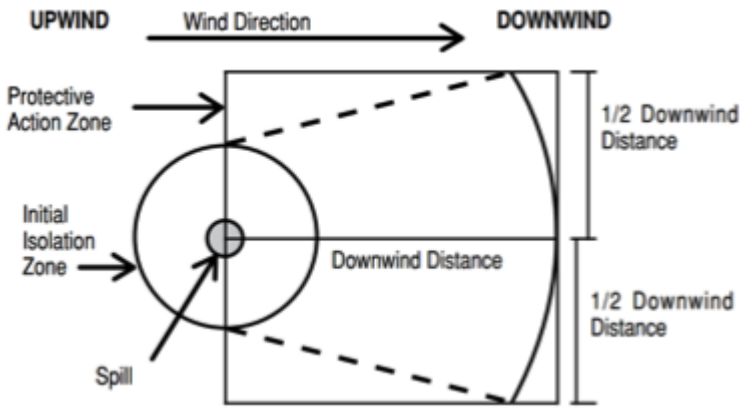

Figure 5: Example of protection zones modelling

Source: Emergency Response Guidebook (ERG)

The area of concern spreads out to form a cone. Members of the public inside this area are potentially at risk. The degree of risk should be assessed by the HMA.

It should be remembered that the two zones – the initial isolation zone and the downwind protection zone – imply two different types of area. An initial isolation zone is more likely to require an evacuation. The downwind protection zone suggests that the public in this area need only to be protected from the release and this may often be considered for a shelter-in-place strategy.

The responsibility for air quality monitoring falls outside of fire and rescue service personnel. The equipment is used by environmental agencies and the data interpreted by public health agencies. For further information see National Operational Guidance: Environmental Protection – Air quality cell function

Strategic actions

Fire and rescue services should:

- Make provision for weather reporting systems to inform downwind protection zones
- Provide specialist personnel and/or hazardous materials advisers (HMA) who understand the software and can interpret the information it provides

- Provide access for fire control room staff and responders to meteorological services and plume modelling such as the Hazard Manager tool provided by the Met Office

Tactical actions

Incident commanders should:

- Obtain advice from the hazardous materials adviser (HMA) on the size of any downwind protection zone
- Predict any likely protection zone based on specialist advice observation or modelling
- Consider the risks in the downwind protection zone, such as buildings with high-risk or high-dependency members of the public

Control measure - Containment: Hazardous Materials

Control measure knowledge

The principle of containment whenever practicable and safe to do so is the preferred approach to managing incidents where polluting hazardous materials or liquids have been released or generated by on-site activities, including firefighting.

This hierarchy should be used in most instances when containing contaminated run-off and spillages of polluting materials:

Hierarchy	Activity	Description
1	Containment at source	The most effective intervention point is where the source of pollution can be controlled to stop or reduce the volume released. Methods include the use of clay seal putty, leak sealing devices, wedges, and drums. Contaminated run-off will ideally be contained at an incident scene either inside the building or as close to it as possible.

Hierarchy	Activity	Description
2	Containment close to source	The next point of intervention is as close to the source as possible. This may be when it is not possible to contain at source or where there has already been significant loss of pollutant. Methods include the use of grab packs, booms and pop-up pools.
3	Containment on the surface	The most common way for contaminants to enter the environment is via drainage systems. Methods to prevent this include the use of booms, clay drain mats, pipe blockers, pumps, and inflatable dams.
4	Containment in drainage system	Pollutants may be contained in drainage systems if they have already entered the system. This can be carried out using in-built pollution control devices in the drainage systems such as oil separators, drain closure valves and containment lagoons/tanks and ponds. Such a system should allow predictable volumes of run-off to be stored, although allowance should be made for rainfall and how well systems have been maintained. Portable equipment such as pipe blockers can also be used.
5	Containment on or in watercourse	The deployment of booms on a watercourse downstream of an incident is of significant benefit where a pollutant floats. Damming can be used where pollutants are mixed or do not float but is normally restricted to small ditches and streams with low flows. Booms can also be deployed around drinking water intakes.

For further information see the Environmental Protection Handbook for the fire and rescue service.

Specific actions that may be taken to contain a release or spill at the source include:

- Remote isolation or valving down
- Site drainage/ventilation shutdown
- Retention, for example drain blocking
- Covering, for example, use salvage sheets or foam
- Damming
- Overpacking
- Patching
- Plugging
- Pressure isolation
- Solidification

- Vacuuming
- Water bottoming
- Decanting

Strategic actions

Fire and rescue services should:

- Develop procedures for containing leaked or released hazardous materials
- Provide access to specialised equipment to control and contain hazardous materials
- Develop partnerships with other agencies and the chemical industry to assist in containing and controlling hazardous materials that have released

Tactical actions

Incident commanders should:

- Attempt to contain the release or spill of a hazardous material using a Source – Pathway - Receptor model
- Identify the presence and effectiveness of secondary and tertiary containment (e.g. bund)

Control measure - Absorption: Hazardous materials

Control measure knowledge

Minor spillages can be contained using absorbent materials like pads, sheets and booms. Hazardous materials will retain their hazardous properties when absorbed and this must be considered when handling any absorbed material. Soil and sand all have absorbent qualities and can also be used to create improvised containment barriers or bunds. Using absorbent materials should be avoided for larger spillages because of the amount of waste that will be created and the cost of disposing it.

Strategic actions

Fire and rescue services should:

- Identify arrangements for the disposal of contaminated absorbents where the responsibility for waste disposal cannot be identified
- Consider the provision of absorbent material for use in response to minor spills of hazardous materials

Tactical actions

Incident commanders should:

- Consider the use of appropriate of absorbent materials for spills of hazardous materials and pollutants
- Consider absorbing spills with inert materials

Control measure - Dilution: Hazardous materials

Control measure knowledge

In certain situations, the best way to deal with domestic quantities of spillage may be to dilute it with a large amount of water. High levels of dilution should ensure that pollutants have little impact on the environment. It is important to consider the pollutant type and quantity, and how sensitive the receiving water is before doing this.

Approval should also be sought from environmental agencies and sewerage company before diluting a spillage unless there is an immediate life risk. In such circumstances, they must be informed as soon as is reasonably practicable. See Guideline notification criteria Appendix 4: DCLG Environmental Protection Handbook for the fire and rescue service.

Strategic actions

Fire and rescue services should:

- Have procedures for diluting hazardous materials at incidents, including access to specialist advice

Tactical actions

Incident commanders should:

- Consider dilution at incidents involving a release or spill of hazardous materials based on specialist advice

Control measure - Treatment: Hazardous materials

Control measure knowledge

Neutralisation is the term used for counteracting an acid against an alkali (or vice versa) to bring its pH value to pH7 (the centre of the pH scale). The term neutralise implies removing the risk from a chemical. For example, bleach may neutralise the risk from a biohazard, or water may neutralise the risk from an exothermic material.

To neutralise the risk posed by a material it is necessary to know what the initial hazard is and what decontamination additive could be used to counteract its effect. A fire and rescue service may encounter many common materials where an additive will neutralise the effect. In all cases, initial responders will need advice from a hazardous materials adviser (HMA) or scientific adviser.

Some additives may present risks of their own and may only be suitable for use on chemical protective clothing (CPC) and not on the skin. Therefore, the use of an additive will vary depending on who or what is being decontaminated

Strategic actions

Fire and rescue services should:

- Seek advice from hazardous materials advisers (HMA) and scientific advisers regarding known decontamination additives and consider making them available to be used against commonly encountered materials

- Determine the most appropriate way that additives can be brought to an incident and who is most qualified to use them

Tactical actions

Incident commanders should:

- Identify additives that may treat or neutralise chemical hazards in liaison with a hazardous materials adviser (HMA)

- Incorporate identified neutralising additives into the casualty's treatment or decontamination strategy

Control measure - Personal Protective Equipment (PPE): Hazardous Materials

Control measure knowledge

Fire and rescue services (FRS) should recognise that in line with the concept of the hierarchy of controls in risk management, personal protective equipment (PPE) forms the last line of defence for an individual working in a hazardous environment. Legislative requirements such as the Control of Asbestos Regulations require fire and rescue services to prevent or control the exposure of personnel and others to hazardous substances whilst at work. However, when fire and rescue service personnel attend hazardous materials, there may be few alternatives to using PPE as a risk control, particularly when saving life or preventing damage to the environment. It is therefore vitally important that fire and rescue services understand the advantages and limitations of available PPE ensembles. This can only be achieved by understanding the performance standards and level of protection afforded by PPE ensembles.

Several PPE ensembles are available to fire and rescue service responders. Rarely does one ensemble protect the wearer against all foreseeable hazards. Selecting hazardous materials PPE must be the result of a risk assessment carried out at the scene of operations.

In general, when pre-planning for hazardous materials incidents, PPE should be considered in three distinct areas:

- Respiratory protective equipment (RPE) – to prevent exposure to harmful substances through inhalation and ingestion
- Chemical protective clothing (CPC) – to prevent exposure through skin contact and penetration
- Protection against other foreseeable hazards, for example, fire, extreme heat or cold or projectiles

Structural firefighting PPE should be the common default position for fire and rescue personnel whilst en route and during the initial attendance. Subsequent actions determined by the incident commander, and subject to an appropriate risk assessment, may require crews to wear additional or alternative PPE. The PPE chosen by responders should be suitable and sufficient for the tasks that need to be carried out. There should be a basic analysis of what needs to be done and the hazards that are likely to be encountered.

To select the most appropriate PPE the incident commander will have decided the tasks to be carried out and the hazards that may be encountered. The choice of PPE should consider the joint understanding of risk (JUR) and information available from other responder agencies. They will then choose the ensemble that provides the greatest level of protection against the most dangerous foreseeable hazards. Seven basic factors will generally determine the level and type of protection required by responders:

- Fire – Is fire or a flammable atmosphere present? Most chemical protective clothing (CPC) should not be used in fire situations
- Toxicity – Primarily via inhalation, but also consider ingestion or skin exposure
- Corrosiveness – From weak or strong concentrations of acids or alkalis
- Oxidation – Where there is a reaction with organic materials, producing heat and oxygen
- Temperature – Where the substance is at an extreme of temperature, whether hot or cold
- Biohazards – From pathogens and open cultures
- Radiation (ionising) – Whether involving an unsealed source or not

To determine the level of PPE required at the initial response phase of an incident involving hazardous materials in a transport scenario, reference may be made to the Dangerous Goods Emergency Action Code List (EACs), also known as Hazchem codes. These codes give the emergency services an indication of the actions that may be necessary during the first few minutes of an incident involving dangerous goods should the incident commander consider it necessary to take immediate action.

Additional personal protection (APP) codes give emergency responders more information on appropriate levels of chemical protective clothing. These codes do not appear on vehicle placards or on emergency action code (EAC) cards but are available in the Dangerous Goods Emergency Action Code List (EAC) list, generally through fire control rooms or mobile data terminals.

Initial operational response (IOR)

Operational personnel responding to initial operational response (IOR) incidents must be competent to wear self-contained breathing apparatus (SCBA) and be aware of the requirement for minimum crews of two personnel. They should be rigged in a minimum of structural firefighting PPE and SCBA, and where available, should consider wearing nitrile type gloves (as in road traffic collision protocols) beneath their fire gloves.

The use of structural firefighting PPE and SCBA should only be used during the initial stages of the incident to undertake immediate lifesaving activities, and the incident commander should confirm that there are saveable lives before implementing a rescue plan.

During later phases, activities such as mass decontamination may be necessary. When carrying out such activities, PPE such as gas-tight suits (GTS) and powered respirator protective suits (PRPS), identified in existing guidance should be used.

Operational personnel should be aware of the requirements to limit deployments in the hot zone for a maximum duration of 15 minutes for deliberate reconnaissance activities, and 30 minutes for rescue activities in the hot and warm zones.

PPE for decontamination

All appropriate personnel should be familiar with the requirements for responder decontamination and the safe undressing procedure detailed in the IOR guidance.

The level or type of decontamination selected will vary according to the nature and degree of the contaminants and the resources available. The type selected will dictate the level of PPE required by decontamination operatives.

The minimum level of PPE for decontamination operatives is structural firefighting PPE, SCBA and nitrile gloves. Gas tight suits (GTS) or powered respirator protective suits (PRPS) should be used if required by the hazardous materials assessment.

Strategic actions

Fire and rescue services must:

- Ensure any personal protective equipment (PPE) provided is fit for purpose and complies with current legislation
- Provide a number of generic ensembles of hazardous material personal protective equipment and make them available to responders
- Provide specialist information, instruction and training to staff that deal with incidents involving hazardous material, including CBRN(e), on the selection of personal protective equipment

- Support the incident commander to implement the highest level of PPE available to provide a safe system of work (SSOW) and reduce risk of cross-contamination to decontamination operatives to as low as reasonably practicable

- Ensure that all fire and rescue service personnel fully understand their own service's PPE policies and procedures, and with Initial operational response to a CBRN Incident (Home Office, July 2015)

Fire and rescue services should:

- Ensure personnel are properly trained in the use and limitations of any personal protective equipment (PPE) that is provided

- Ensure procedures are in place for maintaining, cleaning, re-using and/or disposing of personal protective equipment (PPE)

- Ensure they have policies that allow the use, decontamination, maintenance and testing of structural firefighting PPE for performing immediate lifesaving actions at a CBRN(e) incident

Tactical actions

Incident commanders should:

- Ensure all personnel wear PPE according to service risk assessment and procedures for HazMat incidents

Control measure - Respiratory protective equipment (RPE)

Control measure knowledge

Respiratory protective equipment (RPE) is a particular type of personal protective equipment designed to protect the wearer from breathing in harmful substances, or from oxygen-deficient atmospheres, when other controls are either not possible or insufficient on their own.

The two main types of RPE are respirators and breathing apparatus:

- Respirators (filtering devices) use filters to remove contaminants from the air being breathed in. Non-powered respirators rely on the wearer breathing to draw air through the filter
- Breathing apparatus (BA) requires a supply of breathing-quality air from an independent source (e.g. air cylinder)

Where RPE is used, it must be able to provide adequate protection for individual wearers. RPE cannot protect the wearer if it leaks. A major cause of leaks is poor fit; tight-fitting face pieces need to fit the wearer's face to be effective.

Maintenance is a requirement for all RPE, except for disposable (single use) RPE, and should be carried out by properly trained personnel. Thorough maintenance, examination and tests should be carried out at regular intervals in accordance with the manufacturer's instructions.

Face fit testing

Face fit testing is a method of checking that a tight-fitting facepiece matches the wearer's facial features and seals adequately to their face. A fit test should be carried out as part of the initial selection of the RPE and it is good practice to ensure repeat fit testing is carried out on a regular basis.

See: Regulation 7, The Control of Substances Hazardous to Health Regulations 2002 (as amended)

See: HSG53, Respiratory protective equipment at work, 4th Ed. HSE (2013)

Breathing apparatus

Breathing apparatus (BA) enables firefighters to breathe safely in otherwise irrespirable atmospheres. The use of BA as a control measures is likely to be applied as part of the incident plan for any incident involving smoke and fire gases, confined space specified risks and hazardous materials including asphyxiants, dusts, toxic, flammable and explosive substances.

The foundation for breathing apparatus guidance outlines procedures that should be adopted at operational incidents involving the deployment of BA. These procedures allow efficient, effective and safe working practices to be adopted at incidents of all sizes and type where an irrespirable atmosphere presents a hazard to personnel.

See: Foundation for Breathing Apparatus

Strategic actions

Fire and rescue services must:

- Provide employees with suitable respiratory protective equipment that fits the wearer correctly and adequately controls identified risks

- Ensure that personal respiratory protective equipment worn simultaneously is compatible

and does not negatively impact other safety measures

Fire and rescue services should:

- Specify the type of respiratory protective equipment required for hazards identified through risk assessment and communicate to personnel
- Have policies, procedures and guidance for all personnel on the safe use and management of respiratory protective equipment at incidents
- Provide suitable information, instruction and training to all personnel who may be required to wear respiratory protective equipment
- Have suitable arrangements for the provision, testing and maintenance of respiratory protective equipment

Tactical actions

Incident commanders should:

- Ensure that all personnel wear the type of RPE identified by service risk assessments, procedures and training
- Implement BA entry control procedures appropriate to the level of risk identified

Hazard - Contaminated members of the public

Hazard Knowledge

Understanding the current threat to life and the need for immediate action will take priority and influence any pre-determined planned responses. The first objective of the three primary emergency blue light services is to save life, and all agencies are required to assist in achieving this key objective as a matter of urgency.

Evacuation, disrobe and decontamination are key principles to follow when conducting life-saving activity in a contaminated environment. Maximum benefit will be realised if conducted within

fifteen minutes of exposure.

Evidence has shown that the actions taken by first responders to incidents involving the contamination of members of the public saves lives. The condition of contaminated individuals is likely to worsen the longer it takes for responders to react. Actions during initial operational response (IOR) should concentrate on:

- **Remove** casualties from the immediate area to avoid further exposure to the substance. Evacuate casualties upwind, and if possible uphill, away from the scene of contamination and into fresh air. Use available resources to form an improvised 'inner cordon' upwind of the incident. See control measure: Evacuation
- **Remove** the outer clothing of casualties by asking them to disrobe, avoiding pulling clothing over the head if possible. Do not pull off clothing stuck to skin. See control measure: Disrobe
- **Remove** the substance from the skin using a dry absorbent material to either soak it up or brush it off. Rinse continually with water if skin is inching an in pain. See control measure: Improvised decontamination

Failure to remove casualties to an area of relative safety and instigate disrobing in the shortest possible time will result in unnecessarily prolonged exposure to the contaminant, adversely affecting patient outcomes and affecting survivability.

The impact on members of the public will depend on the type of contaminant and the clothing they are wearing. Factors such as the total surface area of skin covered by clothing, the type of the clothing (waterproof, absorbent, fabric type, etc.), the number of layers, the speed and method with which it is removed will all vary the degree of contamination and harm to the person.

Responsibility for dealing with any member of the public who is reluctant or refuses to be decontaminated, and recording people passing through decontamination rests with the police or security services.

To understand this hazard fully, it is important responders know the following definitions relating to public decontamination:

- **Decontamination:** The physical or chemical process of reducing contamination to minimise the risk of further harm occurring and to minimise the risk of cross-contamination to a level as low as reasonably practicable (it is not always possible to totally remove the contaminant or clean the equipment on site)
- **Improvised decontamination:** Using an immediately available method of decontamination before the use of specialist resources
- **Interim decontamination:** Using standard equipment to provide a planned and structured 'wet decontamination' process
- **Mass decontamination:** A planned and structured procedure using purpose designed decontamination equipment where there are large numbers of contaminated casualties that require 'wet decontamination'
- **Clinical decontamination:** The process where contaminated casualties are treated individually, by trained healthcare professionals, using purpose-designed decontamination

equipment. Triage should determine the priority for any casualties

See National Operational Guidance: Performing rescues – Casualty care for further information.

Control measure - Life-saving actions

Control measure knowledge

Understanding the threat to life and the need for immediate action will take priority and influence any pre-determined planned responses. Members of the public in areas of either gross contamination or high concentrations of hazardous materials, and who therefore have no safe escape route, may require immediate life-saving actions.

At a hazardous materials incident, it is recognised that members of the public may be directly involved. The priority for emergency responders at all incident types is to save life; therefore the primary focus for emergency responders involved in a hazardous material incident will be to conduct initial life-saving activity for casualties that need assistance, direction or rescue.

These early operational activities should be considered an absolute priority. Casualties should be directed away from the scene, ideally upwind and uphill of contamination and point of release. Any casualties who can walk should be directed to this area with the minimum direct physical contact from emergency responders.

Initial operational response (IOR) identifies realistic expectations of frontline emergency responders during a response to a CBRN(e) event. This principle can be applied to a hazardous material incident where a risk to life exists and the properties of the substance involved are not known in the early part of the response phase.

To conduct life-saving actions in a hazardous material environment it is important to understand:

- The Step 1-2-3 Plus - Safety Triggers for Emergency Personnel) process
- The advantages and limitations of responder personal protective equipment (PPE) and respiratory protective equipment (RPE)
- The need for multi-agency joint understanding of risk (JUR) and a dynamic risk assessment (DRA)

If the incident commander is considering deploying crews to conduct life-saving activity it is important to ensure an effective emergency decontamination strategy is available for both firefighters and casualties.

Incident commanders should be able to undertake the joint understanding of risk (JUR) and service-specific risk assessment and apply the identified control measures effectively before committing personnel to undertake deliberate reconnaissance and rescue activities in the hot and warm zones.

The presence of saveable lives can be confirmed through the casualties being in line of sight. If casualties are not in line of sight but there is a reasonable suspicion, based on intelligence, that live casualties are in the area, the incident commander may commit a deliberate reconnaissance team for a maximum of 15 minutes to provide confirmation.

Strategic actions

Fire and rescue services should:

- Ensure incident commanders have the skills, knowledge and understanding required to undertake rapid risk assessment to limit or prevent exposure during immediate life-saving rescues at hazardous materials incidents
- Consider providing appropriate equipment to assist in removing casualties from the risk area, such as loud hailers, vehicle personal address systems and stretchers
- Ensure staff are aware of the principles of IOR and that they are incorporated into all policies and procedures which address CBRN(e) incidents;

Tactical actions

Incident commanders should:

- Assess the need to conduct immediate life-saving actions at incidents involving hazardous materials

Control measure - Warn, inform and advise people

Control measure knowledge

Under the Civil Contingencies Act, Category 1 responders are required to put arrangements in place

to make information available to the public about civil protection matters and to maintain arrangements to warn, inform and advise the public in the event of an emergency.

In some situations, information provided to the public may have to be restricted, especially if its release could cause panic and potentially result in further harm to people.

Information communicated to, or withheld from, people can influence their behaviour. Communicating with people, particularly those in groups or crowds, is essential to maintain order and manage behaviour.

In emergencies, the key communications objective will be to deliver accurate, clear and timely warnings, information and advice to people, so they feel confident, safe and well-informed.

Warnings, information and advice should:

- Be specific and clear
- Be timely and accurate
- Come from a credible source and be verifiable
- Convey the nature and extent of the danger

Warnings, information and advice can be delivered in many ways including:

- Face-to-face
- Visiting premises – residential and commercial
- Media and social media announcements
- Public announcements in areas such as public buildings, shopping centres, sports venues and transport networks

Strategic actions

Fire and rescue services should:

- Develop guidance and support arrangements to effectively communicate with people during emergency incidents

- Develop arrangements with partner agencies for the delivery of warnings, information and advice during emergency

- Develop guidance and support arrangements for the effective use of media services

Tactical actions

Incident commanders should:

- Use the most effective methods for communicating with people who are either directly or indirectly involved in the incident

- Consider the use of media, social media and other methods to communicate with people

- Establish a media liaison point and brief a nominated media liaison officer

Control measure - Controlled evacuation of contaminated casualties

Control measure knowledge

The first phase for mass decontamination (MD) is the controlled evacuation of contaminated casualties, by directing or removing them from the scene of contamination.

The removal of casualties from the scene of contamination and point of release (normally in or around the hot zone), will significantly reduce the likelihood of any further contamination occurring. Likewise exposure through the casualties' unprotected respiratory systems will be reduced.

An area away from the scene of contamination (normally in the warm zone) should be identified. Where possible, this should be upwind, and ideally uphill, of the scene of contamination. Any ambulant casualties should be directed to this area as quickly as possible, with the minimum of direct physical contact from emergency responders. It is essential that responders communicate effectively with casualties to gain their confidence and co-operation.

Strategic actions

Fire and rescue services should:

- Provide equipment or access to information to determine and monitor wind speed and direction
- Consider providing equipment, such as speakers or loudhailers, to enable communication with casualties from a distance
- Provide an initial supply of disrobe packs

Tactical actions

Incident commanders should:

- Determine and monitor wind speed and direction, using appropriate equipment, or other sources of information such as CHEMET
- Identify an appropriate area for the casualties to be evacuated to
- Evacuate casualties to the identified area
- Initiate and maintain communication with the casualties, to provide instructions and keep them informed
- Issue disrobe packs
- Provide regular updates to NRFC on incident development and casualty numbers

Control measure - Establish a triage sieve (adult and paediatric)

Control measure knowledge

The core principle of triage is to do the most for the most. The initial triage method in a multiple casualty situation is the triage sieve.

The triage sieve will identify immediately life-threatening problems based on the C < A B C > system and correctly prioritise the patients for treatment. Not doing this will potentially risk lives.

All fire and rescue services should be aware of this system and be prepared to employ it in a multiple casualty situation or at a major incident.

As a principle, in a poorly resourced scene, minimal casualty care is carried out in a multiple casualty situation. The following list provides guidance on what could be achieved without breaching the core principle of triage:

- Quickly turn a patient to protect an airway
- Encourage self help
- Encourage a bystander to apply direct pressure

With the publication of the 2013 Ambulance Clinical Practice Guidelines (JRCALC) it was acknowledged that now ambulance services are all practising C < A B C > in their initial patient assessment, the standard triage sieve needed to be updated to take account of the importance of initial assessment and treatment of catastrophic haemorrhage.

The diagram below is the new National Ambulance Service Medical Directors Group (NASMeD) Triage Sieve, which was published in 2013 for use by all ambulance staff at a major incident (NARU, 2013).

The priorities are described as:

- P1 or red tags (immediate) are used to label those who cannot survive without immediate treatment but who have a chance of survival
- P2 or yellow tags (observation) are for those who require observation (and possible later re-triage). Their condition is stable for the moment and they are not in immediate danger of death. These casualties will still need hospital care and would be treated immediately under normal circumstances.
- P3 or green tags (wait) are reserved for the 'walking wounded' who will need medical care at some point, after more critical injuries have been treated.

The JESIP casualty triage has an additional priority:

- P4 or P1E (expectant) is used for those whose injuries are so extensive that they will not be able to survive given the care/resource that is available. This is only to be used under authorisation of the Medical Incident Officer. They alone have the responsibility to match these patients' injuries with the number and type of the other casualties and the remaining resources available to the hospitals..

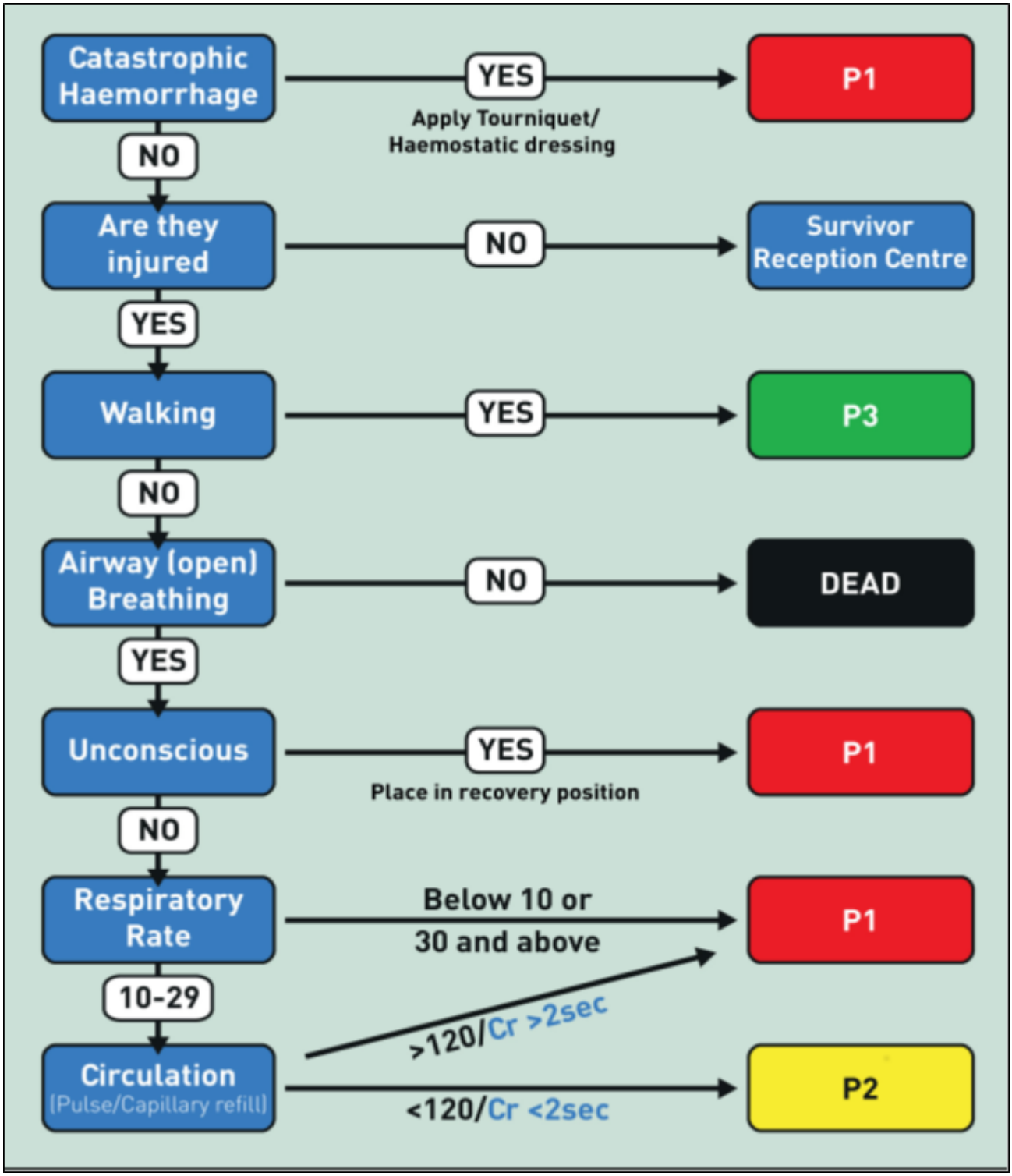

Figure 3: Triage Sieve

Source: National Ambulance Service Medical Directors Group (NASMeD)

The same triage principles apply to children. Paediatric triage tape is available, which groups children by length, weight and age and provides normal physiological values for respiratory rate and pulse in each of the groups to carry out the triage process.

Having labelled the casualty with their priority, casualties are handed over to an appropriately

trained and competent practitioner. A record or log of the numbers of each priority should be kept.

When referring to casualties and the above categories at the scene of an incident, everyone should be sensitive to those who may be nearby, which could include relatives and other members of the public.

Strategic actions

Fire and rescue services should:

- Ensure that responders understand the principle of casualty triage at incidents involving more than one casualty

Tactical actions

Incident commanders should:

- Identify the number of casualties requiring medical attention and instigate a triage process
- Record the outcome of triage and communicate to medical responders

Control measure - Rescue: Hazardous materials

Control measure knowledge

When evacuating ambulant casualties, fire and rescue service personnel should be aware of the difficulty in communicating with the casualties and the potential of failing to identify a place of relative safety. To minimise this hazard, it is important that the place of relative safety is identified before personnel are committed to carry out rescues.

Until specialist responders from other services arrive (HART, SORT, police service CBRN(e) responders) fire and rescue service personnel have the only available access to the personal protective equipment (PPE) suitable to carry out immediate rescue within the scene of contamination and therefore should be the only people to enter this area.

Casualties identified as breathing and conscious but unable to walk should be regarded as a high priority to be rescued. They should be moved from the perceived area of greatest contamination and taken to an area of relative safety. At the earliest practicable opportunity, these casualties should be helped to disrobe and, if possible, undergo improvised or interim decontamination.

It is recognised that the time taken to don gas-tight suits (GTS) may compromise the ability to

rescue non-ambulent, saveable life casualties in a timely manner. In these circumstances, the fire and rescue incident commander should consider the use of other acceptable PPE ensembles. Fire and rescue service structural firefighting PPE combined with self-contained breathing apparatus (SCBA) provides less protection than gas-tight suits (GTS). However, research has demonstrated that protection factors provided by this level of PPE reduces the risk to fire and rescue service personnel to a level that may be considered acceptable in circumstances where saveable-life rescues could potentially be carried out.

For more information see ORCHIDS - Optimisation through Research of CHemical Incident Decontamination Systems

It cannot be over-emphasised that this guidance is not an instruction to deploy responders into a potentially contaminated area in structural firefighting PPE and SCBA in every circumstance. The purpose is to provide incident commanders with guidance to allow them to make calculated risk-based decisions, based on all available information, on whether to deploy staff in structural firefighting PPE and SCBA as part of a plan to rescue saveable lives.

Strategic actions

Fire and rescue services should:

- Have recording systems and checklists in place in the mobilising controls to capture the need for rescues and be able to give instructions to those in need on the initial call
- Ensure personnel are aware of the principles of initial operational response (IOR)
- Understand standard protocols and rescue techniques that can be applied in a hazardous materials environment

Tactical actions

Incident commanders should:

- Commit crews to perform rescues based on the hazard assessment and joint understanding of risk (JUR)

Control measure - Disrobe

Control measure knowledge

When done effectively disrobing, followed by appropriate decontamination, has been shown to reduce contamination a level below that which is considered harmful. Disrobing should therefore be considered the primary action following evacuation from a contaminated area.

Undressing should be systematic to avoid transferring any contamination from clothing to the skin.

Fire and rescue service (FRS) disrobe packs should be made available on frontline appliances and contain a pictogram showing a safe undressing procedure that minimises spreading contamination from clothing to exposed skin. If these packs are not available, responders should consider improvising the disrobe procedures. Disrobe packs are not necessary for undressing and the lack of an alternative should not delay undressing which is an absolute priority.

Responders should consider the potential for hypothermia as well as modesty concerns. If available, alternative clothing or blankets should be used.

It is essential for crime scene investigation purposes that contaminated waste materials and clothing is contained in bags and left for the police investigation team. Where this can be achieved without compromising the speed and effectiveness of the evacuation and decontamination of casualties it should be given full attention/consideration.

Strategic actions

Fire and rescue services should:

- Ensure disrobe packs are available as part of the initial response

Tactical actions

Incident commanders should:

- Remove the outer clothing of members of the public and issue disrobe packs if available
- Instruct contaminated members of the public to disrobe and issue disrobe packs if available
- Distribute disrobe packs to casualties once they are in a place of relative safety

Control measure - Mass decontamination: Disrobe

Control measure knowledge

The vast majority of contaminants are removed if disrobing, followed by appropriate decontamination, is carried out effectively. Disrobing should be carried out in a way that avoids transferring contaminant from clothing to the skin.

Instructions on how to disrobe, and how to bag and secure clothing and personal items, are provided in pictogram form within the disrobe packs. It is important that clothing and personal items are contained in bags for police crime scene investigation purposes, especially if the incident could be a CBRN(e) event. Although very important, this process should not be allowed to compromise the speed and effectiveness of decontamination.

Disrobe packs can be distributed to casualties in a number of ways, including:

- Distributed in cages, positioned close to the edge of the hazard area, to enable casualties to collect disrobe packs
- Fire and rescue service personnel in the cold zone can throw disrobe packs into the hazard area to the casualties
- Fire and rescue service personnel, wearing appropriate personal protective equipment (PPE), distributing the disrobe packs

Casualties should be provided with disrobe packs, instructed to commence disrobing and await further instructions. Some casualties may be unable to access disrobe packs themselves, and will require assistance.

The disrobe packs use a method of unique identification numbers, to ensure that clothing and personal items are linked to the appropriate casualty.

Personnel, wearing appropriate PPE, should provide instructions, guidance and assistance to the casualties on how to use the disrobe packs.

Strategic actions

National Resilience should:

- Provide sufficient disrobe packs for the number of casualties involved

Tactical actions

Specialist responders should:

- Distribute the disrobe packs using an appropriate method
- Wear appropriate personal protective equipment (PPE) while distributing the disrobe packs
- Treat all casualties with respect and provide appropriate instructions, guidance and assistance
- Communicate with casualties throughout the disrobe process
- Ensure clothing and personal items are retained in appropriate bags, with unique identification numbers, for police investigation purposes

Control measure - Improvised decontamination

Control measure knowledge

Research of decontamination methods has shown that disrobing and dry decontamination could have a significant role from an injury mitigation and lifesaving perspective. This is dependent on the chemical contaminant involved (i.e. whether it was caustic or not) and the availability of appropriate absorbent materials in sufficient quantities. In such circumstances, dry decontamination is likely to be most effective if undertaken by first responders, as soon as possible and before specialist resources are likely to be able to arrive.

Rolls of absorbent tissue ‘blue roll’ and plastic bags have been provided to fire and rescue services (FRS) specifically for this purpose. However, any dry absorbent material may be used, for example: kitchen towel; toilet paper; paper tissues; towels and clean rags; strips of blanket or sheeting etc. Other material, such as cat litter and dry soil can also be used. All waste material, arising from the dry decontamination process, should be bagged and left in situ if possible.

Staff should be mindful, that the casualty's hair may still hold some contaminant and a method of improvised wet decontamination of the hair should be considered if there is good reason to believe it may be contaminated. Likewise, corrosive materials will also initially require a wet

decontamination which can be applied via an improvised or interim decontamination solution.

For specific advice on acid attacks see National Operational Guidance: Health Hazards - Corrosive materials

Strategic actions

Fire and rescue services should:

- Secure access to appropriate specialist advice, both internal and external, on decontamination
- Incorporate the priorities of their multi-agency partners into their own response to public decontamination
- Provide procedures for improvised decontamination following initial operational response (IOR) guidance

Tactical actions

Incident commanders should:

- Implement an improvised dry decontamination process for members of the public
- Implement improvised wet decontamination where casualties have been exposed to caustic or irritant substances
- Remove the substance from skin using dry decontamination (or wet decontamination for caustic substances)

Control measure - Interim decontamination

Control measure knowledge

Although the health service has primacy for public decontamination, the fire and rescue service (FRS) is acknowledged as being the most capable emergency service due to its provision at an emergency incident. This is because of the equipment and personnel it can provide.

In the early stages of the incident and dependent on the symptoms and needs of contaminated people, the fire and rescue service (FRS) incident commander may decide (where possible in conjunction with the ambulance and police services) to establish interim decontamination.

Interim decontamination has the advantage of being a more structured and controlled method of decontamination than improvised decontamination.

The designation of an area to carry it out decontamination can greatly influence the effectiveness of the process and can reduce the impact of the process on the surrounding environment. If a 'wet' decontamination process is chosen, the run-off must be contained and prevented from entering drainage until discussed with the relevant agency and water companies.

Liaise with the environmental agencies or hazardous materials adviser (HMA) regarding appropriate disposal.

See National Operational Guidance: Environmental protection

Strategic actions

Fire and rescue services should:

- Ensure personnel who respond to hazardous materials incidents are provided with the necessary knowledge, skills and understanding to decontaminate members of public effectively
- Develop procedures for interim decontamination using standard frontline equipment
- Provide systems for resilience in the event of breakdown or fault with any item of equipment; this may include replacement equipment or alternate methodology

Tactical actions

Incident commanders should:

- Establish interim decontamination using standard frontline equipment based on hazard assessment

Control measure - Provide treatment to burns casualties

Control measure knowledge

Effective treatment of thermal and chemical burn injuries can be treated through:

- SAFE approach:
  - Shout/call for help
  - Assess the scene
  - Free from danger
  - Evaluate the casualty
- Stop the burning process with irrigation (tap water)
- Cool the burn wound, warm the patient
- Dress the affected area
- Assess and manage immediately or imminently life threatening problems
- Request specialist advice and medical response

Strategic actions

Fire and rescue services should:

- Make burn treatments available to responders likely to encounter casualties
- Train responding personnel to understand the treatment of casualties suffering from burns

Tactical actions

Incident commanders should:

- Identify the nature and extent of casualty burns and communicate this to medical support teams
- Cool skin burns using the recommended method and request specialist medical assistance
- Dress burns according to service procedures and training

Control measure - Mass decontamination: Set up

structures

Control measure knowledge

MD1 structures are used for disrobing, MD2 structures provide shower facilities, MD3 structures are used for re-robing and MD4 structures are used for emergency responders.

The MD4 structure will usually be erected first, and a team of three powered respirator protective suit (PRPS) wearers will be deployed into the warm zone; they will communicate with and reassure the casualties. A PRPS emergency team will be established at the same time.

The remaining MD structures will then be erected; they should be located as close as possible to the MD4 structure, allowing for ancillary equipment between the structures. Each area of MD operations should be considered as a sector in its own right.

Care should be taken when siting the MD structures, as it is not possible to move them during an incident. The structures, along with supporting equipment and other resources, require a large area. Advice on the location of the MD structures may be sought from the tactical advisers (TacAds) and other multi-agency partners.

The MD sector may be supported by an MD support unit (MDSU), which contains additional MD equipment.

Strategic actions

National Resilience should:

- Mobilise National Resilience (NR) resources, including tactical advisers (TacAds), to appropriate incidents to carry out mass decontamination (MD)
- Work with partner agencies to ensure the MD process is interoperable
- Provide sufficient MD structures and associated equipment for the number of casualties involved
- Provide sufficient MD4 structures and associated equipment for the number of emergency responders
- Consider requests from the police and ambulance service to support multi-agency emergency responder decontamination

Tactical actions

Specialist responders should:

- Erect the MD structures in appropriate locations, in consultation with the requesting fire and rescue service's incident commander and the DIM team
- Set up the appropriate MD equipment, with an appropriate layout, for the type and number of casualties
- Have personnel in place to carry out the MD, including providing guidance to people, operating and servicing the decontamination equipment

Control measure - Mass decontamination: Members of public

Control measure knowledge

It may be difficult to assess if casualties in the vicinity of the release have been contaminated and to what extent. Therefore it may be appropriate to put everyone who may have been exposed to the contaminant through the mass decontamination (MD) process.

If casualties have undergone any decontamination prior to the arrival of National Resilience (NR) resources, they may also be processed through clinical decontamination or MD if required.

Before entering the MD shower structure, casualties will need to remove the disrobe pack clothing in the MD undressing area. The PRPS teams should remove the discarded disrobe pack clothing from the undressing area after each group of casualties have left it. Discarded disrobe pack clothing should be kept in a suitable area, or areas, within the hazard area.

Whenever possible the maximum number of casualties should be processed through the shower structures on each decontamination cycle; this will ensure the best response for the greatest number of casualties is achieved.

However, distress of the casualties or other factors may affect the efficiency of the decontamination process. Examples of issues that may be encountered, and considerations that may assist, are provided below:

Casualties involved	Considerations for decontamination
Children	• May be less distressed if kept with their family, or accompanied by an older child • May not be able to understand or follow instructions • May need additional reassurance • May respond better to personnel whose face they can see
People with physical health conditions	• Should preferably be decontaminated by the ambulance service • May need assistance, preferably from a carer • May take longer to go through the decontamination process • Prosthetic limbs and mobility aids may need to go through a separate decontamination process
Visually impaired or hearing impaired	• Should preferably be decontaminated by the ambulance service • May require assistance or support
People with mental health conditions	• Should preferably be decontaminated by the ambulance service • May need assistance, preferably from a carer • May take longer to go through the decontamination process • May not be able to understand or follow instructions • May need additional reassurance • May respond better to personnel whose face they can see
People with gender, cultural or religious sensitivities	• Separate MD structures may need to be used, to provide a level of privacy • Community leaders may be able to provide reassurance
People who do not understand English	• Seek other casualties who are able to translate instructions and information • Consider using an interpretation service • Refer casualties to the pictograms provided in the disrobe packs • Provide demonstrations of the processes

The fire and rescue service should not be expected to independently provide decontamination for arrested or detained persons as the process can be dangerous and complex. However, the fire and rescue service may need to provide assistance to the police for the decontamination of detainees at

the scene.

The arresting police officers will accompany their detainees through decontamination to:

- Ensure evidence is not lost or discarded
- Protect fire and rescue personnel and ambulance service personnel from violence, or threats of violence
- Prevent any escape attempts

The police will need to retain clothing and property removed from a detainee, as this will be evidential property, although it may need to undergo decontamination.

Strategic actions

National Resilience should:

- Provide sufficient and appropriate decontamination materials, including absorbent material, water and water additives

Tactical actions

Specialist responders should:

- Treat all casualties with respect and provide appropriate instructions, guidance and assistance
- Communicate with casualties throughout the decontamination process
- Provide absorbent material for people to remove surface contamination
- Provide wet decontamination for people contaminated with caustic materials
- Remove discarded disrobe pack clothing and retain in the hazard area
- Assist the police with the decontamination of arrested or detained persons

Control measure - Mass decontamination: Re-robing and handover of decontaminated casualties

Control measure knowledge

When the casualties have been decontaminated, they will need to be provided with re-robe packs, delivered in cages to the MD re-robe structure. There will need to be sufficient re-robe packs delivered in time to provide clothing for decontaminated ambulant casualties leaving the MD structures.

As it can take longer for casualties to re-robe than to shower, bottlenecks will need to be controlled. This could be by slowing down the rate of decontamination or by providing additional re-robe facilities.

Some casualties may need assistance with re-robing, and personnel should provide instructions, guidance and assistance to the casualties on how to use the re-robe packs. As detailed in the control measure for Decontaminating casualties, consideration may need to be given to the types of casualties involved and appropriate adjustments made for the re-robing process.

The fire and rescue service will pass responsibility for decontaminated casualties to other agencies following the decontamination and re-robe processes.

The ambulance service will provide any immediate clinical assistance and will also be responsible for ensuring decontaminated casualties are provided with medical aftercare, including hospital treatment if required.

The police are responsible for carrying out immediate investigation once the casualties are decontaminated and re-robed. The police will set up information sharing between agencies in support of the casualty bureau function, and attempt to identify any survivors who left the scene of the incident without going through the decontamination process.

Strategic actions

National Resilience should:

- Provide sufficient re-robe packs and facilities for the number of casualties involved

Tactical actions

Specialist responders should:

- Provide re-robe packs to the casualties
- Treat all casualties with respect and provide appropriate instructions, guidance and assistance
- Communicate with casualties throughout the re-robe process
- Consider the potential for hypothermia of casualties and provide additional protection, such as emergency blankets
- Hand over the decontaminated casualties to an appropriate agency for onward care

Control measure - Detection, identification and monitoring: Provide support to mass decontamination operations

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Control measure knowledge

Detection, identification and monitoring (DIM) activity is required whenever mass decontamination or decontamination of body bags is carried out, in order to:

- Monitor the effectiveness of the decontamination process
- Monitor the environment inside the MD structures
- Check for cumulative build-up of contamination inside the decontamination structures
- Check the area where used solid waste, such as disrobe packs or brushes, are being kept

Strategic actions

National Resilience should:

- Ensure sufficient DIM teams are available to support mass decontamination of body bags

(DBB) operations

- Ensure equipment is provided to fulfill this role

Tactical actions

Specialist responders should:

- Wear the appropriate PPE when supporting mass decontamination operations
- Ensure any movement of responders does not spread contamination into the cold zone

Control measure - Mass decontamination: Environmental considerations

Control measure knowledge

The pre-determined and structured MD process has a statutory requirement to contain water, unlike unstructured or initial operational response (IOR) decontamination, where every effort should be made to contain water.

Contaminants and contaminated materials gathered during a mass decontamination (MD) response should ideally be contained at the scene until analysed and identified. Once the type of contamination has been identified, a decision can be made on the treatment needed to make the material harmless for disposal, or following a risk assessment, which disposal process can be used.

Sewage or wastewater service providers and environmental agencies should be consulted as soon as possible before discharging any contaminated water to waste, or if contaminated water has already entered the drainage system. This will enable measures to take place to protect the sewage or wastewater system or to divert contaminated water from treatment works.

Sewage or wastewater service providers and environmental agencies will try to provide prompt advice to emergency responders. Their advice on environmental impact and drainage issues should help to implement actions that will mitigate the potential impact of decontamination water run-off.

For further information on this topic refer to the National Operational Guidance: Environmental protection – Control measure: Decontamination.

Strategic actions

National Resilience should:

- Provide equipment to contain run-off from the decontamination procedure

Fire and rescue services should:

- Have arrangements in place to organise the safe disposal of contaminated run-off

Tactical actions

Specialist responders should:

- Ensure the area being used for decontamination is suitable; consider its topography for any slopes or dips which will allow run-off to flow or collect
- Establish the physical properties of the contaminant and the hazards it presents to the environment
- Ensure solid waste, such as disrobe and re-robe packs, is managed for disposal

Incident commanders should:

- Recognise drainage types and prioritise the blocking of surface drains
- Consider the potential for the contaminant to spread while the response plan is being implemented
- Assess the environmental impact of the MD response
- Assess the effectiveness of containment facilities
- Ensure that the appropriate sewage or wastewater service providers and environmental agencies are informed about the incident as soon as possible
- Seek specialist advice regarding the appropriate disposal of all run-off and other contaminated waste from the decontamination process

Control measure - Closing down a mass decontamination (MD) response

Control measure knowledge

Fire and rescue service appliances and equipment, used or deployed outside of the hazard area, should be available for return to service once the mass decontamination (MD) response to the incident is completed.

Equipment used for the decontamination process, including boilers, heaters, containment dams, should remain in place until scientific advice is obtained about the best methods for its decontamination or disposal.

The Department for Environment, Food and Rural Affairs (Defra) will take the lead role in facilitating the required decontamination or disposal processes.

All MD units should be inventory checked and shortages recorded to enable restocking, to ensure the earliest availability for redeployment.

Criminal investigations

The police service may:

- Impound fire and rescue service assets as part of their incident investigation
- Gather material evidence from fire and rescue service personnel
- Take statements from fire and rescue service personnel

Post-incident activity

Other things that should be considered post-incident include:

- Record keeping and document management
- Critical incident stress management (defusing) of crews in line with individual fire and rescue service welfare procedures
- Debriefing, subject to police guidance

Other issues may be addressed by a recovery working group if established for the incident.

Strategic actions

National Resilience should:

- Keep a record of any MD resources that are affected by equipment shortages, where it may impact on the ability for them to respond to further incidents

Tactical actions

Incident commanders should:

- Carry out an inventory check of all MD units
- Restock MD units for redeployment
- Ensure that MD equipment that has been used is decontaminated and returned to the MD-hosting fire and rescue service, subject to scientific advice
- Release equipment to the police for investigation purposes if required
- Provide evidence and statements to the police if required

Hazard - Exposed members of the public

Hazard Knowledge

Exposure occurs when a harmful substance enters the body through a route, for example, inhalation, ingestion, absorption or injection, or when the body is irradiated.

Where exposure to a hazardous material is suspected, the speed of the response is critical to saving lives. The process of evacuation and early treatment will benefit member(s) of the public.

Rescuing people who are physically trapped may be protracted and result in the casualties being exposed to a contaminant for an extended period. A protracted extrication may also increase the risk to responders owing to extended exposure, and incident commanders should consider this as part of the joint understanding of risk (JUR).

Control measure - Life-saving actions

Control measure knowledge

Understanding the threat to life and the need for immediate action will take priority and influence any pre-determined planned responses. Members of the public in areas of either gross contamination or high concentrations of hazardous materials, and who therefore have no safe escape route, may require immediate life-saving actions.

At a hazardous materials incident, it is recognised that members of the public may be directly involved. The priority for emergency responders at all incident types is to save life; therefore the primary focus for emergency responders involved in a hazardous material incident will be to conduct initial life-saving activity for casualties that need assistance, direction or rescue.

These early operational activities should be considered an absolute priority. Casualties should be directed away from the scene, ideally upwind and uphill of contamination and point of release. Any casualties who can walk should be directed to this area with the minimum direct physical contact from emergency responders.

Initial operational response (IOR) identifies realistic expectations of frontline emergency responders during a response to a CBRN(e) event. This principle can be applied to a hazardous material incident where a risk to life exists and the properties of the substance involved are not known in the early part of the response phase.

To conduct life-saving actions in a hazardous material environment it is important to understand:

- The Step 1-2-3 Plus - Safety Triggers for Emergency Personnel) process
- The advantages and limitations of responder personal protective equipment (PPE) and respiratory protective equipment (RPE)
- The need for multi-agency joint understanding of risk (JUR) and a dynamic risk assessment (DRA)

If the incident commander is considering deploying crews to conduct life-saving activity it is important to ensure an effective emergency decontamination strategy is available for both firefighters and casualties.

Incident commanders should be able to undertake the joint understanding of risk (JUR) and service-specific risk assessment and apply the identified control measures effectively before committing personnel to undertake deliberate reconnaissance and rescue activities in the hot and warm zones.

The presence of saveable lives can be confirmed through the casualties being in line of sight. If casualties are not in line of sight but there is a reasonable suspicion, based on intelligence, that live casualties are in the area, the incident commander may commit a deliberate reconnaissance team for a maximum of 15 minutes to provide confirmation.

Strategic actions

Fire and rescue services should:

- Ensure incident commanders have the skills, knowledge and understanding required to undertake rapid risk assessment to limit or prevent exposure during immediate life-saving rescues at hazardous materials incidents
- Consider providing appropriate equipment to assist in removing casualties from the risk area, such as loud hailers, vehicle personal address systems and stretchers
- Ensure staff are aware of the principles of IOR and that they are incorporated into all policies and procedures which address CBRN(e) incidents;

Tactical actions

Incident commanders should:

- Assess the need to conduct immediate life-saving actions at incidents involving hazardous materials

Control measure - Warn, inform and advise people

Control measure knowledge

Under the Civil Contingencies Act, Category 1 responders are required to put arrangements in place to make information available to the public about civil protection matters and to maintain arrangements to warn, inform and advise the public in the event of an emergency.

In some situations, information provided to the public may have to be restricted, especially if its

release could cause panic and potentially result in further harm to people.

Information communicated to, or withheld from, people can influence their behaviour. Communicating with people, particularly those in groups or crowds, is essential to maintain order and manage behaviour.

In emergencies, the key communications objective will be to deliver accurate, clear and timely warnings, information and advice to people, so they feel confident, safe and well-informed.

Warnings, information and advice should:

- Be specific and clear
- Be timely and accurate
- Come from a credible source and be verifiable
- Convey the nature and extent of the danger

Warnings, information and advice can be delivered in many ways including:

- Face-to-face
- Visiting premises – residential and commercial
- Media and social media announcements
- Public announcements in areas such as public buildings, shopping centres, sports venues and transport networks

Strategic actions

Fire and rescue services should:

- Develop guidance and support arrangements to effectively communicate with people during emergency incidents

- Develop arrangements with partner agencies for the delivery of warnings, information and advice during emergency

- Develop guidance and support arrangements for the effective use of media services

Tactical actions

Incident commanders should:

- Use the most effective methods for communicating with people who are either directly or indirectly involved in the incident

- Consider the use of media, social media and other methods to communicate with people

- Establish a media liaison point and brief a nominated media liaison officer

Control measure - Controlled evacuation of contaminated casualties

Control measure knowledge

The first phase for mass decontamination (MD) is the controlled evacuation of contaminated casualties, by directing or removing them from the scene of contamination.

The removal of casualties from the scene of contamination and point of release (normally in or around the hot zone), will significantly reduce the likelihood of any further contamination occurring. Likewise exposure through the casualties' unprotected respiratory systems will be reduced.

An area away from the scene of contamination (normally in the warm zone) should be identified. Where possible, this should be upwind, and ideally uphill, of the scene of contamination. Any ambulant casualties should be directed to this area as quickly as possible, with the minimum of direct physical contact from emergency responders. It is essential that responders communicate effectively with casualties to gain their confidence and co-operation.

Strategic actions

Fire and rescue services should:

- Provide equipment or access to information to determine and monitor wind speed and direction
- Consider providing equipment, such as speakers or loudhailers, to enable communication with casualties from a distance
- Provide an initial supply of disrobe packs

Tactical actions

Incident commanders should:

- Determine and monitor wind speed and direction, using appropriate equipment, or other sources of information such as CHEMET
- Identify an appropriate area for the casualties to be evacuated to
- Evacuate casualties to the identified area
- Initiate and maintain communication with the casualties, to provide instructions and keep them informed
- Issue disrobe packs
- Provide regular updates to NRFC on incident development and casualty numbers

Control measure - Establish a triage sieve (adult and paediatric)

Control measure knowledge

The core principle of triage is to do the most for the most. The initial triage method in a multiple casualty situation is the triage sieve.

The triage sieve will identify immediately life-threatening problems based on the C < A B C > system and correctly prioritise the patients for treatment. Not doing this will potentially risk lives.

All fire and rescue services should be aware of this system and be prepared to employ it in a multiple casualty situation or at a major incident.

As a principle, in a poorly resourced scene, minimal casualty care is carried out in a multiple casualty situation. The following list provides guidance on what could be achieved without breaching the core principle of triage:

- Quickly turn a patient to protect an airway
- Encourage self help
- Encourage a bystander to apply direct pressure

With the publication of the 2013 Ambulance Clinical Practice Guidelines (JRCALC) it was acknowledged that now ambulance services are all practising C < A B C > in their initial patient assessment, the standard triage sieve needed to be updated to take account of the importance of initial assessment and treatment of catastrophic haemorrhage.

The diagram below is the new National Ambulance Service Medical Directors Group (NASMeD) Triage Sieve, which was published in 2013 for use by all ambulance staff at a major incident (NARU, 2013).

The priorities are described as:

- P1 or red tags (immediate) are used to label those who cannot survive without immediate treatment but who have a chance of survival
- P2 or yellow tags (observation) are for those who require observation (and possible later re-triage). Their condition is stable for the moment and they are not in immediate danger of death. These casualties will still need hospital care and would be treated immediately under normal circumstances.
- P3 or green tags (wait) are reserved for the 'walking wounded' who will need medical care at some point, after more critical injuries have been treated.

The JESIP casualty triage has an additional priority:

- P4 or P1E (expectant) is used for those whose injuries are so extensive that they will not be able to survive given the care/resource that is available. This is only to be used under authorisation of the Medical Incident Officer. They alone have the responsibility to match these patients' injuries with the number and type of the other casualties and the remaining resources available to the hospitals..

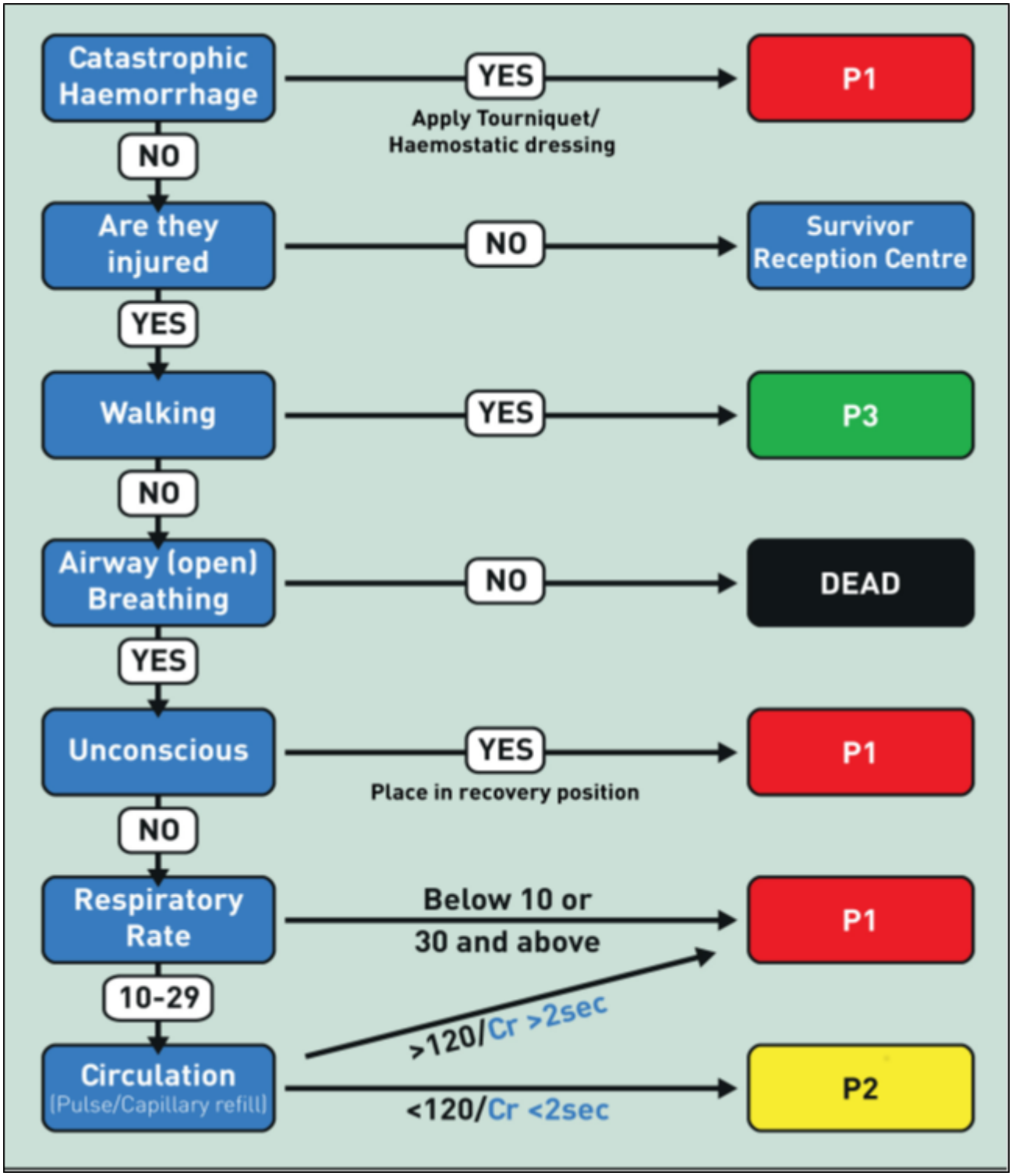


Figure 3: Triage Sieve

Source: National Ambulance Service Medical Directors Group (NASMeD)

The same triage principles apply to children. Paediatric triage tape is available, which groups children by length, weight and age and provides normal physiological values for respiratory rate and pulse in each of the groups to carry out the triage process.

Having labelled the casualty with their priority, casualties are handed over to an appropriately trained and competent practitioner. A record or log of the numbers of each priority should be kept.

When referring to casualties and the above categories at the scene of an incident, everyone should be sensitive to those who may be nearby, which could include relatives and other members of the public.

Strategic actions

Fire and rescue services should:

- Ensure that responders understand the principle of casualty triage at incidents involving more than one casualty

Tactical actions

Incident commanders should:

- Identify the number of casualties requiring medical attention and instigate a triage process
- Record the outcome of triage and communicate to medical responders

Control measure - Rescue: Hazardous materials

Control measure knowledge

When evacuating ambulant casualties, fire and rescue service personnel should be aware of the difficulty in communicating with the casualties and the potential of failing to identify a place of relative safety. To minimise this hazard, it is important that the place of relative safety is identified before personnel are committed to carry out rescues.

Until specialist responders from other services arrive (HART, SORT, police service CBRN(e) responders) fire and rescue service personnel have the only available access to the personal protective equipment (PPE) suitable to carry out immediate rescue within the scene of contamination and therefore should be the only people to enter this area.

Casualties identified as breathing and conscious but unable to walk should be regarded as a high priority to be rescued. They should be moved from the perceived area of greatest contamination and taken to an area of relative safety. At the earliest practicable opportunity, these casualties should be helped to disrobe and, if possible, undergo improvised or interim decontamination.

It is recognised that the time taken to don gas-tight suits (GTS) may compromise the ability to rescue non-ambulent, saveable life casualties in a timely manner. In these circumstances, the fire and rescue incident commander should consider the use of other acceptable PPE ensembles. Fire

and rescue service structural firefighting PPE combined with self-contained breathing apparatus (SCBA) provides less protection than gas-tight suits (GTS). However, research has demonstrated that protection factors provided by this level of PPE reduces the risk to fire and rescue service personnel to a level that may be considered acceptable in circumstances where saveable-life rescues could potentially be carried out.

For more information see ORCHIDS - Optimisation through Research of CHemical Incident Decontamination Systems

It cannot be over-emphasised that this guidance is not an instruction to deploy responders into a potentially contaminated area in structural firefighting PPE and SCBA in every circumstance. The purpose is to provide incident commanders with guidance to allow them to make calculated risk-based decisions, based on all available information, on whether to deploy staff in structural firefighting PPE and SCBA as part of a plan to rescue saveable lives.

Strategic actions

Fire and rescue services should:

- Have recording systems and checklists in place in the mobilising controls to capture the need for rescues and be able to give instructions to those in need on the initial call
- Ensure personnel are aware of the principles of initial operational response (IOR)
- Understand standard protocols and rescue techniques that can be applied in a hazardous materials environment

Tactical actions

Incident commanders should:

- Commit crews to perform rescues based on the hazard assessment and joint understanding of risk (JUR)

Control measure - Provide treatment to burns casualties

Control measure knowledge

Effective treatment of thermal and chemical burn injuries can be treated through:

- SAFE approach:
  - Shout/call for help
  - Assess the scene
  - Free from danger
  - Evaluate the casualty
- Stop the burning process with irrigation (tap water)
- Cool the burn wound, warm the patient
- Dress the affected area
- Assess and manage immediately or imminently life threatening problems
- Request specialist advice and medical response

Strategic actions

Fire and rescue services should:

- Make burn treatments available to responders likely to encounter casualties
- Train responding personnel to understand the treatment of casualties suffering from burns

Tactical actions

Incident commanders should:

- Identify the nature and extent of casualty burns and communicate this to medical support teams
- Cool skin burns using the recommended method and request specialist medical assistance
- Dress burns according to service procedures and training

Control measure - Mass decontamination: Set up structures

Control measure knowledge

MD1 structures are used for disrobing, MD2 structures provide shower facilities, MD3 structures are used for re-robing and MD4 structures are used for emergency responders.

The MD4 structure will usually be erected first, and a team of three powered respirator protective

suit (PRPS) wearers will be deployed into the warm zone; they will communicate with and reassure the casualties. A PRPS emergency team will be established at the same time.

The remaining MD structures will then be erected; they should be located as close as possible to the MD4 structure, allowing for ancillary equipment between the structures. Each area of MD operations should be considered as a sector in its own right.

Care should be taken when siting the MD structures, as it is not possible to move them during an incident. The structures, along with supporting equipment and other resources, require a large area. Advice on the location of the MD structures may be sought from the tactical advisers (TacAds) and other multi-agency partners.

The MD sector may be supported by an MD support unit (MDSU), which contains additional MD equipment.

Strategic actions

National Resilience should:

- Mobilise National Resilience (NR) resources, including tactical advisers (TacAds), to appropriate incidents to carry out mass decontamination (MD)
- Work with partner agencies to ensure the MD process is interoperable
- Provide sufficient MD structures and associated equipment for the number of casualties involved
- Provide sufficient MD4 structures and associated equipment for the number of emergency responders
- Consider requests from the police and ambulance service to support multi-agency emergency responder decontamination

Tactical actions

Specialist responders should:

- Erect the MD structures in appropriate locations, in consultation with the requesting fire and rescue service's incident commander and the DIM team
- Set up the appropriate MD equipment, with an appropriate layout, for the type and number of casualties

- Have personnel in place to carry out the MD, including providing guidance to people, operating and servicing the decontamination equipment

Control measure - Mass decontamination: Members of public

Control measure knowledge

It may be difficult to assess if casualties in the vicinity of the release have been contaminated and to what extent. Therefore it may be appropriate to put everyone who may have been exposed to the contaminant through the mass decontamination (MD) process.

If casualties have undergone any decontamination prior to the arrival of National Resilience (NR) resources, they may also be processed through clinical decontamination or MD if required.

Before entering the MD shower structure, casualties will need to remove the disrobe pack clothing in the MD undressing area. The PRPS teams should remove the discarded disrobe pack clothing from the undressing area after each group of casualties have left it. Discarded disrobe pack clothing should be kept in a suitable area, or areas, within the hazard area.

Whenever possible the maximum number of casualties should be processed through the shower structures on each decontamination cycle; this will ensure the best response for the greatest number of casualties is achieved.

However, distress of the casualties or other factors may affect the efficiency of the decontamination process. Examples of issues that may be encountered, and considerations that may assist, are provided below:

Casualties involved	Considerations for decontamination
Children	• May be less distressed if kept with their family, or accompanied by an older child • May not be able to understand or follow instructions • May need additional reassurance • May respond better to personnel whose face they can see

Casualties involved	Considerations for decontamination
People with physical health conditions	• Should preferably be decontaminated by the ambulance service • May need assistance, preferably from a carer • May take longer to go through the decontamination process • Prosthetic limbs and mobility aids may need to go through a separate decontamination process
Visually impaired or hearing impaired	• Should preferably be decontaminated by the ambulance service • May require assistance or support
People with mental health conditions	• Should preferably be decontaminated by the ambulance service • May need assistance, preferably from a carer • May take longer to go through the decontamination process • May not be able to understand or follow instructions • May need additional reassurance • May respond better to personnel whose face they can see
People with gender, cultural or religious sensitivities	• Separate MD structures may need to be used, to provide a level of privacy • Community leaders may be able to provide reassurance
People who do not understand English	• Seek other casualties who are able to translate instructions and information • Consider using an interpretation service • Refer casualties to the pictograms provided in the disrobe packs • Provide demonstrations of the processes

The fire and rescue service should not be expected to independently provide decontamination for arrested or detained persons as the process can be dangerous and complex. However, the fire and rescue service may need to provide assistance to the police for the decontamination of detainees at the scene.

The arresting police officers will accompany their detainees through decontamination to:

- Ensure evidence is not lost or discarded
- Protect fire and rescue personnel and ambulance service personnel from violence, or threats

of violence
- Prevent any escape attempts

The police will need to retain clothing and property removed from a detainee, as this will be evidential property, although it may need to undergo decontamination.

Strategic actions

National Resilience should:

- Provide sufficient and appropriate decontamination materials, including absorbent material, water and water additives

Tactical actions

Specialist responders should:

- Treat all casualties with respect and provide appropriate instructions, guidance and assistance
- Communicate with casualties throughout the decontamination process
- Provide absorbent material for people to remove surface contamination
- Provide wet decontamination for people contaminated with caustic materials
- Remove discarded disrobe pack clothing and retain in the hazard area
- Assist the police with the decontamination of arrested or detained persons

Control measure - Mass decontamination: Re-robing and handover of decontaminated casualties

Control measure knowledge

When the casualties have been decontaminated, they will need to be provided with re-robe packs, delivered in cages to the MD re-robe structure. There will need to be sufficient re-robe packs delivered in time to provide clothing for decontaminated ambulant casualties leaving the MD structures.

As it can take longer for casualties to re-robe than to shower, bottlenecks will need to be controlled. This could be by slowing down the rate of decontamination or by providing additional re-robe facilities.

Some casualties may need assistance with re-robing, and personnel should provide instructions, guidance and assistance to the casualties on how to use the re-robe packs. As detailed in the control measure for Decontaminating casualties, consideration may need to be given to the types of casualties involved and appropriate adjustments made for the re-robing process.

The fire and rescue service will pass responsibility for decontaminated casualties to other agencies following the decontamination and re-robe processes.

The ambulance service will provide any immediate clinical assistance and will also be responsible for ensuring decontaminated casualties are provided with medical aftercare, including hospital treatment if required.

The police are responsible for carrying out immediate investigation once the casualties are decontaminated and re-robed. The police will set up information sharing between agencies in support of the casualty bureau function, and attempt to identify any survivors who left the scene of the incident without going through the decontamination process.

Strategic actions

National Resilience should:

- Provide sufficient re-robe packs and facilities for the number of casualties involved

Tactical actions

Specialist responders should:

- Provide re-robe packs to the casualties
- Treat all casualties with respect and provide appropriate instructions, guidance and assistance

- Communicate with casualties throughout the re-robe process
- Consider the potential for hypothermia of casualties and provide additional protection, such as emergency blankets
- Hand over the decontaminated casualties to an appropriate agency for onward care

Control measure - Mass decontamination: Environmental considerations

Control measure knowledge

The pre-determined and structured MD process has a statutory requirement to contain water, unlike unstructured or initial operational response (IOR) decontamination, where every effort should be made to contain water.

Contaminants and contaminated materials gathered during a mass decontamination (MD) response should ideally be contained at the scene until analysed and identified. Once the type of contamination has been identified, a decision can be made on the treatment needed to make the material harmless for disposal, or following a risk assessment, which disposal process can be used.

Sewage or wastewater service providers and environmental agencies should be consulted as soon as possible before discharging any contaminated water to waste, or if contaminated water has already entered the drainage system. This will enable measures to take place to protect the sewage or wastewater system or to divert contaminated water from treatment works.

Sewage or wastewater service providers and environmental agencies will try to provide prompt advice to emergency responders. Their advice on environmental impact and drainage issues should help to implement actions that will mitigate the potential impact of decontamination water run-off.

For further information on this topic refer to the National Operational Guidance: Environmental protection – Control measure: Decontamination.

Strategic actions

National Resilience should:

- Provide equipment to contain run-off from the decontamination procedure

Fire and rescue services should:

- Have arrangements in place to organise the safe disposal of contaminated run-off

Tactical actions

Specialist responders should:

- Ensure the area being used for decontamination is suitable; consider its topography for any slopes or dips which will allow run-off to flow or collect
- Establish the physical properties of the contaminant and the hazards it presents to the environment
- Ensure solid waste, such as disrobe and re-robe packs, is managed for disposal

Incident commanders should:

- Recognise drainage types and prioritise the blocking of surface drains
- Consider the potential for the contaminant to spread while the response plan is being implemented
- Assess the environmental impact of the MD response
- Assess the effectiveness of containment facilities
- Ensure that the appropriate sewage or wastewater service providers and environmental agencies are informed about the incident as soon as possible
- Seek specialist advice regarding the appropriate disposal of all run-off and other contaminated waste from the decontamination process

Control measure - Closing down a mass

Control measure knowledge

Fire and rescue service appliances and equipment, used or deployed outside of the hazard area, should be available for return to service once the mass decontamination (MD) response to the incident is completed.

Equipment used for the decontamination process, including boilers, heaters, containment dams, should remain in place until scientific advice is obtained about the best methods for its decontamination or disposal.

The Department for Environment, Food and Rural Affairs (Defra) will take the lead role in facilitating the required decontamination or disposal processes.

All MD units should be inventory checked and shortages recorded to enable restocking, to ensure the earliest availability for redeployment.

Criminal investigations

The police service may:

- Impound fire and rescue service assets as part of their incident investigation
- Gather material evidence from fire and rescue service personnel
- Take statements from fire and rescue service personnel

Post-incident activity

Other things that should be considered post-incident include:

- Record keeping and document management
- Critical incident stress management (defusing) of crews in line with individual fire and rescue service welfare procedures
- Debriefing, subject to police guidance

Other issues may be addressed by a recovery working group if established for the incident.

Strategic actions

National Resilience should:

- Keep a record of any MD resources that are affected by equipment shortages, where it may impact on the ability for them to respond to further incidents

Tactical actions

Incident commanders should:

- Carry out an inventory check of all MD units
- Restock MD units for redeployment
- Ensure that MD equipment that has been used is decontaminated and returned to the MD-hosting fire and rescue service, subject to scientific advice
- Release equipment to the police for investigation purposes if required
- Provide evidence and statements to the police if required

Hazard - Chemical, Biological, Radiological, Nuclear (explosive) event

Hazard Knowledge

CBRN(e) terrorism entails the assumption or knowledge, based on intelligence or actual evidence, of actual or threatened dispersal of chemical, biological, radiological or nuclear material (either on their own or with explosives), with deliberate, criminal, malicious or murderous intent, targeted at a given population or economic or symbolic points. The CBRN material may initially be expelled in all directions and spread over a wide area from the point of release. The fallout of the explosion may also contain undetonated explosive material.

A CBRN(e) event has many elements. The impact and response will vary depending on the nature of the material and event, for example:

- A chemical attack may produce rapid onset of severe symptoms. Many chemical agents can be readily detected and potentially identified with specialist equipment
- A biological release may not be identified for some time and may only be recognised through health monitoring. The scene of any release may be unidentified
- A radiological release may be accompanied by explosives (a dirty bomb), or the dispersal of radioactive particulates into the air with no obvious sudden onset of symptoms
- A nuclear attack is likely to be readily identified and result in immediate, with catastrophic consequences and a long-lasting radiation hazard

- Explosives may be used as a means of dissemination for the above materials or as an additional method of attack. In the context of this document the lower case (e) is used to differentiate the use of explosives only as a means of dissemination

Whilst any such incident is ongoing there will be a continued threat to life. Uncertainty about release locations, spread of contamination and the intent and capability of the terrorists means that the management of life-saving interventions may be much more difficult than for other major incidents.

The hazard area of a CBRN(e) event will vary in size depending on the following factors:

- The type and concentration of CBRN material; this can be affected by water and temperature
- The form of the material (gas, vapour, liquid, solid)
- Method of distribution
- The movement of contaminated people, vehicles and objects
- Weather and topography

A CBRN(e) event, over and above a hazardous materials event, may have the potential for:

- Multiple events caused by secondary devices
- More than one area of release
- Material being intentionally spread or channelled
- Perpetrators to use virulent agents that may be both persistent and difficult to identify
- Perpetrators or terrorists present
- Safety signage or information to be changed, removed or concealed
- Locations to be selected that exploit the characteristics of the attack
- Increased public and emergency responder exposure

CBRN(e) may be difficult to recognise, resulting in initial responders being deployed to the scene. Initial responders could inadvertently drive into or through a contaminated area en route to the incident. Airborne contamination is not easily identifiable although some visual indicators may be present.

Casualties of a CBRN(e) attack may be traumatised by witnessing the incident and the effect it is having on others, or because of being contaminated themselves. Casualties may act unexpectedly; for example, they may be unresponsive to commands or unaware of the potential danger they are in.

CBRN materials

Chemical

Chemical agents used as weapons can cause temporary incapacity, permanent harm or death. There may be a rapid onset of medical symptoms, such as nausea, vomiting, burns or skin rashes. There may be visual indicators such as a coloured residue, dead foliage, pungent odour or dead animals.

Chemical agents can be classified as:

- Nerve agents such as sarin, VX or VR – these usually gain access to the body through the skin or lungs
- Respiratory agents such as chlorine or phosgene – these are inhaled and either cause damage to the lungs, or are transmitted to the body via the lungs
- Blister agents such as mustard gas or nerve agents – these are absorbed through the skin, either damaging it, or are transmitted to the body via the skin, or both

A further classification is based on the duration of the hazard. Persistent agents such as mustard gas may remain in the affected area for several weeks. They:

- Are usually substances of low volatility
- Contaminate surfaces
- Have the potential to damage the skin on contact and may release vapours which are inhaled
- May be used to create obstacles, contaminate strategic places or equipment, thereby making access difficult

Non-persistent agents, such as hydrogen cyanide or phosgene, evaporate or disperse quickly. They:

- Are usually volatile substances
- May be used to incapacitate people in an area that the perpetrator is trying to gain access after the release
- Do not usually contaminate surfaces
- Cause harm through inhalation and may damage the skin

Chemical agents used as weapons are effective because of their toxicity, that is, their chemical action can cause death, permanent harm or temporary incapacity.

Chemical incidents are characterised by the rapid (minutes to hours) onset of medical symptoms, e.g. nausea, vomiting, burns/rash, etc. and readily observed signatures (coloured residue, dead foliage, pungent odour, and dead insect and animal life).

Biological

The deliberate release of biological agent is intended to infect people with pathogenic microorganisms such as viruses. Biological agents can multiply in a host over time. In the case of a biological incident, the onset of symptoms requires days to weeks and there may be no immediate symptoms. Because of the delayed onset of symptoms in a biological incident, the area affected may be much greater due to the movement of infected people.

Biological agents used as weapons are those that achieve their intended effects by infecting people with pathogenic microorganisms and other replicative entities, including viruses, infectious nucleic acids and prions. The chief characteristic of biological agents is their ability to multiply in a host over time. The disease they may cause is the result of the interaction between the biological agent, the host (including the host's genetic constitution, nutritional status and the immunological status of the host's population) and the environment (e.g. sanitation, temperature, water quality, population density).

Because the onset of symptoms at a biological incident can sometimes be delayed, the area affected may be much greater due to the migration of infected individuals. This may need to be considered when determining cordon sizes.

Biological agents are commonly classified according to their taxonomy (e.g. fungi, bacteria, viruses). This classification is important because of its implications for detection, identification, prophylaxis and treatment.

Radiological

Radiological materials are not recognisable by the senses, as they are colourless and odourless. Specialised equipment is required to determine the size of the affected hazard area and if the level of radioactivity presents an immediate or long-term health hazard. The onset of symptoms often requires days to weeks. Because of the delayed onset of symptoms in a radiological incident, the affected area may be much greater due to the movement of contaminated people.

Radiological dispersal devices (RDD) are designed to disperse radioactive material to cause destruction, contamination, and injury from the radiation produced by the material. An RDD can be almost any size, defined only by the amount of radioactive material and explosives.

- A passive RDD is a system in which unshielded radioactive material is dispersed or placed manually at the target
- An explosive RDD, often called a dirty bomb, is any system that uses the explosive force of detonation to disperse radioactive material
- An atmospheric RDD is any system in which radioactive material is converted into a form that is easily transported by air currents

Use of an RDD could result in health, environmental, and economic effects as well as political and social effects. It will cause fear, injury, and possibly lead to levels of contamination requiring costly and time-consuming clean-up efforts.

Nuclear

An improvised nuclear device (IND) is intended to cause a yield-producing nuclear explosion. An IND could consist of diverted nuclear weapon components, a modified nuclear weapon, or indigenous-designed device. Unlike RDDs, that can be made with almost any radioactive material, INDs require fissile material (such as highly-enriched uranium or plutonium) to produce nuclear yield.

Control measure - Procedures for a confirmed or suspected CBRN(e) event

Control measure knowledge

If the incident is confirmed or suspected to be due to a CBRN or CBRN(e) event, key steps need to be taken without delay. There will need to be the involvement of several agencies and specialist emergency response will be essential, particularly detection, identification and monitoring (DIM) activity and possibly a requirement for mass decontamination (MD).

Detection and monitoring equipment for CBRN(e) incidents is not limited to those provided specifically for this CBRN(e) but may include those provided for industrial HazMat purposes. Examples include electronic personal dosimeters (EPD).

The definition of detection and monitoring and categorisation is:

- Detection: recognising the presence of CBR material
- Monitoring: a continuous or periodic process of qualitatively or quantitatively determining the presence or absence of CBR material
- Categorisation: A partial identification of CBR material

The JESIP document, Responding to a CBRN(e) event: Joint operating principles for the emergency services, provides guidance for the emergency services in how to plan, prepare and work together to respond to CBRN(e) incidents effectively.

Strategic actions

Fire and rescue services should:

- Pre-plan for a multi-agency response to a CBRN or CBRN(e) event
- Make provision for appropriate specialist emergency response for a CBRN or CBRN(e) event
- Ensure their personnel are made aware of the need to be aware of who is present at a potential CBRN(e) incident and the possibility of perpetrators or terrorists still being present

Tactical actions

Incident commanders should:

- Request the appropriate emergency response for a confirmed or suspected CBRN or CBRN(e) event
- Instigate the deployment of mass casualty decontamination resources as soon as the need is identified

Control measure - Mass decontamination: Set up structures

Control measure knowledge

MD1 structures are used for disrobing, MD2 structures provide shower facilities, MD3 structures are used for re-robing and MD4 structures are used for emergency responders.

The MD4 structure will usually be erected first, and a team of three powered respirator protective suit (PRPS) wearers will be deployed into the warm zone; they will communicate with and reassure the casualties. A PRPS emergency team will be established at the same time.

The remaining MD structures will then be erected; they should be located as close as possible to the MD4 structure, allowing for ancillary equipment between the structures. Each area of MD operations should be considered as a sector in its own right.

Care should be taken when siting the MD structures, as it is not possible to move them during an incident. The structures, along with supporting equipment and other resources, require a large area. Advice on the location of the MD structures may be sought from the tactical advisers (TacAds) and other multi-agency partners.

The MD sector may be supported by an MD support unit (MDSU), which contains additional MD equipment.

Strategic actions

National Resilience should:

- Mobilise National Resilience (NR) resources, including tactical advisers (TacAds), to appropriate incidents to carry out mass decontamination (MD)
- Work with partner agencies to ensure the MD process is interoperable
- Provide sufficient MD structures and associated equipment for the number of casualties involved
- Provide sufficient MD4 structures and associated equipment for the number of emergency responders

- Consider requests from the police and ambulance service to support multi-agency emergency responder decontamination

Tactical actions

Specialist responders should:

- Erect the MD structures in appropriate locations, in consultation with the requesting fire and rescue service's incident commander and the DIM team
- Set up the appropriate MD equipment, with an appropriate layout, for the type and number of casualties
- Have personnel in place to carry out the MD, including providing guidance to people, operating and servicing the decontamination equipment

Control measure - Mass decontamination: Members of public

Control measure knowledge

It may be difficult to assess if casualties in the vicinity of the release have been contaminated and to what extent. Therefore it may be appropriate to put everyone who may have been exposed to the contaminant through the mass decontamination (MD) process.

If casualties have undergone any decontamination prior to the arrival of National Resilience (NR) resources, they may also be processed through clinical decontamination or MD if required.

Before entering the MD shower structure, casualties will need to remove the disrobe pack clothing in the MD undressing area. The PRPS teams should remove the discarded disrobe pack clothing from the undressing area after each group of casualties have left it. Discarded disrobe pack clothing should be kept in a suitable area, or areas, within the hazard area.

Whenever possible the maximum number of casualties should be processed through the shower structures on each decontamination cycle; this will ensure the best response for the greatest number of casualties is achieved.

However, distress of the casualties or other factors may affect the efficiency of the

decontamination process. Examples of issues that may be encountered, and considerations that may assist, are provided below:

Casualties involved	Considerations for decontamination
Children	• May be less distressed if kept with their family, or accompanied by an older child • May not be able to understand or follow instructions • May need additional reassurance • May respond better to personnel whose face they can see
People with physical health conditions	• Should preferably be decontaminated by the ambulance service • May need assistance, preferably from a carer • May take longer to go through the decontamination process • Prosthetic limbs and mobility aids may need to go through a separate decontamination process
Visually impaired or hearing impaired	• Should preferably be decontaminated by the ambulance service • May require assistance or support
People with mental health conditions	• Should preferably be decontaminated by the ambulance service • May need assistance, preferably from a carer • May take longer to go through the decontamination process • May not be able to understand or follow instructions • May need additional reassurance • May respond better to personnel whose face they can see
People with gender, cultural or religious sensitivities	• Separate MD structures may need to be used, to provide a level of privacy • Community leaders may be able to provide reassurance
People who do not understand English	• Seek other casualties who are able to translate instructions and information • Consider using an interpretation service • Refer casualties to the pictograms provided in the disrobe packs • Provide demonstrations of the processes

The fire and rescue service should not be expected to independently provide decontamination for arrested or detained persons as the process can be dangerous and complex. However, the fire and rescue service may need to provide assistance to the police for the decontamination of detainees at the scene.

The arresting police officers will accompany their detainees through decontamination to:

- Ensure evidence is not lost or discarded
- Protect fire and rescue personnel and ambulance service personnel from violence, or threats of violence
- Prevent any escape attempts

The police will need to retain clothing and property removed from a detainee, as this will be evidential property, although it may need to undergo decontamination.

Strategic actions

National Resilience should:

- Provide sufficient and appropriate decontamination materials, including absorbent material, water and water additives

Tactical actions

Specialist responders should:

- Treat all casualties with respect and provide appropriate instructions, guidance and assistance
- Communicate with casualties throughout the decontamination process
- Provide absorbent material for people to remove surface contamination
- Provide wet decontamination for people contaminated with caustic materials
- Remove discarded disrobe pack clothing and retain in the hazard area
- Assist the police with the decontamination of arrested or detained persons

Control measure - Mass decontamination: Re-robing and handover of decontaminated casualties

Control measure knowledge

When the casualties have been decontaminated, they will need to be provided with re-robe packs, delivered in cages to the MD re-robe structure. There will need to be sufficient re-robe packs delivered in time to provide clothing for decontaminated ambulant casualties leaving the MD structures.

As it can take longer for casualties to re-robe than to shower, bottlenecks will need to be controlled. This could be by slowing down the rate of decontamination or by providing additional re-robe facilities.

Some casualties may need assistance with re-robing, and personnel should provide instructions, guidance and assistance to the casualties on how to use the re-robe packs. As detailed in the control measure for Decontaminating casualties, consideration may need to be given to the types of casualties involved and appropriate adjustments made for the re-robing process.

The fire and rescue service will pass responsibility for decontaminated casualties to other agencies following the decontamination and re-robe processes.

The ambulance service will provide any immediate clinical assistance and will also be responsible for ensuring decontaminated casualties are provided with medical aftercare, including hospital treatment if required.

The police are responsible for carrying out immediate investigation once the casualties are decontaminated and re-robed. The police will set up information sharing between agencies in support of the casualty bureau function, and attempt to identify any survivors who left the scene of the incident without going through the decontamination process.

Strategic actions

National Resilience should:

- Provide sufficient re-robe packs and facilities for the number of casualties involved

Tactical actions

Specialist responders should:

- Provide re-robe packs to the casualties
- Treat all casualties with respect and provide appropriate instructions, guidance and assistance
- Communicate with casualties throughout the re-robe process
- Consider the potential for hypothermia of casualties and provide additional protection, such as emergency blankets
- Hand over the decontaminated casualties to an appropriate agency for onward care

Control measure - Mass decontamination: Environmental considerations

Control measure knowledge

The pre-determined and structured MD process has a statutory requirement to contain water, unlike unstructured or initial operational response (IOR) decontamination, where every effort should be made to contain water.

Contaminants and contaminated materials gathered during a mass decontamination (MD) response should ideally be contained at the scene until analysed and identified. Once the type of contamination has been identified, a decision can be made on the treatment needed to make the material harmless for disposal, or following a risk assessment, which disposal process can be used.

Sewage or wastewater service providers and environmental agencies should be consulted as soon as possible before discharging any contaminated water to waste, or if contaminated water has already entered the drainage system. This will enable measures to take place to protect the sewage or wastewater system or to divert contaminated water from treatment works.

Sewage or wastewater service providers and environmental agencies will try to provide prompt advice to emergency responders. Their advice on environmental impact and drainage issues should

help to implement actions that will mitigate the potential impact of decontamination water run-off.

For further information on this topic refer to the National Operational Guidance: Environmental protection – Control measure: Decontamination.

Strategic actions

National Resilience should:

- Provide equipment to contain run-off from the decontamination procedure

Fire and rescue services should:

- Have arrangements in place to organise the safe disposal of contaminated run-off

Tactical actions

Specialist responders should:

- Ensure the area being used for decontamination is suitable; consider its topography for any slopes or dips which will allow run-off to flow or collect
- Establish the physical properties of the contaminant and the hazards it presents to the environment
- Ensure solid waste, such as disrobe and re-robe packs, is managed for disposal

Incident commanders should:

- Recognise drainage types and prioritise the blocking of surface drains
- Consider the potential for the contaminant to spread while the response plan is being implemented
- Assess the environmental impact of the MD response
- Assess the effectiveness of containment facilities
- Ensure that the appropriate sewage or wastewater service providers and environmental

agencies are informed about the incident as soon as possible

- Seek specialist advice regarding the appropriate disposal of all run-off and other contaminated waste from the decontamination process

Control measure - Closing down a mass decontamination (MD) response

Control measure knowledge

Fire and rescue service appliances and equipment, used or deployed outside of the hazard area, should be available for return to service once the mass decontamination (MD) response to the incident is completed.

Equipment used for the decontamination process, including boilers, heaters, containment dams, should remain in place until scientific advice is obtained about the best methods for its decontamination or disposal.

The Department for Environment, Food and Rural Affairs (Defra) will take the lead role in facilitating the required decontamination or disposal processes.

All MD units should be inventory checked and shortages recorded to enable restocking, to ensure the earliest availability for redeployment.

Criminal investigations

The police service may:

- Impound fire and rescue service assets as part of their incident investigation
- Gather material evidence from fire and rescue service personnel
- Take statements from fire and rescue service personnel

Post-incident activity

Other things that should be considered post-incident include:

- Record keeping and document management
- Critical incident stress management (defusing) of crews in line with individual fire and rescue service welfare procedures
- Debriefing, subject to police guidance

Other issues may be addressed by a recovery working group if established for the incident.

Strategic actions

National Resilience should:

- Keep a record of any MD resources that are affected by equipment shortages, where it may impact on the ability for them to respond to further incidents

Tactical actions

Incident commanders should:

- Carry out an inventory check of all MD units
- Restock MD units for redeployment
- Ensure that MD equipment that has been used is decontaminated and returned to the MD-hosting fire and rescue service, subject to scientific advice
- Release equipment to the police for investigation purposes if required
- Provide evidence and statements to the police if required

Hazard - Environmental harm

Hazard Knowledge

For hazard knowledge see National Operational Guidance: Environmental Protection: Polluting materials

Control measure - Containment

Control measure knowledge

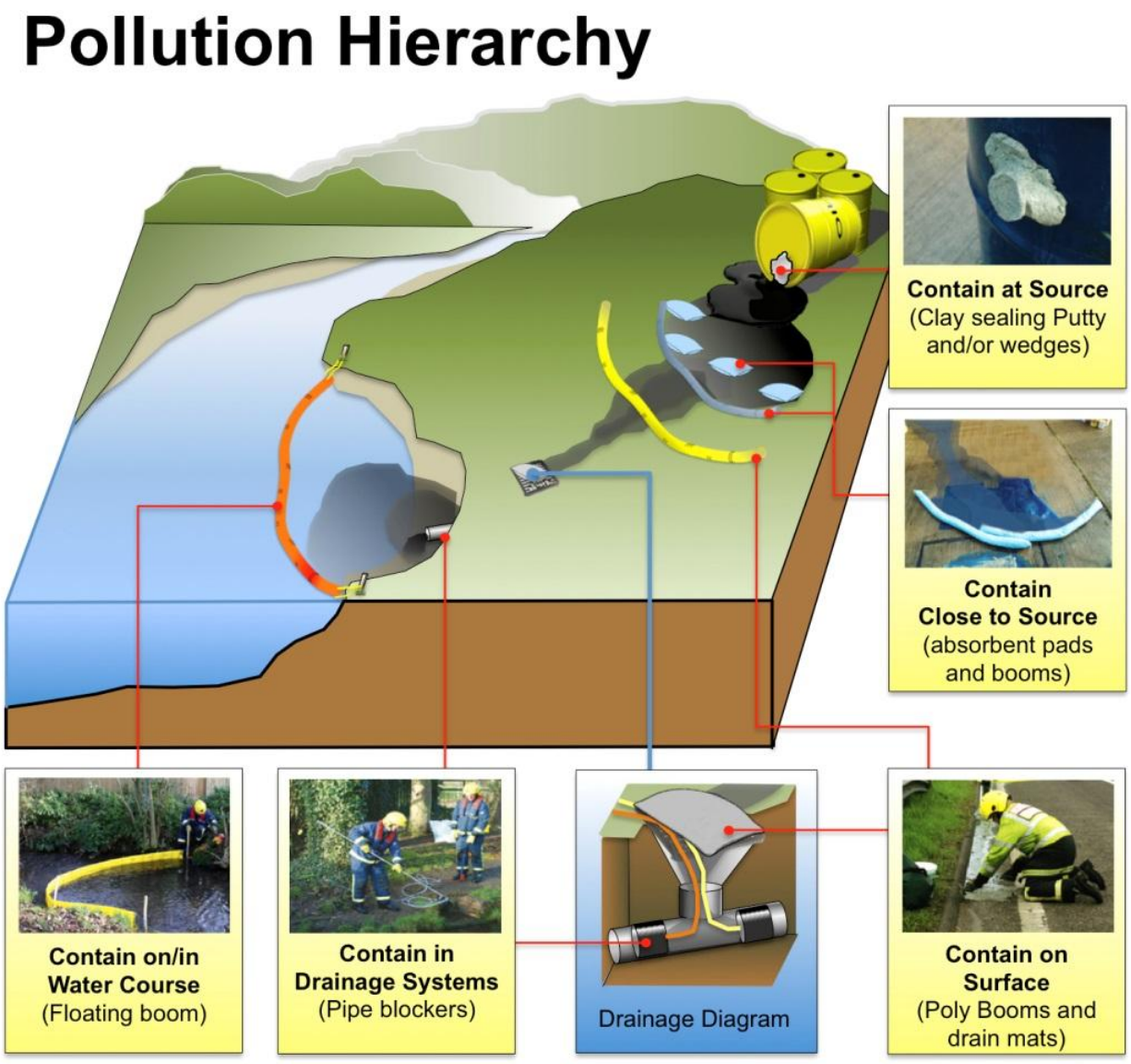
The principle of containment whenever practicable and safe to do so is the preferred approach to managing incidents where polluting liquids or materials have been released or generated by on-site activities, including firefighting.

This hierarchy should be used in most instances when containing contaminated fire water run-off and spillages of polluting materials:

Hierarchy	Activity	Description
1	Containment at source	The most effective intervention point is where the source of pollution can be controlled to stop or reduce the volume released. Methods include the use of clay seal putty, leak sealing devices, wedges, and drums. Contaminated fire water will ideally be contained at an incident scene either inside the building or as close to it as possible.
2	Containment close to source	The next point of intervention is as close to the source as possible. This may be when it is not possible to contain at source or where there has already been significant loss of pollutant. Methods include the use of grab packs, booms and pop-up pools.
3	Containment on the surface	The most common way for contaminants to enter the environment is via drainage systems. Methods to prevent this include the use of booms, clay drain mats, pipe blockers, pumps, and inflatabe dams.
4	Containment in drainage system	Pollutants may be contained in drainage systems if they have already entered the system. This can be carried out using in-built pollution control devices in the drainage systems such as oil separators, drain closure valves and containment lagoons/tanks and ponds. Such a system should allow predictable volumes of run-off to be stored, although allowance should be made for rainfall and how well systems have been maintained. Portable equipment such as pipe blockers can also be used.

5	Containment on or in watercourse	The deployment of booms on a watercourse downstream of an incident is of significant benefit where a pollutant floats. Damming can be used where pollutants are mixed or do not float but is normally restricted to small ditches and streams with low flows. Booms can also be deployed around drinking water intakes.

See Section 3.2, Environmental Protection Handbook.



Off-site containment is an alternative that can be considered by fire and rescue services. Foul sewerage systems can be used to contain polluting material if approved by the sewerage company

and environment agency. When doing so take care that pollutants and sewage do not escape from any storm overflows into the sewerage system. The contained pollutants and sewage may then be removed.

It may also be possible to divert pollutants to a local sewage treatment works, where the pollutant can either be treated in the treatment process or contained in storm tanks before deciding on disposal. These tanks are present at many treatment works and are used to store the large volumes of diluted sewage produced during high rainfall. Approval from the sewerage company must be sought before diverting pollutants to a sewage treatment works because the treatment process can be affected if levels of pollution are too high. This would result in the release of both pollutants and untreated or partially treated sewage. See Section 1.66, Environmental Protection Handbook.

Pollution control devices such as drain closure valves, storage lagoons or balancing ponds are installed in some surface water drainage systems. These devices can be used to help contain pollutants if permission is given by the sewerage company, the owner/occupier or highway authority. In some places the environment agencies keep large volume pumps that can be used to support, supplement or replace fire and rescue service pumps.

Unless there is an immediate risk to life, containment measures can be used and advice and guidance from environment agencies should be sought before making any attempt to dilute. Never add detergent or any other cleaning products to spillages and never hose spillages to the drain without prior authority from the environment agencies and/or sewerage undertakers.

For further information see the Environmental Protection Handbook.

Strategic actions

Fire and rescue services should:

- Develop procedures for containing fire water run-off
- Obtain sewerage information from local sewerage undertaker
- Consider the inclusion of drainage information in operational risk plans. See National Operational Guidance: Operations

Tactical actions

Incident commanders should:

- Minimise the impact of the incident and fire service actions on any identified environmental risk
- Consider the legal exemptions in relation to environmental protection i.e.
    - A discharge is made in an emergency to avoid danger to human health
    - All reasonably practicable steps were taken to minimise pollution

    - The relevant environment agency is informed of the incident as soon as possible
- Consider carrying out an environmental risk assessment to identify:
    - Site drainage
    - local surface waters and/or groundwater and vulnerability
- Attempt to control pollution using a Source – Pathway - Receptor model
- Consider the availability of pollution control equipment and/or pollution containment facilities on site
- Establish the location of the nearest sewage treatment works, and whether it has the capacity to contain and or treat fire water run-off?
- Inform and/or seek advice from environment agencies and/or sewage undertakers where necessary
- Consider diverting water to holding areas or sacrificial areas that will not affect firefighting operations
- Identify potential drainage routes for fire water run-off and released vehicle content
- Consider future disposal options. See section Disposal
- Identify the location of motorway pollution control devices (PCD) and operate as necessary
- Communicate any risk to the environment to those attending the incident and relevant agencies

Control measure - Absorption

Control measure knowledge

Minor spillages can be contained using absorbent materials like pads, sheets and booms.

Hazardous materials will retain their hazardous properties when absorbed and this must be considered when handling any absorbed material. Soil, sand and cement all have absorbent qualities and can also be used to create improvised containment barriers or bunds. Absorbent materials should not be used for larger spillages because of the amount of waste that will be created and the cost of disposing it.

Fire and rescue services will normally have the responsibility for disposing of waste they generate at incidents they attend.

Strategic actions

Fire and rescue services should:

- Identify arrangements for the disposal of contaminated absorbents where the responsibility for waste disposal cannot be identified
- Refer to control measure actions for disposal of contaminated firewater run off under fire water run-off

Tactical actions

Incident commanders should:

- Consider the appropriate type of absorbent to be used for the pollutants
- Consider the benefits of using absorbents against the cost of disposal
- Consider how contaminated absorbent materials will be disposed of in consultation with the relevant environment agency and responsible persons based on the "polluter pays" principle.
- Consider identifying who is responsible for the disposal. See Disposal section in Fire water run-off

Control measure - Treatment

Control measure knowledge

Treatment of pollution in a watercourse, for example using activated carbon, or hydrogen peroxide are specialised techniques employed by an environment agency or specialist contractor rather than fire and rescue service personnel. However fire and rescue services maybe asked to assist at

incidents where such techniques are employed subject to local agreement.

Strategic actions

Fire and rescue services should:

- Identify activities that will and will not be carried out by fire and rescue service personnel and equipment

Tactical actions

Incident commanders should:

- Ensure that where fire and rescue service personnel or equipment are requested to assist with any form of treatment activity a close liaison with the local environment agency and, where appropriate, specialist advisers is maintained

Control measure - Dilution

Control measure knowledge

In certain situations the best way to deal with domestic quantities of spillage may be to dilute it with a large amount of water. High levels of dilution should ensure that pollutants have little impact on the environment. It is important to consider the pollutant type and quantity, and how sensitive the receiving water is before doing this.

Approval should also be sought from the environment agency and sewerage company before diluting a spillage unless there is an immediate life risk. In such circumstances they must be informed as soon as is reasonably practicable. See Guideline notification criteria Appendix 4, Environmental Protection Handbook

Strategic actions

Fire and rescue services should:

- Ensure that fire and rescue service managers who are likely to be in command of an incident involving hazardous materials and/or environmental risk, or are likely to perform the

specialist advisory role of hazardous materials advisor (HMA), receive specialist environmental training. This training should place emphasis on larger-scale incidents where there is significant environmental risk

- Consider mobilising or involving a Hazardous Materials Advisor (HMA for any incident with the potential to pollute the environment, not only those incidents involving hazardous materials. See section 3.3, Environmental Protection Handbook

- Identify triggers where the local environment agency should be informed or where advice should be requested

- Secure access to more detailed advice from scientific advisers or from the CHEMSAFE service provided by the National Chemical Emergency Centre (NCEC)

Tactical actions

Incident commanders should:

- Contain the spill
- Seek guidance from environment agencies before any attempt at dilution

- Not flush spillages down drains without approval from:

    - The local environment agency
    - Sewerage company

- Ensure that if detergents or other chemicals are added to spillages to assist with clean up or treatment the resulting mixture is not to be flushed down drains

Control measure - Aeration

Control measure knowledge

Organic pollutants such as milk and sewage will remove oxygen from bodies of water. Environment agencies and some specialist contractors can use aeration units or chemical methods to raise oxygen levels. Pumping the affected water into the air through hose jets is less effective but is a technique that can be used by fire and rescue services.

Strategic actions

Fire and rescue services should:

- Identify activities that will and will not be carried out by fire and rescue service personnel and equipment

Tactical actions

Incident commanders should:

- Liaise with the local environment agency and, where appropriate, specialist advisers when aeration is to be used to reduce environmental damage.

Control measure - Transportation

Control measure knowledge

There are strict controls on transporting hazardous waste. Fire and rescue services do have dispensation in exceptional, life saving circumstances. See Section 3.10.3, Environmental Protection Handbook.

Fire and rescue services are allowed to transport and store small quantities of non-hazardous waste from incidents.

Strategic actions

Fire and rescue services should:

- Be aware of their legal responsibilities and possible defences for the transportation of hazardous waste

- Develop procedures for the transportation and storage of small quantities of non-hazardous waste, which includes items such as disposable gloves or chemical protection suits. See Section 3.10.4, Environmental Protection Handbook

Tactical actions

Incident commanders should:

- Ensure that in the event that emergency transportation of hazardous waste is required, the relevant environment agency is to be informed of the incident as soon as possible and is involved in the decision to transport hazardous waste

- Ensure that fire and rescue service procedures relating to management and transportation of small quantities of non-hazardous waste are followed

Control measure - Disposal

Control measure knowledge

During the early stages of an incident when the fire service activities are more dynamic, it may not always be possible to contain fire water safely. In these circumstances use of the foul sewer should be considered for disposal. The flow rate should be controlled to avoid the foul sewer overflowing. Failure to control the flow could result in polluting water entering the water environment. See Fire water run-off.

At some incidents, the foul sewage system may be the best disposal option. If this is the case, the sewerage company must be contacted. They will consider the request and take account of the likely impact if they do not approve the discharge. Agreement from the appropriate environment agency must be obtained before any release takes place. This can be obtained by telephone but must be applied for and confirmed in writing later. See Section 1.6.6, Environmental Protection Handbook.

For further information see Section 3.10.3 Environmental Protection Handbook: The movement of hazardous waste by the fire and rescue service in emergencies.

For further information see Section 3.2.8 Environmental Protection Handbook.

Strategic actions

Fire and rescue services should:

- Be aware of their legal responsibilities and possible defences for the disposal of fire water

under the Environmental Permitting Regulations 2010 and Environmental Damage (Prevention and Remediation) Regulations 2015 (EDR 2015)

- Develop plans for the disposal of contaminated fire water run off which include plans for:
    - Use off-site storage within drainage infrastructure e.g. balancing ponds
    - Use of foul water drainage
    - Contingencies for where the responsibility for disposal cannot be identified

Tactical actions

Incident commanders should:

- Ensure that waste products created by the fire and rescue service are disposed of both legally and responsibly. The Environmental Permitting (England and Wales) Regulations 2010 (EPR 2010) provides two exceptions for the emergency disposal of contaminated fire water runoff where the primary focus of fire and rescue service actions is saving life:
    - Emergency discharge and subsequent contamination of the water environment
    - The removal of waste by a fire and rescue services using fire and rescue service equipment or vehicles
- Consider the legal exceptions. see Environmental Legislation
- Ensure that the relevant environment agency is informed of the incident as soon as possible and is be involved in the decision to discharge
- Inform sewerage undertakers if discharge is to foul the water sewerage system
- Identify if the responsibility for disposal of waste produced at an incident can be delegated to a third party based on location, material and quantities involved. Namely:
    - Local authority - Playing fields, public open spaces, beaches and some roads
    - Landowner or owner / occupier - Private property
    - Highways agency - (Road Service in Northern Ireland) - Major roads
- Identify if there are any alternative methods of disposal:
    - Suitable site arrangements for a waste disposal
    - Tankering away the contaminated water
- Identify potential drainage routes for fire water run-off and released vehicle content
- Ensure that waste products created by the fire and rescue service are disposed of legally and responsibly

Control measure - Air quality cell function

Control measure knowledge

If major chemical air pollution occurs at an incident, the environment agencies and public health bodies will set up an air quality cell. This will include other organisations including the Meteorological Office, the Health and Safety Laboratory and local authorities.

The air quality cell will co-ordinate air monitoring and will provide air quality information. Public health bodies use this information to provide health advice to responders and the public. See Section 3.8, Environmental Protection Handbook.

Similar arrangements exist in Wales, Northern Ireland and in Scotland, where Scottish Environment Protection Agency (SEPA) provides air quality monitoring through the Airborne Hazards Emergency Response (AHER) service.

Strategic actions

Fire and rescue services should:

- Ensure that lines of communication are in place to disseminate information provided by the air quality cell to incident commanders and other specialist advisers during major incidents or other significant events

Tactical actions

Incident commanders should:

- Implement appropriate control measures on the receipt of air quality information
- Consider requesting an air quality cell
- Monitor and review the potential impact on public health with the assistance of the public health agency

Hazard - Contaminated responders

Hazard Knowledge

The optimum situation is to avoid the contamination of responders by applying appropriate control measures. This hazard deals with situations where responders have been unavoidably contaminated. The purpose of decontamination is to remove the wearer from their personal protective equipment

Contaminated responders Firefighter decontamination Decontaminant additive Emergency decontamination procedures Decontaminate other responders Arrangements to deal with firefighter emergencies Hygiene: Hazardous materials Welfare

(PPE) while minimising the potential for any cross contamination. It should not be a task to clean the PPE.

To understand this hazard fully it is important that responders are familiar with the following definitions:

- **Primary or firefighter decontamination**: Using equipment in a planned and structured manner on the incident ground to minimise the risk of further harm and reducing cross-contamination to a level as low as reasonably practicable. This is primary decontamination to minimise risk, carried out on-site. Firefighter or primary decontamination is divided into three levels:
    - Initial decontamination: The decontamination of firefighters using equipment that is immediately available on a pumping appliance. It should be used in all cases where there has been unforeseen contamination of firefighters, where there is an immediate life risk or where, at a minor incident, the hazards posed by the substance can be adequately controlled by the procedures
    - Full decontamination: The decontamination of firefighters using decontamination equipment, structured procedures and personnel who have been fully trained in its use
    - Emergency decontamination: A quick method of removing a responder from their personal protective equipment (PPE). It is an additional control measure for exceptional circumstances such as a breakdown of PPE, for example ripped chemical protective clothing (CPC), self-contained breathing apparatus (SCBA) malfunction or an injured wearer. The decontamination procedure(s) to be adopted in such circumstances should be adapted from the principles and procedures detailed in this section
- **Secondary decontamination**: Further off-site decontamination that may involve washing, scrubbing, thermal treatment and airing. This should take place as soon as possible after the

incident and should be carried out by a competent person with access to specialist advice
- **Decontamination area**: The area containing the decontamination personnel, equipment and structures of the fire and rescue service, and possibly other emergency services. It is a suitable area initially established outside the inner cordon, at first uncontaminated by the initial release, which becomes contaminated by the managed and controlled movement of people who require decontamination. Before decontamination, the inner cordon will be adjusted to encompass the decontamination area. The decontamination area should always be divided into 'clean' and 'dirty' areas to minimise cross contamination. Disrobing and re-robing areas may also be designated

No universal decontamination method will work for every hazardous materials incident. Different decontamination methods will be required for chemical, radioactive and biological contamination. Chemical decontamination may involve mass dilution, for instance, whereas minimal quantities of water should generally be used for biological and radioactive contamination. Although decontamination methods may vary, the general framework of procedures and the structure of firefighter decontamination should not. It is vital that operational personnel are completely familiar with their set-ups and standard operating procedures. These should be flexible enough to allow for variations in the methods and scale of deco

Decontamination methods can be divided into two basic categories:

- Physical methods generally involve physically removing the contaminant from the contaminated person or object. Whilst these methods are often easier to perform and may dilute the concentration of the contamination (reducing its harmful effects) it generally remains chemically unchanged
- Chemical methods generally involve removing the contaminant by some type of chemical process. Chemicals that adhere to the surface of the chemical protective clothing (CPC) (surface contamination) are easy to remove. This means that until the chemical protective clothing has been decontaminated, the surface contamination presents the most significant risk to unprotected personnel handling it or to the wearer during disrobing. This is the reason CPC is decontaminated at the site, to remove the surface contamination before undressing (primary decontamination). Primary decontamination may not remove any chemicals that have been absorbed or that have permeated into the chemical protective clothing material (permeation or matrix contamination)

Accurate assessment of the degree of any remaining contamination of chemical protective clothing can only be made by proper laboratory procedures that may involve a destructive test, thereby making reuse of a test suit impossible. Chemicals that have been absorbed into the matrix of the CPC material may, in some cases, continue to diffuse through the material during storage, thereby presenting a possible risk of contamination to those who next wear or handle it.

Consideration of whether the equipment can be reused should be based on the assessment of the hazardous material involved and the circumstances of the incident.

General degradation of CPC may lessen the standard of chemical protection afforded. Degradation may be due to:

- Exposure to chemicals
- Mechanical damage
- Ageing

Generally, in the early stages of a HazMat incident improvised, initial or emergency decontamination may be instigated for decontaminating first responders where personnel have been committed to carry out immediate life-saving activities.

Control measure - Firefighter decontamination

Control measure knowledge

The type of decontamination will be based on several factors:

- The level and type of personal protective equipment (PPE) (structural firefighting PPE, liquid-tight or gas-tight chemical protective clothing or reusable or disposable protection)
- The type and quantity of contaminant
- The type and availability of decontamination additives
- The ability to monitor and detect contamination
- The availability of drainage and containment options
- The conditions of the weather (rain and wind)
- The topography of the area
- The availability of equipment to conduct the decontamination

The location of the decontamination area should consider the following:

- The topography of the ground – it should be a flat area or sloped away from unprotected personnel in the cold zone
- Wind direction should be blowing away from unprotected personnel
- Any drainage in the area should be identified as either surface, foul or combined drainage and then blocked using a suitable drain blocker or mat
- It should be set up in the cold zone until ready to receive contaminated members of personnel, at which point it will become the warm zone
- It should be appropriately marked to prevent unprotected people from entering the decontamination zone
- Operational circumstances and the risk assessment
- The level and method of decontamination
- The weather conditions
- Location of breathing apparatus entry control

- Location of a pumping appliance if wet decontamination is being provided

Disrobe assistants

The process of undressing contaminated personnel presents a high risk of contamination passing from the PPE to the operative and responder. The application of a strict and well-rehearsed undressing procedure is important in preventing this. It is important for personnel involved in this process to fully understand their role and the procedures to be adopted.

Every attempt should be made to contain run-off from the decontamination process until expert advice is received regarding appropriate disposal. See also Disposal of contaminated water (October 2012)

Strategic actions

Fire and rescue services should:

- Have systems to assess contamination of personal protective equipment (PPE) and other equipment
- Provide suitable equipment to conduct a decontamination process, or range of decontamination processes, based on the types of contamination likely or possible to be encountered during operational incidents in their area
- Ensure personnel that respond to HazMat incidents are provided with the necessary knowledge, skills and understanding to operate decontamination effectively
- Provide hazardous materials advisers (HMA) to determine appropriate decontamination including the use of any additive to assist in removing the contaminant
- Make arrangements for dealing with contaminated equipment, including equipment used inside the hot zone and the decontamination equipment used for the decontamination process
- Develop a decontamination method that allows for a dry/safe undress of contaminated personal protective equipment (PPE)
- Develop a range of emergency decontamination methods where speed is required when there has been a failure of air supply or personal protective equipment (PPE) or when contamination has occurred when only structural firefighting PPE is being worn
- Consider a methodology for dealing with personal protective clothing (PPE) when

decontamination has failed to clean away the contaminant

- Consider a process for disposing of items that are deemed disposable
- Provide arrangements for decontaminating or disposing of contaminated equipment that has been used inside the hot zone; this will require advice from specialist advisers
- Provide arrangements for dealing with the decontamination equipment once the process has been completed
- Have arrangements for testing reusable chemical protective clothing (CPC) which will confirm that CPC can be safely returned to service after decontamination, if appropriate. This includes accepting the risk around re-using CPC
- Have procedures for decontamination zone management which should be readily available to incident commanders and officers with specific responsibility for decontamination on the fire ground

Tactical actions

Incident commanders should:

- Consider firefighter decontamination arrangements prior to committing personnel to the hot zone
- Attempt to contain all run-off from the decontamination process until disposal arrangements are agreed
- Provide disrobe assistants in suitable personal protective equipment (PPE) to assist contaminated personnel

Control measure - Decontaminant additive

Control measure knowledge

Unless a contaminant is totally water soluble, based on advice from a hazardous materials adviser, then a simple water decontamination process is unlikely to be completely effective. In these situations it is likely that a decontamination additive would improve the procedure. If a chemical is water soluble, a large amount of water may be required to neutralise it, whereas a small amount of the appropriate additive may be equally or more effective. Large amounts of water present the issue of containment from the decontamination process.

Testing has also found that simply adding an additive to decontamination water is not always the most effective method of application. Adding anything to water tends to dilute it and, when dealing with strong, concentrated or persistent chemicals, the additive may need to be applied neat and then agitated. Likewise, it has been found that additives that would normally be considered as domestic, such as bottled bleach or low foaming detergents may not have a suitable shelf life for fire and rescue service (FRS) use. Household bleach (sodium hypochlorite) is already in solution and over time the amount of free chlorine reduces, and this is often further diluted before being used as a decontamination additive. This may be acceptable for minor biological materials such as effluent, but it has been shown to be unsuitable for pathogens and other biohazards. In these cases, bleach tablets are much more effective, as concentrated bleach can be prepared fresh at the incident. Commercially available degreasers are also far more effective against oils and oil-based materials than low foaming detergents.

For further information see control measure - Treatment: Hazardous materials

Strategic actions

Fire and rescue services should:

- Make arrangements to provide suitable additives for use with the decontamination process, taking advice from a hazardous materials adviser (HMA)
- Make arrangements to provide an appropriate method to deliver the additives to an incident
- Ensure there are appropriate procedures to determine the effectiveness of the additive/decontamination process

Tactical actions

Incident commanders should:

- Consult a hazardous materials adviser (HMA) regarding the correct use of decontamination additives

Control measure - Emergency decontamination procedures

Control measure knowledge

Decontamination procedures should be in place before fire and rescue service personnel enter the risk area. However, there may be situations where either the decontamination procedure has not been set up or a failure of equipment or personal protective equipment (PPE) leads to a requirement for a speedier decontamination procedure. For example:

• Personnel in structural firefighting PPE entering an incident where the presence of hazardous materials was unknown and contamination occurs

• Damage to chemical protective clothing (CPC) causing an opening or tear in the level of protection

• Failure or malfunction of self-contained breathing apparatus (SCBA)

• Injury or ill health of a member of personnel

In these situations, using a decontamination shower structure or other designed approach for decontamination may either be too time-consuming or unsuitable as it may exacerbate the problem (possibly by forcing a contaminant through a damaged suit).

Strategic actions

Fire and rescue services should:

- Develop a method for removing chemical protective clothing (CPC) in emergency situations
- Develop a method for removing structural firefighting PPE in emergency situations
- Recognise the possible need for health intervention for any personnel where emergency decontamination is required
- Ensure all personnel are aware of the procedures to be adopted for emergency decontamination
- Recognise that it may be unlikely for specialist advice to be available at the time when

emergency decontamination is required and therefore have procedures to ensure personnel have access to guidance in the methods to be used

- Investigate any circumstance that results in the need to perform emergency decontamination

Tactical actions

Incident commanders should:

- Instigate emergency procedures if personnel or responders are accidentally contaminated or exposed

Control measure - Decontaminate other responders

Control measure knowledge

The equipment that the fire and rescue service (FRS) uses for decontaminating firefighters is suitable for decontaminating other agencies. Decontamination methods should be designed around the capability and limitations of the levels of personal protection equipment (PPE) used. Partner agencies are known to have levels of chemical protection for their personnel that may be equivalent to those worn by FRS personnel. However, without an agreed protocol, FRS should refrain from using decontamination methods designed for their own personnel for partner agencies without specialist advice.

FRS may have local agreements where decontamination equipment can be used for partner agencies. In these situations, procedures should have been agreed based on the level of PPE or clothing being worn.

In the event of a response requiring the use of police CBRN PPE and the deployment of police held mass decontamination disrobe (MDD) units FRS may be requested to provide the following in support of the police:

- Compressed air supplies to inflate firefighter decontamination (MD4) structures
- A continuous flow of water to the MD4 decontamination unit
- Re-robe packs (where required)

In addition to the above, fire and rescue services may also be able to provide:

- Police responder rescue
- Improvised or emergency wet decontamination support, including detection, identification and monitoring (DIM), to police responders until police decontamination is established

For further information see: Memorandum of Understanding between the National Counter Terrorism Policing Headquarters (NCTPHQ) and the National Fire Chiefs Council (NFCC) for the provision of a fire and rescue service decontamination support to police operations.

Strategic actions

Fire and rescue services should:

- Consider liaising with all partner agencies who can wear personal protective equipment (PPE) in the hot zone, and, where necessary, design a procedure to decontaminate partner personnel

- Where the partner agency has their own methods for decontaminating its personnel, the fire and rescue service (FRS) may need to assist in the procedure, for example, by providing water

- Consider providing a specialist member of personnel who has specific knowledge about the methods and equipment used by the partner agency and is aware of the requirements of the agency in question

- Provide hazardous materials advisers (HMA) who have sufficient technical knowledge to be able to review and supervise the decontamination process

Tactical actions

Incident commanders should:

- Liaise with multi-agency partners who are operating in the hot zone regarding decontamination

Control measure - Arrangements to deal with firefighter emergencies

Control measure knowledge

The rescue and recovery of firefighters is challenging. Difficult decisions may need to be made. The situation calls for clear judgement, often while struggling to keep emotions under control.

If the incident commander and other commanders fail to maintain control, it may lead to an outcome with serious health and safety consequences. Crews are likely to place themselves at considerable risk to rescue or recover colleagues.

A situation where a firefighter needs rescuing is very likely to lead to fire and rescue service personnel and others experiencing increased stress. This can affect the way people make decisions and process information. See Personal resilience.

The incident commander's resilience and ability to manage pressure in this situation is critical to maintain control. Other important factors are maintaining good situational awareness and sharing accurate information such as last known locations and tasks they were undertaking.

After an incident there may be a requirement to investigate its cause. This may be part of a fire and rescue service review to identify the cause of the incident or to look at how effective fire safety measures were. Additionally, it may be part of a criminal investigation by the police. Other agencies may also have a legal requirement to investigate, for example, the Air Accident Investigation Branch, Marine Accident Investigation Branch, Rail Accident Investigation Branch or the Health and Safety Executive.

From the start of an investigation, fire and rescue service personnel should make sure that evidence is not destroyed or disturbed. They should also make observations and notes to help investigators.

The Health and Safety Executive offer guidance on best practice for the investigation of accidents in the workplace. These include the Work Related Deaths Protocol.

Further information is available. See CFOA guide Death in the Workplace: Guidance for United Kingdom fire and rescue services.

Strategic actions

Fire and rescue services must:

- Have policies for firefighter emergencies which incorporate communications, investigation and welfare.

Fire and rescue services should:

- Consider developing procedures for critical incident welfare of affected personnel

Tactical actions

Incident commanders should:

- Establish emergency arrangements appropriate to the size and complexity of the incident
- Maintain effective command and control in an emergency situation and review incident priorities, tactics and resources
- In a firefighter emergency preserve the scene to inform future internal and external investigations

Control measure - Hygiene: Hazardous materials

Control measure knowledge

Because of the much greater risk of personnel encountering dangerous substances at hazardous materials incidents, normal hygiene and welfare procedures should be enhanced. The primary objective is to prevent accidental ingestion of hazardous materials. Any designated hygiene area should:

- Have hygiene procedures that are monitored by supervisory personnel to ensure effective hand washing, etc.
- Be free from contamination and the risk of cross-contamination
- Be provided with copious supplies of drinking water
- Have supervisory personnel to monitor the recovery of wearers who have carried out hard work in chemical protective clothing (CPC)

Strategic actions

Fire and rescue services should:

- Ensure personnel have access to effective washing facilities at HazMat incidents
- Ensure personnel have access clean rest areas where they can rehydrate free from the risk of cross contamination

Tactical actions

Incident commanders should:

- Enforce hygiene measures and ensure personnel don't eat, drink or smoke except in appropriate areas

Control measure - Welfare

Control measure knowledge

Adopting appropriate welfare arrangements at operational incidents will assist with the safe and effective management of personnel and provide them with welfare support, whether physical or psychological. By having effective arrangements for the management of welfare and physical wellbeing at incidents, fire and rescue services will support several key elements of the safe person principles.

Consideration should be given to work rotation, rest, recovery and reliefs taking account of activities undertaken and weather conditions. At protracted incidents provision should be made for suitable sanitary conveniences and hygiene facilities; an adequate supply of drinking water should be provided for all personnel.

See: Workplace (Health, Safety and Welfare) Regulations 1992

Strategic actions

Fire and rescue services should:

- Make suitable arrangements to provide welfare for personnel at protracted operational incidents including shelter, drinking water, hygiene and sanitary conveniences.

Tactical actions

Incident commanders should:

- Consider the effects of geography on equipment logistics, casualties and crew welfare

- Provide first aid equipment to crews deployed to areas with no immediate medical assistance
- Consider requesting facilities for the welfare of crews deployed at protracted incidents

Hazard - Incident closure and handover: Hazardous materials

Hazard Knowledge

The fire and rescue service (FRS) is responsible for the emergency phase of an incident. It has no legal responsibility to clean up releases of hazardous materials but may become involved in the non-emergency phase of incidents. This is because they can be difficult and expensive to clean up, and they can present longer term health issues if people are exposed to harmful substances.

Control measure - Manage, inspect and test equipment

Control measure knowledge

At the conclusion of an incident appliances and equipment should be returned to operational readiness with appropriate speed. Operational equipment should be inspected and tested according to service policy and any test results must be recorded. Cleaning of equipment should be completed and the appliance should be fully restowed. Where appropriate, any defective equipment should be clearly marked and, where necessary, removed from use.

Any equipment defects or deficiencies should be recorded, before leaving the incident ground and, where appropriate, fire control should be informed. The appliance commander is responsible for all crew members and equipment stowed on their appliance.

See Fire and Rescue Authorities, Health, safety and welfare framework for the operational environment Section 5, Formulating Health and Safety Policy for the Operational Environment, sub section 5.1, paragraph 3, Arrangement for procuring and maintaining operational equipment / plant Page 12-13.)

(Fire Service Manual, Volume 1, Fire Service Technology, Equipment and Media, Inspection and Testing of Equipment, Chapter 3: Inspection, Testing and Maintenance, sub section 3.4 - 3.17.2)

Strategic actions

Fire and rescue services should:

- Have procedures for the post incident inspection and maintenance of operational appliances, equipment and other resources

Tactical actions

Incident commanders should:

- Ensure equipment receives appropriate after use inspection and testing before changing availability status
- Conduct an inventory check and ensure equipment receives appropriate after use inspection and testing
- Consider decontamination of personnel, PPE and equipment proir to redeployment
- Consider the condition and serviceability of PPE when assessing operational readiness for redeployment

Control measure - Closing down a detection, identification and monitoring (DIM) response

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Control measure knowledge

Detection, identification and monitoring (DIM) equipment that has been used should be thoroughly decontaminated and returned to service, subject to scientific advice and the manufacturer's instructions.

DIM vehicles should be inventory checked and shortages recorded to enable restocking and ensure the earliest availability for redeployment.

Criminal investigation

The police may:

- Impound fire and rescue service equipment as part of their incident investigation
- Gather material evidence from fire and rescue service personnel
- Take statements from fire and rescue service personnel

Post-incident activity

Other things that should be considered post-incident include:

- Record keeping and document management
- Critical incident stress management (defusing) of crews in line with individual fire and rescue service welfare procedures
- Debriefing, subject to police guidance

Other issues may be addressed by a recovery working group if established for the incident.

Strategic actions

National Resilience should:

- Keep a record of any DIM resources that are affected by equipment shortages, where it may impact on the ability for them to respond to further incidents

Tactical actions

Specialist responders should:

- Carry out an inventory check of all DIM units
- Restock DIM units for redeployment
- Ensure that DIM equipment that has been used is decontaminated and returned to the DIM-hosting fire and rescue service, subject to scientific advice
- Release National Resilience (NR) equipment to the police for investigation purposes if required
- Provide evidence and statements to the police if required
- Provide a handover to the recovery working group
- Provide details of the exposure of fire and rescue service personnel to hazardous substances

Control measure - Closing down a mass decontamination (MD) response

Control measure knowledge

Fire and rescue service appliances and equipment, used or deployed outside of the hazard area, should be available for return to service once the mass decontamination (MD) response to the incident is completed.

Equipment used for the decontamination process, including boilers, heaters, containment dams, should remain in place until scientific advice is obtained about the best methods for its decontamination or disposal.

The Department for Environment, Food and Rural Affairs (Defra) will take the lead role in facilitating the required decontamination or disposal processes.

All MD units should be inventory checked and shortages recorded to enable restocking, to ensure the earliest availability for redeployment.

Criminal investigations

The police service may:

- Impound fire and rescue service assets as part of their incident investigation
- Gather material evidence from fire and rescue service personnel
- Take statements from fire and rescue service personnel

Post-incident activity

Other things that should be considered post-incident include:

- Record keeping and document management
- Critical incident stress management (defusing) of crews in line with individual fire and rescue service welfare procedures
- Debriefing, subject to police guidance

Other issues may be addressed by a recovery working group if established for the incident.

Strategic actions

National Resilience should:

- Keep a record of any MD resources that are affected by equipment shortages, where it may impact on the ability for them to respond to further incidents

Tactical actions

Incident commanders should:

- Carry out an inventory check of all MD units
- Restock MD units for redeployment
- Ensure that MD equipment that has been used is decontaminated and returned to the MD-hosting fire and rescue service, subject to scientific advice
- Release equipment to the police for investigation purposes if required
- Provide evidence and statements to the police if required

Control measure - Make an effective handover to the responsible person

Control measure knowledge

Competent management of the closure of the incident is just as important as the initial actions of an incident commander on arrival. This includes:

- Facilitating proper handovers as the incident reduces in size
- Continued vigilance regarding the hazards that continue to exist or newly emerge
- Ensuring that site occupiers, neighbours and others who have been affected by the incident are kept appropriately informed

At the closure of the response phase to some operational incidents, residual hazards may exist that could cause harm to others if not properly managed. There may be control measures implemented by the fire service to reduce risk that will need to be maintained post incident. These could include immediate threats to safety, security of premises or environmental risks.

At some incidents a responsible person or body will be present to whom the management of these risks can be transferred. The risks may have a wider impact on the public or occupiers of neighbouring premises. There could also be no obvious way of maintaining control measures after fire service resources leave the incident.

Where there is a responsible person or body a formal handover of responsibility for the management of risk should be undertaken and a record made; this record may include the following:

- Responsible person's details and time and date of the handover
- Identification of hazards and measures to ensure health and safety arrangements are maintained
- Security issues, particularly where premises are left vulnerable, and the need to communicate with persons accepting responsibility
- Logging decisions made by the incident commander
- Formal acceptance of responsibility by the responsible person

The fire service may need to secure the personal effects and valuables of persons involved in the incident and ensure that these are handed over to the appropriate authorities. A record should be made of items recovered by the fire service and to whom these were handed prior to leaving the incident.

See National Operational Guidance: Incident command

See Joint Doctrine: The Interoperability Framework, Joint Decision Making model

Strategic actions

Fire and rescue services should:

- Have procedures for handing over responsibility for the safe management of incidents to a responsible person or body
- Have procedures to secure premises and maintain control measures at incidents where no responsible person can be identified

- ARCHIVED Ensure that hazards are identified when handing over responsibility for safety to the responsible person

Tactical actions

Incident commanders should:

- Report any safety critical issues to every person affected by the incident before leaving the scene
- Take measures to secure premises where no responsible person can be identified

- Ensure that hazards and risk controls are identified when handing over safety to the

responsible person

Control measure - Transportation

Control measure knowledge

There are strict controls on transporting hazardous waste. Fire and rescue services do have dispensation in exceptional, life saving circumstances. See Section 3.10.3, Environmental Protection Handbook.

Fire and rescue services are allowed to transport and store small quantities of non-hazardous waste from incidents.

Strategic actions

Fire and rescue services should:

- Be aware of their legal responsibilities and possible defences for the transportation of hazardous waste
- Develop procedures for the transportation and storage of small quantities of non-hazardous waste, which includes items such as disposable gloves or chemical protection suits. See Section 3.10.4, Environmental Protection Handbook

Tactical actions

Incident commanders should:

- Ensure that in the event that emergency transportation of hazardous waste is required, the relevant environment agency is to be informed of the incident as soon as possible and is involved in the decision to transport hazardous waste
- Ensure that fire and rescue service procedures relating to management and transportation of small quantities of non-hazardous waste are followed

Control measure - Disposal

Control measure knowledge

During the early stages of an incident when the fire service activities are more dynamic, it may not always be possible to contain fire water safely. In these circumstances use of the foul sewer should be considered for disposal. The flow rate should be controlled to avoid the foul sewer overflowing. Failure to control the flow could result in polluting water entering the water environment. See Fire water run-off.

At some incidents, the foul sewage system may be the best disposal option. If this is the case, the sewerage company must be contacted. They will consider the request and take account of the likely impact if they do not approve the discharge. Agreement from the appropriate environment agency must be obtained before any release takes place. This can be obtained by telephone but must be applied for and confirmed in writing later. See Section 1.6.6, Environmental Protection Handbook.

For further information see Section 3.10.3 Environmental Protection Handbook: The movement of hazardous waste by the fire and rescue service in emergencies.

For further information see Section 3.2.8 Environmental Protection Handbook.

Strategic actions

Fire and rescue services should:

- Be aware of their legal responsibilities and possible defences for the disposal of fire water under the Environmental Permitting Regulations 2010 and Environmental Damage (Prevention and Remediation) Regulations 2015 (EDR 2015)

- Develop plans for the disposal of contaminated fire water run off which include plans for:
    - Use off-site storage within drainage infrastructure e.g. balancing ponds
    - Use of foul water drainage
    - Contingencies for where the responsibility for disposal cannot be identified

Tactical actions

Incident commanders should:

- Ensure that waste products created by the fire and rescue service are disposed of both legally and responsibly. The Environmental Permitting (England and Wales) Regulations 2010 (EPR 2010) provides two exceptions for the emergency disposal of contaminated fire water runoff where the primary focus of fire and rescue service actions is saving life:
    - Emergency discharge and subsequent contamination of the water environment
    - The removal of waste by a fire and rescue services using fire and rescue service equipment or vehicles
- Consider the legal exceptions. see Environmental Legislation
- Ensure that the relevant environment agency is informed of the incident as soon as possible and is be involved in the decision to discharge
- Inform sewerage undertakers if discharge is to foul the water sewerage system
- Identify if the responsibility for disposal of waste produced at an incident can be delegated to a third party based on location, material and quantities involved. Namely:
    - Local authority - Playing fields, public open spaces, beaches and some roads
    - Landowner or owner / occupier - Private property
    - Highways agency - (Road Service in Northern Ireland) - Major roads
- Identify if there are any alternative methods of disposal:
    - Suitable site arrangements for a waste disposal
    - Tankering away the contaminated water
- Identify potential drainage routes for fire water run-off and released vehicle content
- Ensure that waste products created by the fire and rescue service are disposed of legally and responsibly

Control measure - Methods for dealing with waste from hazardous materials incidents

Control measure knowledge

Any hazardous materials incident has the potential to produce waste. This may either be the

hazardous material itself, equipment used to clean up the spillage, deal with the hazardous material or personal protective equipment (PPE) worn to protect personnel from the effects of the material.

Where waste is generated, it must be dealt with in an appropriate manner. This will normally involve passing the waste material either directly to a registered hazardous waste contractor, or to a responsible person who is instructed to dispose of the waste in an appropriate manner.

The fire and rescue service (FRS) needs to be able to determine who is responsible for the waste material. Generally, this will be the owner of the material or the site on which it is discovered, which will extend to all waste produced because of dealing with the incident. However, waste material needs to be handed over to the responsible person in a state that is safe to handle and to transport to a location of final disposal. Where the material cannot be left in a state that is safe to handle, detailed instructions from a hazardous materials adviser (HMA) should be left, providing information on how the material should be handled and by whom.

On rare occasions, the FRS may need to provide a disposal route for hazardous materials. This needs to be done through an agreed protocol and registered waste contractor. However, this waste should be limited to disposal of fire service equipment or equipment for secondary decontamination being transported for this purpose. It should not be for containers of hazardous materials, as these should not be transported on any fire service vehicle.

It should be noted that exemptions to the controls set out in the Accord européen relatif au transport international des marchandises Dangereuses par Route (ADR) European Agreement concerning the international carriage of dangerous goods by road is in place in Volume 1: section 1.1.3.1(d) where the carriage of dangerous goods is undertaken by a competent authority to transport material to the nearest appropriate safe place. Furthermore, Volume 1: section 1.1.3.1(e) allows the material to be transported for saving life and protecting the environment. Both these sections should allow for disposable equipment to be transported at the end of an incident if or when a responsible person cannot be determined.

Strategic actions

Fire and rescue services should:

- Ensure personnel that respond to hazardous materials incidents are provided with the necessary knowledge, skills and understanding to recognise and deal with hazardous waste effectively

- Have agreed protocols concerning hazardous waste, including a procedure for handing the responsibility back to a responsible person

- Have equipment to contain hazardous waste, including any waste generated because of

dealing with an incident. This should include equipment provided by the environmental agencies, and identified items of equipment for bagging up waste items or hazardous materials

- Provide access to a hazardous materials adviser (HMA) to give guidance on how waste can be contained and what precautions are required for dealing with it after the fire and rescue service have left the scene

Tactical actions

Incident commanders should:

- Implement service procedures for dealing with hazardous waste post incident

Control measure - Record personal exposure

Control measure knowledge

Exposure to a hazardous material may have acute or chronic effects. In every case, the exposure needs to be recorded by the fire and rescue service (FRS) in a manner that allows the information to be readily accessed in the days following the exposure. It also needs to form part of the individual's employment health record, as in some cases this is required by law.

Where information is stored for access in the days following exposure, it is advised that this information is stored so that it can be accessed 24 hours a day by a person with the authority to pass personal details to a medical professional, once all necessary confirmation of identity has been carried out.

Strategic actions

Fire and rescue services should:

- Keep a record of personnel and update this record with any exposure, or possible exposure, to hazardous substances

- Make records of any exposure immediately available to a suitably authorised member of personnel who can pass this information to a medical professional

- Have systems in place to ensure they are satisfied with the proof of identity provided by any medical professional who requests personal details of a member of personnel

- Store all information related to a member of personnel for a period agreed by legislation and, where legislation does not apply, for an absolute minimum of the duration that the member of personnel is in the employment of the fire and rescue service (FRS)

- Provide access to specialist advice on both the nature of the hazardous materials and the effect that this may have on the member of personnel

- Provide a system that ensures the information is as detailed and as accurate as possible

Tactical actions

Incident commanders should:

- Ensure that all records related to the exposure or potential exposure are completed as soon as possible

Control measure - Health surveillance

Control measure knowledge

Health surveillance allows for early identification of ill health and helps identify any corrective action needed. Health surveillance may be required by law if personnel are exposed to noise or vibration, solvents, fumes, dusts, biological agents and other substances hazardous to health, or work in compressed air. Appropriately trained and competent health professionals must undertake this, especially where there is a regulatory requirement to monitor the health of personnel.

Fire and rescue services should also provide for the effective monitoring of mental health and wellbeing of all operational personnel to ensure that any exposure to psychological hazards can be monitored. Critical incident stress management procedures should be considered as part of an

intervention to minimise the impact of traumatic incidents on individuals and to reduce work related stress.

See also:

The Control of Noise at Work Regulations

The Control of Substances Hazardous to Health Regulations

The Control of Asbestos Regulations

The Control of Lead at Work Regulations

The Ionising Radiations Regulations

(and equivalent devolved legislation)

Strategic actions

Fire and rescue services must:

- Have procedures for health surveillance following exposure of personnel to substances where there is a legal requirement to do so

Fire and rescue services should:

- Have procedures for the monitoring of mental and physical health and wellbeing following exposure to traumatic events and/or hazardous materials

Tactical actions

Incident commanders should:

- Follow service protocols for post incident health surveillance and monitoring

Hazard - Contaminated body bags

Hazard Knowledge

Body bags may be contaminated if a hazardous materials incident, including a CBRN(e) event, has resulted in fatalities.

Contaminated body bags may act as a vector for contamination transfer or spread unless properly decontaminated.

Control measure - Set up facilities for decontamination of body bags

Control measure knowledge

The decontamination of body bags (DBB) is carried out using mass decontamination (MD) equipment.

This warm zone activity is usually carried out during the recovery phase of an incident, but can be used in the response phase if required. The DBB process will normally commence 48 hours after the last casualty has been decontaminated.

The outline approach is that the police will be responsible for:

- The recovery of fatalities
- Placing fatalities within suitable body bags
- Transporting fatalities from the 'hot zone' to the 'warm zone'
- Providing suitable storage facilities within the inner cordon
- Holding the fatalities within the storage facilities within the inner cordon

The fire and rescue service will be responsible for:

- Establishing and maintaining modified MD structures for DBB
- Managing any contaminated water run-off
- Establishing and maintaining MD4 structures for emergency responders
- Considering requests from the police and ambulance service to support multi-agency emergency responder decontamination

Strategic actions

Fire and rescue services should:

- Provide an interoperable service through working with other agencies, to deliver an efficient

process for DBB

Tactical actions

Specialist responders should:

- Understand how to work with other agencies to carry out efficient decontamination of body bags

Control measure - Establish the decontamination of body bags sector

Control measure knowledge

The key principles for the safe handling of contaminated fatalities (SHCF), as part of a multi-agency response are that:

- The movement of highly-contaminated fatalities should be restricted to the hot and warm zones to avoid spreading the contamination
- In order to minimise the number of people coming into contact with the contamination, the number of responders deployed to handle contaminated fatalities should be limited

The siting of the decontamination of body bags (DBB) sector will depend on the set-up of the wider safe handling of contaminated fatalities area. Although it may be necessary to modify the SHCF footprint, the DBB sector layout should not require modification.

When establishing the DBB sector, many factors will need to be considered, and agreed by multi-agency partners, including:

- Topography of the incident scene
- Location of fatalities
- Wind direction and strength – this should be monitored throughout the process
- Travel distances for the police body recovery teams, fire and rescue service teams and hazardous area response teams
- Maintenance of the integrity of hot, warm and cold zones
- Ability to contain contaminated water and solid waste
- Ability for the police to secure and contain the area

Key stakeholders include:

- Police:
    - Senior investigating officer (SIO)
    - Scene evidence recovery manager (SERM)
    - Tactical adviser (TacAd) (for CBRN(e) events)
- Fire:
    - DBB sector commander
    - Hazardous materials adviser
    - Tactical adviser (TacAd) (for CBRN(e) events)
    - National Resilience Assurance Team (NRAT) DBB adviser
- Science:
    - Scientific and technical advisory cell (STAC)

The DBB capability uses a combination of frontline and National Resilience (NR) equipment, drawn from both local fire and rescue service resources and dedicated regional or centralised resources.

It should be assumed that the fire and rescue service resources that have been used in the initial response phase will be contaminated. Therefore they should not be used for the DBB process; however, unused fire and rescue service resources may be used.

The DBB sector is regarded as being within the cold zone during the set-up phase. As no contamination should be present, normal personal protective equipment should provide sufficient protection.

The DBB structures and ancillary equipment should be constructed as described in the National Resilience equipment information and procedural information.

Strategic actions

National Resilience should:

- Mobilise National Resilience resources to appropriate incidents to carry out decontamination of body bags

- Ensure the resources provided are suitable for the type of contamination and the numbers of contaminated fatalities

Tactical actions

Specialist responders should:

- Establish the DBB sector in the most appropriate position; this should be in accordance with the other agencies involved in the process

- Agree the movement of cordon boundaries to encompass the decontamination of body bags sector
- Set-up the fire and rescue service structures and ancillary equipment to support the decontamination of body bags process
- Establish decontamination facilities for powered respirator protective suit (PRPS) wearers - DBB
- Establish and agree emergency signals and procedures for multi-agency responders
- Ensure a comprehensive hazard briefing is provided to all personnel deployed for decontamination of body bags
- Set up the appropriate number of emergency responder MD4 structures prior to deploying the powered respirator protective suits wearers into the warm zone

Control measure - Carry out decontamination of body bags- DBB

Control measure knowledge

The decision to commit powered respirator protective suit (PRPS) operators to commence the decontamination of body bags (DBB) process will be made by the fire and rescue service DBB sector commander, in liaison with their police counterpart. The personnel should be made available in the vicinity of the PRPS entry control point (ECP).

The DBB sector commander should consider implementing a PRPS main control process to co-ordinate the provision of personnel and resources for the DBB process.

Within the DBB structure, PRPS wearers carry out the following roles:

- Wash team – positioned on either side of the conveyor in the wash structure
- Support operative – ensure ancillary equipment and consumable supplies are available to support one-hour of work; this includes buckets, wash brushes, warm water, detergent, rinse brushes and towels
- Quality assurance director – instructs the wash team to carry out the process, following pre-

determined actions and timings
- Safety officer – adopts the most suitable position to monitor team activity and welfare
- Detection, identification and monitoring (DIM) adviser – provides ongoing monitoring of the DBB structures to ensure any secondary contamination remains within acceptable tolerances, particularly the accumulation of harmful gases or vapours
- Emergency crew – provide rescue cover for the DBB process

The fire and rescue service may be asked to provide rescue cover for other activities within the warm zone, such as police operations; if so, additional emergency crew will be required.

PRPS crew rotation will be managed by the DBB sector commander, to ensure the most efficient use of personnel. When the PRPS wearers have completed an hour working in the DBB structure, they will need to go through the decontamination process.

Decontamination should be carried out in accordance with the established PRPS decontamination procedures, with a hazardous materials adviser overseeing the process.

In some circumstances the DBB activities may need to be suspended, for example if:

- The police have not provided bagged fatalities
- There are insufficient bags available for the police to complete their task
- An emergency procedure has been implemented
- Environmental conditions do not support continued activity, for example lack of light or poor weather conditions
- The safe system of work has failed
- There is a fault with the DBB equipment
- There has been an injury to a DBB PRPS operative
- There is a shortage of DBB resources

Strategic actions

National Resilience should:

- Provide additional equipment to support the decontamination of body bags process

Tactical actions

Specialist responders should:

- Ensure powered respirator protective suit (PRPS) are worn when carrying out decontamination of body bags - DBB

- Ensure pre-designated roles are adopted during the process

- Ensure appropriate decontamination takes place after carrying out decontamination - DBB

Control measure - Environmental considerations for the decontamination of body bags

Control measure knowledge

The requesting fire and rescue service is responsible for the management of solid and liquid waste generated by the decontamination of body bags (DBB) process. The quantity of waste that will be generated can be assessed using the hourly and daily waste generation rates, found in the National Resilience (NR) procedural information.

The incident commander for the affected fire and rescue service, supported by a hazardous materials adviser, should liaise with the Scientific and Technical Advisory Cell (STAC) for advice on the management and disposal of waste.

The DBB capability adviser should liaise with the STAC for advice on management of contaminated NR assets.

Also refer to the control measure ‘Environmental considerations

Strategic actions

National Resilience should:

- Provide current information about the management of solid and liquid waste generated by the decontamination of body bags process

Tactical actions

Specialist responders should:

- Provide ongoing information to relevant agencies about the quantity and type of waste being generated by decontamination of body bags

Control measure - Detection, identification and monitoring: Provide support to mass decontamination operations

Control measure knowledge

Detection, identification and monitoring (DIM) activity is required whenever mass decontamination or decontamination of body bags is carried out, in order to:

- Monitor the effectiveness of the decontamination process
- Monitor the environment inside the MD structures
- Check for cumulative build-up of contamination inside the decontamination structures
- Check the area where used solid waste, such as disrobe packs or brushes, are being kept

Strategic actions

National Resilience should:

- Ensure sufficient DIM teams are available to support mass decontamination of body bags (DBB) operations
- Ensure equipment is provided to fulfill this role

Tactical actions

Specialist responders should:

- Wear the appropriate PPE when supporting mass decontamination operations
- Ensure any movement of responders does not spread contamination into the cold zone