

Title:	Fire in waste sites (including renewable energy facilities)
Project Executive:	DAC Mark Andrews, London Fire Brigade
Synopsis:	This guidance covers waste fires that require more than one jet. It applies to fires at waste sites, renewable energy facilities and other sites where waste is handled, stored or transported as part of a wider operation. It replaces the Generic Risk Assessment 3.7: fighting fires in refuse.
Published:	11/04/2016
Next Review Date:	11/04/2019
Status:	Approved
Version:	First edition version one
Latest Position:	First edition version one published 11/04/16

National Operational Guidance – Fires in waste sites first edition version one (ARCHIVED on 20-09-2017)

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Introduction

UK fire and rescue services attend around 300 significant fires in waste sites each year. Fires occur at waste sites that are permitted or licensed by environmental agencies, that have an exemption from the relevant environmental agency, and also at waste sites that operate illegally.

Many waste sites are managed by professional operators, which strictly adhere to regulations and good practice in controlling hazards on site. However, other sites are managed badly or are illegal and have little regard for regulations or health and safety. Hazards at illegal sites may present an even greater risk to firefighters, as there may not be enough information on the content of the waste stored on site, or good operating practices may not be followed.

This guidance provides recommended good practice for dealing with hazards associated with waste fires. It takes lessons from many incidents and offers tactical advice and strategic considerations. It offers a range of control measures that can be used at waste fires.

This guidance should be read in conjunction with other guidance, in particular National Operational Guidance: [Environmental protection](#) and the [Environment Agency and DCLG Environmental handbook](#). Where other guidance has details that are appropriate and relevant to the subject matter being discussed, this will be identified and signposted in this guidance.

Fires in waste sites are often difficult to extinguish, needing a lot of resources for long periods, and can have serious effects on public health, the environment, safety to firefighters and local communities. Impacts may be short term or long term, including:

- Public health impacts on responders and communities
- The public being evacuated or sheltering in place
- Environmental impacts
- Pollution of surface and groundwater
- Road closures
- High demand on fire and rescue services and other agency resources
- Large-scale financial losses and disruption

This guidance applies to waste fires that require more than one jet. It applies to fires at waste sites, renewable energy facilities and other sites where waste is handled, stored or transported as part of a wider operation.

The Waste Industry Safety and Health (WISH) forum code of practice on [Reducing fire risk at waste management sites](#) applies to sites storing more than 50m³ of waste. This is approximately the size of a full double garage. The types of waste commonly encountered are:

- Paper, cardboard, plastics, wood and wood products
- Rubber (natural or synthetic), including whole, shredded or crumbed tyres
- Component waste, such as from vehicle dismantling
- Refuse derived fuels (RDF), solid recovered fuels (SRF) and similar fuels
- [Waste electrical and electronic equipment \(WEEE\)](#), containing combustible materials

Waste is generally considered hazardous if it (or the material or substances it contains) is harmful to

humans or the environment. Examples of hazardous waste include:

- Asbestos
- Chemicals, such as brake fluid or print toner
- Batteries
- Solvents
- Pesticides
- Oils
- Equipment containing ozone depleting substances, such as fridges
- Hazardous waste containers

When dealing with waste fires, the fire and rescue service incident commander will have the ultimate say in how the incident will be managed and the strategy that will be used to bring the incident to a satisfactory conclusion.

However, there are often a number of conflicting views, pressures or powers from interested parties such as the public, the site operator, insurance companies, public health agencies, environment agencies and local authorities.

These conflicting views can be difficult to manage and can place the incident commander under considerable pressure to find a solution that fits the differing priorities from different organisations.

The hazards identified in this guidance focus on hazards to people (public and responding agencies) and hazards to the environment. This guidance identifies control measures that can help to reduce or remove the risk to people and the environment resulting from these types of fires.

Where appropriate, this guidance will direct the reader to other areas of guidance where the hazard and/or control measures are covered.

The following waste sites have been considered in developing this guidance; these sites may hold a permit, or have an exemption, from the relevant environmental agency or may be illegal sites.

Landfill

Landfill activities involve the development of land so that waste can be deposited in an environmentally safe manner. The waste is usually deposited in separate cells, which are filled with compacted waste materials, progressively covered and then sealed with a permanent cap. The waste handled may be inert, non-hazardous or hazardous, depending on the type of landfill or permit held.

Biodegradable materials degrade to release landfill gas, which is mainly composed of methane and carbon dioxide. Increasingly, this landfill gas is being collected for combustion and energy conversion.

Waste decomposing and water passing through the waste give rise to leachate – a mixture of organic degradation products, liquid wastes and rainwater. Leachate is extremely variable in composition, depending on the nature of the waste in the landfill, the landfill design and so on. Leachate is collected in a network of pipes, removed from the landfill and treated.

Thermal treatment

Thermal treatment technologies include incineration (energy from waste plants) and advanced conversion technologies such as anaerobic digestion, gasification and pyrolysis. These technologies use a variety of processes to convert waste into energy and/or by-product fuels to be used in associated power generation activities.

Note: The term 'waste' is generally considered to mean unwanted products for disposal, recycling or recovery. However, in advanced conversion sites (anaerobic digestion sites), some material used is grown exclusively for the process and is therefore not a waste product. For the purpose of this guidance the term 'waste' is used generically to describe all material.

Civic amenity sites

Civic amenity sites are controlled areas where the public can dispose of household waste. The waste accepted varies from site to site, but typically includes bulky household items and material for recycling. Civic amenity sites often also collect hazardous, explosive and flammable materials.

Transfer stations

Transfer stations are facilities where waste or recyclable materials from separate collection vehicles are combined into loads to be transported to waste treatment or disposal facilities. The waste or recyclable material may be compacted or bulked before transportation.

Waste treatment sites or facilities

These facilities collect and hold large quantities of waste received from transfer stations, to support the process of turning waste into a new substance or product. These sites would include, for example, end of life vehicle (ELV) sites.

Relevant legislation for fire and rescue services

Many pieces of legislation have an impact on fire and rescue services as they pursue their fundamental duties, including:

- [Fire and Rescue Services Act 2004](#)
- [Civil Contingencies Act 2004](#)
- [Civil Contingencies Act 2004 \(Contingency Planning\) \(Amendment\) Regulations 2011](#)
- [Dangerous Substances and Explosive Atmospheres Regulations 2002](#)
- <http://www.legislation.gov.uk/uksi/1997/1713/contents/made>The Confined Spaces Regulations 1997
- <http://www.legislation.gov.uk/uksi/2005/735/contents/made>The Work at Height Regulations 2005
- <http://www.legislation.gov.uk/ukpga/1984/60/contents>Police and Criminal Evidence Act 1984
- [The Environmental Permitting \(England and Wales\) Regulations 2010](#)
- [The Environmental Damage \(Prevention and Remediation\) \(England\) Regulations 2015](#)
- [Water Act 2003](#)
- [Regulatory Reform \(Fire Safety\) Order 2005](#)

Fire and rescue services should also consider whether they need to refer to local acts for the storage of waste in their area.

Risk management plan

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

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

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 fires at waste sites. Fire and rescue services should ensure their policies, procedures and training cover all of the hazards and control measures contained within this guidance.

Hazard and control statement

Hazard	Control measures
Fires in waste sites	<ul style="list-style-type: none">Apply situational awarenessRefer to Site-Specific Risk Information (SSRI)Establish scene safety and cordonsAppoint safety officersCarry out appropriate interventionLiaise with the responsible person (or appointed competent person)Seek specialist advice for hazardous materialsLiaise with other organisationsWear appropriate personal protective equipment (PPE) and respiratory protection equipment (RPE)
Thermal radiation	<ul style="list-style-type: none">Apply generic control measures [as detailed for Hazard – Fires in waste sites]Consider removing waste and plant from site or relocating it to a safe area

Hazard	Control measures
	Protect surroundings from thermal radiation
Hidden or rapid fire growth	<p>Apply generic control measures [as detailed for Hazard – Fires in waste sites]</p> <p>Consider using thermal imaging cameras or on-site thermal scanning equipment</p> <p>Consider creating firebreaks</p> <p>Consider removing waste and plant from site or relocating it to a safe area</p>
Unstable stacks or falling materials	<p>Apply generic control measures [as detailed for Hazard – Fires in waste sites]</p> <p>Implement appropriate cordons</p>
Access and egress	<p>Apply generic control measures [as detailed for Hazard – Fires in waste sites]</p> <p>Consider making a forcible entry</p> <p>Secure access and egress routes</p> <p>Implement avoidance routes</p>
Unstable ground	<p>Apply generic control measures [as detailed for Hazard – Fires in waste sites]</p> <p>Monitor the impact of firefighting activities on ground conditions</p> <p>Restrict access</p> <p>Consider using aerial appliances</p>
Plant, machinery and vehicle movements	<p>Apply generic control measures [as detailed for Hazard – Fires in waste sites]</p> <p>Use competent people to operate specialist plant and machinery</p> <p>Provide supervision</p> <p>Control or appropriately isolate plant and machinery</p> <p>Manage on-site vehicles</p>
Working at height	Apply generic control measures [as detailed for Hazard – Fires in waste sites]
Malicious threats to attending personnel	Apply generic control measures [as detailed for Hazard – Fires in waste sites]
Pressurised containers, aerosols and gas	Apply generic control measures [as detailed for

Hazard	Control measures
cylinders	Hazard – Fires in waste sites] Identify the presence of pressurised containers Implement appropriate cylinder procedures
Hazardous materials, including biological hazards	Apply generic control measures [as detailed for Hazard – Fires in waste sites]
Landfill gas or biogas	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Consider using thermal imaging to detect hot fire gases Use detection and monitoring equipment
Electricity	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Operate from a safe distance from an electrical hazard when attending a fire in a waste site Implement safety management
Impact on the environment and health	Refer to: National Operational Guidance: Environmental protection Environment Agency and DCLG Environmental handbook
Running or pooling fuel fires	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Provide safety jets or other appropriate firefighting media Create bunded areas

Fires in waste sites

Hazard	Control measures
Fires in waste sites	Apply situational awareness Refer to Site-Specific Risk Information (SSRI) Establish scene safety and cordons Appoint safety officers Carry out appropriate intervention Liaise with the responsible person (or appointed

	<p>competent person)</p> <p>Seek specialist advice for hazardous materials</p> <p>Liaise with other organisations</p> <p>Wear appropriate personal protective equipment (PPE) and respiratory protection equipment (RPE)</p>
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Hazard knowledge

The generic control measures for this hazard should be applied when dealing with any fire in a waste site or facility, whatever the size or complexity.

This guidance has been written to assist fire and rescue service personnel when responding to and dealing with a fire in a waste site. The hazards identified, and the associated control measures and tactical actions, are equally valid whether the site is a legal, permitted site or an illegal site.

This guidance acknowledges that many legal waste and recycling sites comply with relevant regulations and are professionally managed. However, each year fires occur in permitted and illegal sites on a regular basis.

Some sites may have been altered since their original commissioning, leading to different material being stored or a larger quantity of material than the site can safely handle. These changes may have been unauthorised and could have a serious impact on the incident.

Stockpiling may be temporary or permanent, due to operators taking in more waste than permitted or delays in processing the waste. Site-Specific Risk Information (SSRI) that was obtained before stockpiling began may not reflect the resultant hazards.

When dealing with any incident, illegal activities should be considered a possibility, such as hazardous materials, medical waste, large quantities of domestic waste or explosives being illegally stored. This can present significant hazards.

Fires in stacks can be particularly difficult to extinguish using conventional firefighting approaches. This is particularly the case at sites storing treated wastes such as tyre crumb, wood chip or compost, because of the small particle size of the waste and the density of the stack.

Direct application of water, with or without firefighting additives such as foam, to burning stacks is often ineffective and may generate large volumes of polluted fire water and/or increase the hazard from the smoke plume, due to lower combustion temperatures.

Fires in landfill sites will pose their own difficulties as there may be very deep seated fires that may have been burning for months. The nature of the waste held on these sites will prove difficult to deal with and may hide many hazards such as sharps, chemicals, hidden voids and bio hazards, all of which will need to be identified and managed by all personnel attending the incident.

The very nature of the waste site environment and the quantity of waste held on-site and/or involved in the fire, means that fire and rescue service personnel may be asked to undertake

arduous and physical tasks. Waste sites, especially landfill, can also be exposed to extreme weather conditions from a lack of shelter.

Incident commanders must monitor personnel welfare. For more information refer to National Operational Guidance: [Operations](#) – Consider welfare.

Control measure – Apply situational awareness

Control measure knowledge

Situational awareness concerns the perception and understanding of a situation, along with anticipating how the situation may develop in the near future.

Understanding the site design, construction, nature of use and occupancy will assist incident commanders in making safe, informed decisions.

Depending on the size and complexity of the incident, other agencies may attend, making effective joint working critical for safety on the incident ground.

Shared situational awareness is a multi-agency common understanding of the circumstances and immediate consequences of the emergency, together with an appreciation of the capabilities available and the priorities of the emergency services.

For more information refer to National Operational Guidance: [Incident command](#) – Organisation at an incident.

So that fire and rescue service personnel can operate safely and effectively at incidents involving fires in waste sites, they should develop an appropriate understanding of site design and layout, the type of materials being stored and the method of storage (for example, stacked and on-site processes).

They should also appreciate the effects of the fire and of firefighting activity on the material involved, the local community and the environment.

Information about fire behaviour and firefighting techniques can be found in National Operational Guidance: [Fires and firefighting](#).

Guidance on environmental issues can be found in the [Environment Agency and DCLG Environmental handbook](#) and National Operational Guidance: [Environmental protection](#).

To make a judgment on the effective deployment of resources, incident commanders should also be aware of the capabilities of the resources at the scene, specialist knowledge available and specialist equipment on-site that might assist in the creation of a successful tactical plan.

Strategic actions

Fire and rescue services should:

- Carry out pre-planning site visits and inspections to gain risk information that can be made available to responding personnel at a fire or other type of incident.

- Gather this information through joint inspection with other agencies, such as an environmental agency wherever possible. Joint visits may help fire and rescue services build a better picture of the challenges an incident may present at a particular site. Joint visits should also allow other agencies to identify concerns they may have about the potential hazards that may need to be dealt with during an incident.

Tactical actions

Incident commanders should consider the following throughout the incident:

- Site use and occupancy
- The local community and their need to shelter in place or evacuate
- Site-Specific Risk Information (SSRI)
- The responsible person (or appointed competent person) for the site
- The outcomes from 360-degree surveys – refer to National Operational Guidance: [Fires and firefighting](#) – 360-degree survey
- Information from closed-circuit television (CCTV) – refer to National Operational Guidance: [Fires and firefighting](#) – Consider using closed-circuit television (CCTV)
- Current and forecast weather conditions, including wind direction and strength
- Liaison and information sharing with others, for example:
 - Environmental agency
 - Environmental health
 - Local authority
 - Police
 - Ambulance service
 - Public health agency
 - Site operator

Control measure – Refer to Site-Specific Risk Information (SSRI)

Control measure knowledge

Every fire and rescue service must assess the hazards and risks in their area, with site-specific risk plans established for locations where hazards and risks are significant. A site-specific assessment includes information relating to the pre-planning of firefighting tactics. Refer to National Operational Guidance: [Operations](#) – Produce site-specific risk information.

Well-managed sites should have a site plan. If storing combustible waste, a permitted site must have a fire prevention plan. For information about contents of these plans refer to [Environment Agency: Fire prevention plans](#).

Strategic actions

Fire and rescue services should:

- Hold Site-Specific Risk Information (SSRI) and make this readily available to responding personnel

- Consider participating in multi-agency site visits to enhance information gathering

Tactical actions

Incident commanders should:

- Refer to Site-Specific Risk Information (SSRI) if available
- Ensure that if verbal information is provided it is documented
- Continually assess and record this information throughout the incident
- Consider other site-specific information that may be available through other agencies, such as the environmental agency or local authority

Control measure – Establish scene safety and cordons

Control measure knowledge

For further information, including strategic actions and tactical actions, refer to National Operational Guidance: [Incident command](#) – Structuring an incident. During a waste fire incident stacked materials can collapse with little or no warning. Therefore the cordon distances should take the stack heights and their stability into consideration.

Tactical actions

Incident commanders should:

- Restrict the number of personnel in hazard or restricted areas
- Record all access and egress into and out of the inner cordon, for fire and rescue service personnel and other agencies
- Brief all personnel entering the risk area on hazards and restricted areas
- Confirm the emergency evacuation procedure and signal
- Take external specialist advice from, for example:
 - The responsible person or site specialist
 - Environmental agency
 - Public health agency
 - Police
 - Local authority
 - Industry experts

Control measure – Appoint safety officers

Control measure knowledge

Appoint a safety officer as soon as reasonably practical and use safety observers in all sectors. Safety officers should monitor the working practices of the firefighters. They should be fully briefed about their role and liaise with the incident commander. They should initiate a tactical withdrawal or emergency evacuation if the need arises, for example, if stacks or piles of waste show signs of collapse.

For further information, including strategic actions and tactical actions, refer to National Operational Guidance: [Incident command](#) – Structuring an incident.

Control measure – Carry out appropriate intervention

Control measure knowledge

The timing and level of intervention will be determined through having knowledge of the site and the materials involved, whether there are rescues to be carried out, the extent of the fire and immediate risk to life or property, and the environmental impact of fire service operations. It is important to gain knowledge of any fire protection systems and facilities for firefighters within the site, including how they are operated and whether they are functioning.

To make an effective deployment, incident commanders should be aware of all the capabilities of available resources. Appropriate intervention should not be delayed, whilst seeking advice from the environmental or other agencies.

Priority objectives include saving life, preventing the incident from escalating, extinguishing the fire and protecting people and the environment. Guidance to determine appropriate intervention and tactical actions can be found in National Operational Guidance: [Fires and firefighting](#) and National Operational Guidance: [Performing rescues](#).

Early liaison with the environmental agency and public health agency is recommended, as a decision will need to be made as to whether the fire should be extinguished or allowed to burn, taking into account the impacts of that decision. Guidance on environmental issues can be found in the [Environment Agency and DCLG environmental handbook](#) and National Operational Guidance: [Environmental protection](#).

Strategic actions

Fire and rescue services should:

- Assess the level of risk within their service ground and provide fire and rescue service personnel with suitable and sufficient equipment and firefighting media to deal with fires in waste sites
- Gather information and pre-plan for incidents on waste sites, making relevant and up to date risk information available for attending personnel

Tactical actions

Incident commanders should:

- Carry out an initial incident assessment and the resultant risk assessment
- Use risk-critical information to identify priority actions, where intervention will be required, as part of the overall tactical plan
- Consider and select the most appropriate firefighting media – refer to National Operational Guidance: [Fires and firefighting](#)
- Manage water run-off carefully, to avoid polluting watercourses and groundwater

- Implement environmental protection measures to control, reduce or eliminate environmental damage or pollution, using pollution control hierarchy:
 - At source
 - Close to source
 - On the surface
 - In drainage or along a pathway
 - Contain, manage, treat pollution at the receptor
- Ensure that protection measures are robust and sustainable
- Request any further resources required to maintain protection tactics
- Consider the possible recirculation of fire water run-off, to reduce water used, as well as the quantity of water being disposed through the foul water drainage system. Refer to the [Environment Agency and DCLG environmental handbook](#) and National Operational Guidance: [Environmental protection](#).
- Develop a media strategy, in liaison with other agencies, to achieve clear and concise communication to the local community
- Ensure regular communication with the environmental agency, preferably on-site if possible

Control measure – Liaise with the responsible person (or appointed competent person)

Control measure knowledge

A responsible person (or appointed competent person) should have the appropriate level of knowledge and skills to be able to provide accurate and relevant information on their specific area of work.

They should have intimate and comprehensive knowledge of the site and the processes undertaken within the site. They should also have access to other subject matter experts regarding processes and procedures carried out on-site, as well as to their business continuity plan, which may hold additional information that could be useful to the incident commander.

They should also be able to interpret and translate such understanding into information that would be useful to support operational priorities for the fire and rescue service.

Strategic actions

Fire and rescue services should:

- Engage with site operators as part of the Site-Specific Risk Information (SSRI) process

Tactical actions

At the earliest opportunity, incident commanders should:

- Identify and record the details of the responsible person (or appointed competent person)
- Attempt to engage with the responsible person (or appointed competent person), to seek accurate, timely and relevant information

- Assess, record and consider using the knowledge gained from the responsible person (or appointed competent person)

Control measure – Seek specialist advice for hazardous materials

Control measure knowledge

Specialist advice should be sought to support the incident commander's operational plan. Advice should be used to identify the type of waste, appropriate actions and the level of personal protective equipment (PPE) and decontamination required.

Incident commanders should consider seeking advice from specialist tactical advisers and/or third party scientific advisers. Staff at specialist waste treatment facilities may also be able to provide advice.

If substances are not known, detection, identification and monitoring (DIM) teams may be able to assist.

For further information, refer to National Operational Guidance: [Hazardous materials](#).

Strategic actions

Fire and rescue services should:

- Understand which specialist advisers may be able to assist and how to contact them in the event of hazardous materials being, or suspected of being, present at a fire in a waste site. These may include:
 - Environment agencies
 - Public health agencies
 - Detection, identification and monitoring (DIM) teams
 - Site owners
 - Hazardous materials advisers
 - Specialist advisers for ammunition
 - Scientific advisers

Tactical actions

Incident commanders should:

- Seek specialist advice
- Obtain a site manifest if available
- Obtain any Control of Substances Hazardous to Health (COSHH) documentation held on-site
- Implement an appropriate level of personal protective equipment (PPE) and respiratory protective equipment (RPE) to deal with identified or suspected hazardous materials
- Deploy the minimum number of personnel required to safely complete the tasks required
- Fully brief all personnel entering the inner cordon on all known or suspected hazards
- Ensure that a clean area for resting and standby teams has welfare and hygiene provision – refer to National Operational Guidance: [Operations](#) for further information

- Ensure appropriate health and safety monitoring during and after the incident
- Document any exposure

Control measure – Liaise with other organisations

Control measure knowledge

Fire and rescue services should liaise with other organisations throughout the incident including:

- Environmental agencies
- Public health agencies
- Police
- Local authorities
- Industry experts
- Community leaders

This is not an exhaustive list as other organisations may be involved throughout the incident. Fires in waste sites may attract interest from the local community and, depending on the size of the incident, its location and impact on the community, they may attract attention at a national level.

Therefore, it is important that the responding fire and rescue service liaises closely with all interested parties throughout the incident. It is also important to develop a good working relationship with other organisations to develop a joined-up tactical and strategic plan to conclude the incident satisfactorily.

Refer to National Operational Guidance: [Incident command](#) for details on tactical, operational and strategic management of an incident.

Tactical actions

Incident commanders should:

- Be aware of the importance of liaising with other organisations
- Make contact with the relevant agencies at the earliest opportunity via the fire control room
- Develop a tactical and strategic plan to deal with the incident, taking into account the recommendations of the other organisations concerned
- Document and share information given by the other organisations
- Record tactical decisions that are made as a result of advice given by other organisations on the incident log
- Ensure other responders receive a full safety briefing and wear appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE)

Control measure – Wear appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE)

Control measure knowledge

The incident commander will decide the level of personal protective equipment (PPE) and respiratory protective equipment (RPE) required, and the level will be continually assessed throughout the incident. Fires in waste sites, by their very nature, tend to be protracted incidents, drawing heavily on resources from the responding fire and rescue service.

This can lead attending fire and rescue service personnel becoming complacent about wearing PPE and RPE, especially at warmer times of the year and in the later stages of an incident.

Strategic actions

Fire and rescue services should:

- Provide appropriate PPE and RPE. Further information can be found in National Operational Guidance: [Operations](#) – Wear personal protective equipment (PPE) and Consider wearing respiratory protection equipment (RPE)

Tactical actions

Incident commanders must:

- Ensure the most appropriate level of PPE and RPE is maintained throughout all phases of the incident, using a process of continual assessment

Incident commanders should:

- Record any reduction in the level of PPE or RPE in risk assessments and decision-making logs

Thermal radiation

Hazard	Control measures
Thermal radiation	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Consider removing waste and plant from site or relocating it to a safe area Protect surroundings from thermal radiation

Hazard knowledge

The thermal radiation from waste fires can be intense. The type, quantity and storage method of waste affects the level of thermal radiation produced by the fire.

There is little research at this time on the heat flux values produced by different waste stack sizes and materials. However, at the time of producing this guidance, research is being undertaken on this topic, to assist with the waste industry recommended stack separation distance and firebreak methodology. Following the publication of the research findings, this guidance may require review.



Figure 1: Site showing stack separation - photograph courtesy of the Environment Agency

Thermal radiation has two key effects:

1. It makes it difficult for firefighters to get close enough to effectively apply extinguishing media
2. It can also cause firespread to other parts of the waste site, structures on or around the site and to vehicles, cylinders, fuel stores and other machinery

Control measure – Consider removing waste and plant from site or relocating it to a safe area

Control measure knowledge

Thermal radiation can affect other parts of the site and equipment stored on the site, such as plant and machinery. Where possible, unaffected waste products, plant and machinery, if not being used for firefighting operations, should be moved to a safe location away from the effects of radiated heat.

Strategic actions

Fire and rescue services should:

- Identify suitable and secure off-site locations for plant and machinery in pre-planning site visits

Tactical actions

Incident commanders should:

- Arrange for plant and machinery to be moved to a safe location away from radiated heat
- As the incident develops, observe for the effect of radiated heat on buildings, equipment and waste products; this should be an ongoing process
- Create firebreaks by removing waste materials where possible

Control measure – Protect surroundings from thermal radiation

Control measure knowledge

Water curtains, jets, sprays or foam can be an effective method to protect firefighters and the surrounding structures, vehicles and hazardous materials from thermal radiation. For further information refer to National Operational Guidance: [Fires and firefighting](#) – Select the correct firefighting media.

Hidden or rapid fire growth

Hazard	Control measures
Hidden or rapid fire growth	<p>Apply generic control measures [as detailed for Hazard – Fires in waste sites]</p> <p>Consider using thermal imaging cameras or on-site thermal scanning equipment</p> <p>Consider creating firebreaks</p> <p>Consider removing waste and plant from site or relocating it to a safe area</p>

Hazard knowledge

Due to the nature of the materials involved in waste site fires, when highly flammable materials or materials that burn easily are present, firespread can be rapid and accelerated. Weather conditions such as strong winds and hot dry summers will also have an impact on the speed at which the materials burn.

Depending on the material being recycled, stacks of baled waste up to five metres in height can cover an extensive area of a site. The density and condensed nature of the bales affect the speed at which fire will spread or burn through them.

On landfill sites, deep-seated fires can burn unnoticed for weeks or months, creating large underground voids within the site.

Sites may have specialist equipment such as heat probes, which may prove useful in detecting deep-seated fires. Use site employees to operate specialist equipment.

Control measure – Consider using thermal imaging cameras or on-site thermal scanning equipment

Control measure knowledge

It may be appropriate to use thermal imaging cameras or on-site thermal scanning equipment to identify the extent of heat within large quantities of waste; this may reveal the effects of combustion that are not visible to the naked eye. For further information refer to National Operational Guidance: [Fires and firefighting](#) – Consider using thermal imaging or scanning.

Control measure – Consider creating firebreaks

Control measure knowledge

Firebreaks prevent the spread of fire by physically removing the fuel from tactically chosen, limited areas, so that firespread is restricted. For further information refer to National Operational Guidance: [Fires and firefighting](#) – Firebreaks.

Strategic actions

Fire and rescue services should:

- Consider strategies for creating firebreaks as part of pre-planning activities

Tactical actions

Incident commanders should:

- Make a realistic assessment of the time taken to remove the fuel and consider the layout of the site and topography before initiating this tactic, as the direction and speed of firespread will determine where the firebreak should be constructed
- Factor the type of fuel and weather conditions into a calculation of how wide an effective firebreak needs to be, considering the heat release rate and likelihood of flying embers, as the type of fuel and available personnel or machinery will impact on how long a firebreak will take to construct
- Consider using fire and rescue service personnel, competent people and specialist machinery (under the direction of the incident commander) to remove fuel, to prevent further fire growth

Control measure – Consider removing waste and plant from site or relocating it to a safe area

For control measure detail, refer to Hazard – Thermal radiation.

Unstable stacks or falling materials

Hazard	Control measures
Unstable stacks or falling materials	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Implement appropriate cordons

Hazard knowledge

For consistency, the following terms are used by the waste industry (refer to [Reducing fire risk at waste management sites](#)) when referring to storage methods:

- Stacks – stored accumulations of all forms of stored wastes, whether baled, open or otherwise stored

- Bunkered/enclosed stacks – wastes (either loose or baled, etc.) stored in a bunker or enclosure, such as a three-sided enclosure, where the walls of the enclosure are of an appropriate construction resulting in an effective fire shield
- Open stacks – wastes (loose or baled, etc.) that are not stored in bunkers or enclosures, such as an open stack of paper bales or open stack of loose wood
- Loose – wastes that have not been baled or wrapped, such as stacks of loose wood, tyres or plastic bottles. Such loose waste could be either bunkered or open (such as an open pile of loose wood).
- Baled/wrapped – wastes that have been baled and/or wrapped, or similar, as discrete ‘packages’ or ‘items’. Such baled/wrapped wastes could be either bunkered or open stacked.

Sites store and stack materials in a variety of ways:

- Sometimes the waste is heaped into a pile, which may collapse into itself as the material underneath burns away
- Other waste, such as scrap vehicles or baled products, may be stacked in such a way that it could fall over and create a hazard in the surrounding area

Waste may be stored inside a building and falling stacks may cause damage to structural features of the building. For structural fire-related hazards, refer to National Operational Guidance: [Fires in the built environment](#).

Stacks can burn away at lower levels, resulting in the higher bales becoming unstable and liable to collapse. Firefighting operations can result in bales becoming saturated and unbalanced, possibly leading to collapse.

Fire and rescue service personnel need to be vigilant when working around stacks, and avoid walking on or over them. Stacks can be, or become, unstable and there could be a risk of falling from height.

Control measure – Implement appropriate cordons

Control measure knowledge

For further information, including strategic actions and tactical actions, refer to National Operational Guidance: [Incident command](#) – Structuring an incident.

A cordon should be set up around a stack or pile if there is a danger of collapse. The radius of the hazard area should be big enough so that debris from the collapse does not fall outside it.

Access into the cordon should be prevented altogether, or limited to essential tasks only. Anyone entering the cordon should be aware of the hazards and the signs of collapse so they can withdraw if necessary.

Access and egress

Hazard	Control measures
Access and egress	Apply generic control measures [as detailed for Hazard – Fires in waste sites]

	Consider making a forcible entry Secure access and egress routes Implement avoidance routes
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Hazard knowledge

Waste sites can be difficult to access due to site security, and may not provide safe access for emergency fire vehicles. Ground conditions may be poor and may not provide safe access for the responding fire and rescue service vehicles. Using unsuitable routes for emergency fire vehicles should be avoided.

There may be limited space for vehicles and equipment on-site and height restrictions may apply due to overhead power lines, bridges and so on. Therefore, rendezvous points (RVPs) and marshalling areas may need to be positioned off-site.

Security features, locked gates, barriers and barbed wire can potentially cause harm, especially to firefighters attempting to gain access via ladders.

Poor access and egress may also increase manual handling risks, such as carrying hose and equipment.

Maintaining safe access and egress is essential, as fires can spread quickly due to the large amounts of waste, inappropriate stacks and poor firebreaks.

Consideration should be given to preventing situations from developing, such as personnel being unable to escape in vehicles or by foot if exit routes are cut off.

Control measure – Consider making a forcible entry

Control measure knowledge

Making a forcible entry into a waste site may be required for a number of reasons, including:

- Time of day (for example, outside normal opening times) with no on-site security
- An illegal site that has no on-site security or has security personnel who are not able or willing to assist with access
- The normal access point is unusable for some reason or is securely locked
- A new access point needs to be created to gain access to part of the site for operational reasons

For further information, including strategic actions and tactical actions, refer to National Operational Guidance: [Operations](#) – Forced access.

Control measure – Secure access and egress routes

Control measure knowledge

Depending on the site's access and egress, routes need to be identified that will be suitable for the resources required at the site, such as stable ground that can support the weight of the vehicles or equipment entering the site.

As the incident develops, routes can become compromised as plant and equipment are moved around the site, as well as waste being moved from one part of the site to another as part of the firefighting strategy.

To prevent escape routes becoming compromised, access and egress routes for firefighting teams should be identified and maintained. Sites may have a fire strategy or plan, which will include the identification and location of designated access and egress points and routes.

For further information, including strategic actions and tactical actions, refer to National Operational Guidance: [Operations](#) – Maintain access and egress routes.

Control measure – Implement avoidance routes

Control measure knowledge

Before tasking personnel, incident commanders should consider all available sources of information. A continuous assessment of working areas and routes through the waste site should be maintained and alternative routes should be identified to avoid unsuitable or hazardous areas.

Pre-planning and site inspection visits will greatly assist fire and rescue service personnel in identifying avoidance routes and site layout.

Strategic actions

Fire and rescue services should:

- Include waste site facilities in their pre-planning and site inspection programme
- Consider providing all-terrain vehicles as part of the pre-determined attendance

Tactical actions

Incident commanders should:

- Provide team briefings
- Ensure correct routes are used
- Cordon off unsuitable routes
- Continuously evaluate and review the routes and working areas implemented

Unstable ground

Hazard	Control measures
Unstable ground	Apply generic control measures [as detailed for Hazard – Fires in waste sites]

	Monitor the impact of firefighting activities on ground conditions Restrict access Consider using aerial appliances
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Hazard knowledge

Depending on the waste site involved, ground conditions can become unstable for many reasons:

- Landfill sites – deep-seated fires, burning away waste deep under the crust, can create cavernous areas, resulting in underground voids appearing with little or no warning. These voids present a significant hazard to plant operators as well as to responding fire and rescue service personnel.
- Illegal waste sites – as these sites are unlikely to have designated hard standing or purpose-made vehicle routes, ground conditions can quickly deteriorate as a consequence of firefighting operations and plant movement
- General wear and tear and poor maintenance of existing roadways and waste storage areas, especially under large areas of stacked waste
- Damage to concrete storage areas due to the intense heat created by the waste fire over many days

When working on landfill sites, constant observation of the waste surface should be maintained to spot any dipping; this may indicate subsidence and possible collapse into unidentified voids.

Control measure – Monitor the impact of firefighting activities on ground conditions

Control measure knowledge

In protracted incidents, large amounts of firefighting media and plant movements can result in ground conditions becoming very soft. This may cause a hazard for any vehicles parked in, or needing to drive through, the area.

Strategic actions

Fire and rescue services should consider:

- Using all-terrain vehicles as part of the pre-determined attendance
- Pre-planning to identify ground conditions and suitable access routes and egress routes
- Using on-site vehicles or plant to assist with operations

Tactical actions

Incident commanders should:

- Be aware of the impact of firefighting run-off water or foam on ground conditions
- Control firefighting run-off water to prevent ground conditions becoming unusable

- Divert water to holding areas or sacrificial areas that will not impede firefighting operations or movement around the site, where necessary
- Maintain vigilance when vehicle pumps are being used, to ensure that vehicles do not become bogged down in soft ground
- Be prepared to move vehicles if the ground is becoming unsafe, to avoid vehicle entrapment
- Monitor ground conditions where on-site plant is assisting with firefighting operations
- Consider using all-terrain vehicles, especially if ground conditions are expected to become unusable for non-four-wheel-drive vehicles

Control measure – Restrict access

Control measure knowledge

Fire and rescue service personnel need to be vigilant when working around stacks, and avoid walking on or over them. Stacks can be, or become, unstable and there could be a risk of falling from height.

On landfill sites great care should be taken when moving vehicles across the site or when crossing the site on foot, as deep-seated fires beneath the landfill surface can create hidden voids, which will be prone to collapse with little or no warning.

Strategic actions

Fire and rescue services should:

- Ensure safety officers understand the signs that identify possible underground voids, such as dipping on the surface of a landfill site

Tactical actions

Incident commanders should:

- Implement cordons to restrict access to the site – refer to National Operational Guidance: [Incident command](#) – Structuring an incident
- Restrict access on or over landfill sites to the minimum personnel and equipment
- Not allow personnel to walk across stacked waste
- Provide a safety briefing to all personnel undertaking tasks within the site
- Fully brief safety officers on the likelihood of ground conditions becoming hazardous
- Consider using thermal imaging cameras or on-site thermal scanning equipment to identify deep-seated fires and areas likely to be affected by hidden firespread

Control measure – Consider using aerial appliances

Control measure knowledge

An aerial appliance can allow the incident commander to create a safe working platform from which fire and rescue service personnel can perform some tasks, such as applying extinguishing media or investigating the scene of operations.

Strategic actions

Fire and rescues services should:

- Consider pre-planning to determine suitable locations for siting aerial appliances

Tactical actions

Incident commanders should:

- Choose a safe site to pitch the aerial appliance
- Monitor the scene to ensure that the siting of the appliance, particularly the jacks, is not adversely affected during the course of the incident
- Consider the likely development of the fire, possible changes to the ground as the extinguishing media is applied and alterations in the weather conditions, as these could compromise the safety of the deployed aerial appliance

Plant, machinery and vehicle movements

Hazard	Control measures
Plant, machinery and vehicle movements	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Use competent people to operate specialist plant and machinery Provide supervision Control or appropriately isolate plant and machinery Manage on-site vehicles

Hazard knowledge

Waste sites often use plant, machinery and vehicles to move or process products. This can be portable machinery such as grabs, bulldozers and forklift trucks. It can also be fixed machinery such as compactors, shredders and conveyor belts.

These may present hazards, either through a collision with fire and rescue service vehicles or through fire and rescue service personnel, or others, being struck by moving vehicles or plant.

Machinery may present hazards if not correctly secured or powered down.

However, the plant and vehicles can often be useful during firefighting operations, to move, disturb and separate waste materials.

Control measure – Use competent people to operate specialist plant and machinery

Control measure knowledge

Sites may have a variety of mobile or static machinery that could prove beneficial in firefighting operations. This equipment would need to be identified and competent people would need to operate it.

This can in turn create additional hazards, as other people may not be used to working with fire and rescue service personnel. Therefore close monitoring of their performance, and detailed briefing as to what is required, will be required from the sector commanders and incident commander.

Strategic actions

Fire and rescue services should:

- Ensure that all fire and rescue service personnel are aware that site equipment should be operated by competent person only

Tactical actions

Incident commanders should:

- Identify suitable equipment on-site that will achieve the objectives required
- Assess the hazards of using equipment in firefighting operations before doing so, and ensure the appropriate control measures are put in place to eliminate or mitigate those hazards
- Consider obtaining plant from another site or hiring suitable equipment if necessary, and agree in writing who will be accountable for the cost of hire and any damage to the equipment
- Ensure appropriate personal protective equipment (PPE) and high visibility clothing is worn in the area where plant or machinery is being operated
- Provide a full safety brief to fire and rescue service personnel and others
- Develop agreed communication methods between fire and rescue service personnel and others, including evacuation signals; these should be implemented before entering cordons and commencing operations
- Constantly monitor all on-site equipment used to assist in firefighting, as this equipment may not withstand the temperatures involved; however, some sites use the mechanical shovels that are also used in foundries, as they can withstand higher temperatures than normal shovels
- Ensure that if plant, machinery or vehicles are not being used and have been powered down, a robust system is implemented to ensure this equipment is not brought back into operation until agreed with the incident commander
- Arrange for a competent person to remove any mobile equipment or vehicles not being used for firefighting operations to an agreed location, where they will not impact on firefighting operations or become involved in the incident

Control measure – Provide supervision

Control measure knowledge

When using on-site machinery, the plant operator should be closely supervised to ensure they are not taking unnecessary risks, that they have the appropriate personal protective equipment (PPE) and they are aware of the presence of fire and rescue service personnel.

The incident commander has the final decision as to what is used, how it is used and by whom.

Fire and rescue service personnel are trained to understand the incident command protocols. However this may not be the same for other people, who may require a high level of supervision when operating in the inner cordon. Their actions could cause serious injury or death to fire and rescue service personnel or others.

Strategic actions

Fire and rescue services should:

- Ensure that all fire and rescue service personnel understand that site equipment should only be operated by competent people

Tactical actions

Incident commanders should:

- Ensure staff are closely supervised when operating in the inner cordon
- Ensure detailed tasking and constant monitoring
- Refer to the tactical actions for 'Use only competent people to operate specialist plant and machinery'

Control measure – Control or appropriately isolate plant and machinery

Control measure knowledge

Plant and machinery may still be operating after the fire and rescue service arrives. Fire and rescue service personnel should liaise with site staff to identify where and how to isolate the plant or machinery, and to consider the implications of isolating the equipment. Keeping processes operational may support firefighting operations if this can move or separate unburnt waste.

Fires can occur in machinery and plant, such as waste compactors. Power should normally be isolated before firefighting begins. Refer to Hazard – Electricity.

Strategic actions

Fire and rescue services should:

- Consider identifying and recording information about power supplies on-site, including whether they are high or low voltage, during pre-planning and site inspection visits

Tactical actions

Incident commanders should:

- Identify and control all power supplies on-site
- Liaise with the site operator about on-site plant, how it is used and who can use it
- Identify what actions will be required and by whom, to isolate the power to different plant, machinery, buildings, etc.
- Request the attendance of electricity company engineers if assistance is required to isolate electrical supplies
- Identify equipment that will require a period of time to be powered down

Control measure – Manage on-site vehicles

Control measure knowledge

Due to the nature of the industry, a large number of non-fire and rescue service vehicle movements on-site and off-site are likely. Firefighting operations are likely to stop or reduce these traffic movements, which may have an impact on the community if waste cannot be delivered and processed.

Strategic actions

Fire and rescue services should:

- Consider the possible traffic management solutions for an incident on the site in pre-planning and site visits
- Make this information available to responding fire and rescue service personnel attending an incident

Tactical actions

Incident commanders should:

- Assess the impact of the incident on traffic management in the local and wider areas
- Agree a traffic management plan with the site operator and other agencies
- Regularly update all parties on expected incident size and duration
- Establish agreed and controlled movement of non-fire and rescue service vehicles to, throughout and from the site

Working at height

Hazard	Control measures
Working at height	Apply generic control measures [as detailed for Hazard – Fires in waste sites]

Hazard knowledge

Fire and rescue service personnel may have to work at height at some waste site incidents. Working at height covers all work activities where there is a possibility of a fall, involving a distance that could cause injury. Refer to the [Work at Height Regulations 2005](#) and National Operational Guidance: [Operations](#) – Physical hazards.

The risk of falls may also happen from ground level, for example a fall into a refuse pit, hidden voids or involving an unguarded edge at an incinerator site.

Malicious threats to attending personnel

Hazard	Control measures
Malicious threats to attending personnel	Apply generic control measures [as detailed for Hazard – Fires in waste sites]

Hazard knowledge

Personnel, including firefighters and those from other agencies, may encounter malicious threats when attending fires on waste sites. Firefighters should not be exposed to violence or aggression and should avoid these threats wherever possible.

A tactical withdrawal may be required to remove personnel, appliances and equipment to a safe location, away from the immediate threat to firefighters. For further information refer to National Operational Guidance: [Incident command](#) - Risk assessment at an incident.

Threats fall into three main areas:

Public violence or aggression

Regulated sites normally have professional security staff that may be able to provide assistance. However, violence and aggression may be encountered, particularly at illegal sites. Consider seeking assistance from the police.

Dogs

Be aware that dogs, whether trained or untrained, may act unpredictably, especially if frightened of the fire or of the large number of people and vehicles arriving at the site. Firefighters should consider not entering the site until any dogs are removed or contained. Consider seeking assistance from specialist animal handlers.

Tampered utility supply

Illegal activities such as tampering with utilities, meters or fixed installations should be considered, as they can present significant hazards. Consider seeking assistance from electricity distributors or utility companies.

Pressurised containers, aerosols and gas cylinders

Hazard	Control measures
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Pressurised containers, aerosols and gas cylinders	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Identify the presence of pressurised containers Implement appropriate cylinder procedures
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Hazard knowledge

Waste management sites are likely to contain varying quantities and types of pressurised containers. These can vary in size from domestic aerosols to larger pressurised gas cylinders, and will present projectile and explosion risks if involved in fire.

Site staff in well-managed sites may be aware of the presence and location of pressurised containers, especially if they are used within a site process or used to power machinery such as forklift trucks.

At sites that are potentially involved in recycling pressurised containers, a large quantity of containers may be present. The storage conditions of the containers will vary from site to site.

At sites that are not so well managed, or used illegally as waste dumping sites, the presence of unknown or unexpected pressurised containers may be higher.

Many sites, such as scrap metal dealers and end of life vehicle sites, may have acetylene cylinders present. There may also be many types of vehicle components, such as pressurised boot or bonnet struts, that can explode if heated.

Information on pressurised containers can be found in National Operational Guidance: [Hazardous materials](#).

In addition to pressurised containers, other sealed metal objects such as box-welded sections of skips, box-welded vehicle components or sealed radiators can become pressurised, resulting in a projectile blast hazard. For further information refer to National Operational Guidance: [Fires and firefighting](#) – Fire not contained, controlled or extinguished.

Control measures – Identify the presence of pressurised containers

Control measure knowledge

Firefighters should access available Site-Specific Risk Information (SSRI) and question the site management and staff. This should include establishing the location of any portable machinery and equipment that is powered using pressurised containers.

Strategic actions

Fire and rescues services should:

- Carry out pre-planning and site inspections to identify and record the type, quantity and location of cylinders that a site might hold

- Use site visits as an opportunity to discuss the likelihood of pressurised containers being located in stacks with the site managers
- Retain information as part of pre-planning documentation and risk information

Tactical actions

Incident commanders should:

- Liaise with site staff about the contents of the stack
- Identify whether there is any likelihood of illegal fly tipping on-site
- Brief crews on the possibility of cylinders being involved
- Use safety officers in all sectors to constantly identify the type of waste involved

Control measure – Implement appropriate cylinder procedures

Control measure knowledge

Firefighters should access available Site-Specific Risk Information (SSRI) and question the management and workforce at the site. This should include establishing the location of any portable machinery and equipment that is powered using pressurised cylinders. For further information refer to National Operational Guidance: [Hazardous materials](#).

Tactical actions

Incident commanders should:

- Locate and identify the type, quantity and location of cylinders on-site
- Brief all personnel on the possibility of cylinders being present
- Ensure that firefighters implement the appropriate procedures if cylinders are known to be, or suspected to be, present on the site
- Deploy the minimum number of personnel to the hazard zone
- Establish an emergency evacuation procedure

Hazardous materials, including biological hazards

Hazard	Control measures
Hazardous materials, including biological hazards	Apply generic control measures [as detailed for Hazard – Fires in waste sites]

Hazard knowledge

Hazardous substances or materials, including chemicals, paints, batteries and oils, may be involved in a waste fire. Some of these may be unknown by the site operator or not marked. At illegal waste sites, there may be a higher risk of finding hazardous substances and materials with little or no information about the contents.

Contact with hazardous substances and materials may have short and/or long term health risks depending on their nature. These risks may result from contact with substances that are:

- Toxic
- Corrosive
- Flammable
- Carcinogenic
- Mutagenic
- Explosive

These items can be particularly hazardous as there is an increased likelihood that there will be a mixture of various substances. It may be extremely difficult to assess the resultant effect when exposed to high temperatures.

There is the possibility that during firefighting actions, substances may mix and react together, resulting in other hazards such as toxic or flammable gas, volatile explosive mixtures or exothermic reactions.

Radioactive materials and discarded pyrotechnic devices or ammunition may also be present.

Additionally a number of biohazards may be present in refuse, including:

- Clinical waste, including hypodermic needles
- Animal waste
- Animal carcasses
- Human waste
- Bacterial and viral infections such as leptospirosis (Weil's disease), hepatitis C and tetanus

Some waste sites have special facilities for dealing with needles and bio-products. The presence of these hazards should be obvious at these sites and the operators should be able to advise on appropriate actions.

At non-specialist sites or illegal sites, the exact contents of waste are often unknown. It should be assumed that general household waste and other scrap materials might contain sharps and penetration hazards.

The enormous volume of waste produced by modern society and the restriction of landfill opportunities have encouraged widespread recycling. This includes processing organic waste material, which could be for composting, or for use in processes such as anaerobic digestion or mechanical treatment.

Whenever organic waste material is treated and handled, bioaerosols (short for biological aerosol) may be generated. Bioaerosols are suspensions of airborne particles that contain living organisms or that were released from living organisms. This also applies to handling livestock manures and bio-solids. Exposure to bioaerosols can lead to respiratory sensitisation and respiratory diseases.

For further information refer to National Operational Guidance: [Hazardous materials](#) and National Operational Guidance: [Operations](#) – Biological hazards.

Landfill gas or biogas

Hazard	Control measures
Landfill gas or biogas	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Consider using thermal imaging to detect hot fire gases Use detection and monitoring equipment

Hazard knowledge

Landfill gas

Landfill gas is a complex mix of different gases, created when bacteria break down organic waste within a landfill site. Landfill gas is approximately 40% to 60% methane, with the remainder being mostly carbon dioxide. Trace amounts of other volatile organic compounds comprise a remaining 2% to 10% including nitrogen, oxygen, ammonia, sulphides, hydrogen and various other gases.

The amount of these gases depends on:

- The type of waste present in the landfill
- The age of the landfill
- Oxygen content
- The amount of moisture
- Temperature

For example, if the temperature or moisture content of the organic waste increases, gas production will also increase. The production of these gases generally reaches a peak in five to seven years, but the landfill process can continue to produce gases for more than 50 years.

Methane is a major component of natural gas; it is highly flammable and can form explosive mixtures with air if it concentrates in an enclosed space with poor ventilation levels. The range of air concentrations at which methane levels are considered to be an explosion hazard is 5% to 15% of the total air volume. Landfill gas explosions are not common occurrences, however.

Landfill gas can spread over large distances and can vent from cracks in the surface of the site, meaning that areas not filled with refuse can contain levels of gas.

A build-up of landfill gas in enclosed spaces, either above or below ground, can ignite. This will cause an explosion, and can result in structural damage above ground and possible subsidence over small or large areas of the landfill surface, if the build-up of gas is underground. Plant or personnel could become engulfed in a resultant underground void.

The gas poses an additional risk as it can burn with an invisible flame. Particular care should be taken if a fire is present on any site, especially in or around any excavations or trenches. In addition, people in close proximity to uncovered refuse can be at greater risk from a fire on the site.

On larger landfill sites gas extraction can power a gas turbine or internal combustion engine to produce electricity. The presence of these would indicate the hazards of high voltage electricity and gas pipelines on the site.

Biogas

Biogas is a product of anaerobic digestion (AD). Anaerobic digestion is a natural process where plant and animal materials (biomass) are broken down by micro-organisms in the absence of air. On these sites the biomass is held and decomposed in large tanks that produce biogas. The tanks are oxygen deficient.

Biogas is a mixture of 60% methane and 40% carbon dioxide, with traces of other contaminant gases. The exact composition of biogas depends on the type of feedstock being digested.

Many forms of biomass are suitable for anaerobic digestion (AD), including food waste, slurry and manure as well as crops and crop residues.

Microbes feed off carbohydrates and fats, producing methane and carbon dioxides as metabolic waste products. This gas can be harnessed as a source of sustainable energy.

In anaerobic digestion facilities, biogas is produced in large digesters (tanks) and filtered off into pressurised holding spheres. On these sites the risk of a gas leak is always possible, but a fire on the site may require the protection of the gas infrastructure.

Biogas can be used to power a gas turbine or internal combustion engine to produce electricity. The presence of these would indicate the hazards of high voltage electricity and gas pipelines on the site.

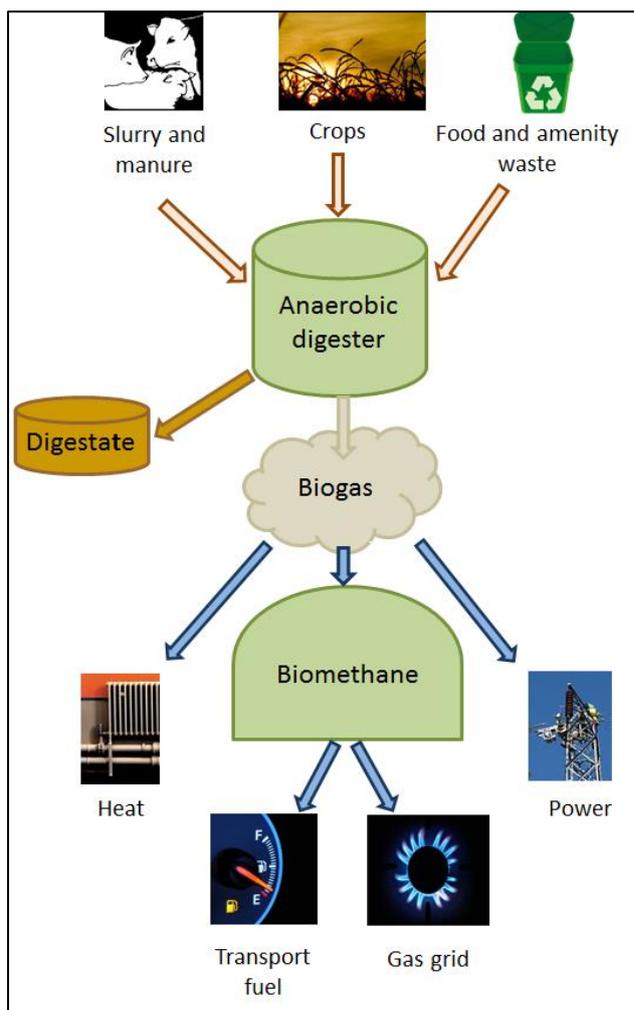


Figure 2: Anaerobic digestion process

Digestate is a biologically active, aqueous liquid (typically 95% to 98% water) made from leftover indigestible material and dead micro-organisms. It contains valuable plant nutrients like nitrogen and potassium. It can be used as a fertiliser and soil conditioner and is stored in pits, tanks or lagoons. Health hazards may arise from contact with, or immersion in, digestate.

Control measure – Consider using thermal imaging to detect hot fire gases

Control measure knowledge

For further information, including strategic actions and tactical actions, refer to National Operational Guidance: [Fires and firefighting](#) – Consider using thermal imaging or scanning. Landfill gas can burn with an invisible flame, the use of thermal imaging cameras or on-site thermal scanning equipment can be effective.

Hot fire gases in landfill sites can travel horizontally, as waste is layered and compressed over many years. A full site assessment using thermal imaging cameras or on-site thermal scanning equipment may be required.

Control measure – Use detection and monitoring equipment

Control measure knowledge

Sites where landfill gas is produced, or facilities where biogas is produced, should have gas detection and monitoring equipment.

Portable gas monitoring equipment will differ throughout the fire and rescue service; using this equipment may prove valuable in controlling this hazard.

Strategic actions

Fire and rescue services should:

- Record, and make available, Site-Specific Risk Information (SSRI)
- Obtain site information held by the relevant environmental agency

Tactical actions

Incident commanders should:

- Identify low lying areas where gas might pool
- Identify buildings that might be affected by a build-up of gas
- Liaise with the site operator to determine the type, location and function of on-site equipment
- Use on-site and/or fire and rescue service portable gas monitoring equipment
- Consider deploying detection, identification and monitoring (DIM) teams to assist with gas monitoring activities
- Consider using gas monitoring equipment belonging to specialist teams such as Urban Search and Rescue (USAR) or other agencies

Electricity

Hazard	Control measures
Electricity	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Operate from a safe distance from an electrical hazard when attending a fire in a waste site Implement safety management

Hazard knowledge

Personnel attending incidents on waste sites could encounter live overhead power lines, some of which may be high voltage. On-site low voltage wiring and equipment can also prove hazardous.

Buried power cables or substations could also be on-site – they may or may not be involved in fire.

Illegal extraction of electricity creates additional hazards as work is often substandard and/or concealed.

Batteries and other stored electrical energy sources, such as uninterruptible power supplies (UPS), can create an additional hazard.

Any accidents involving electricity can result in serious or fatal injury from electrocution and burns.

Control measure – Operate at a safe distance from an electrical hazard when attending a fire in a waste site

Control measure knowledge

Electricity can jump gaps and does not require direct contact.

Undulating ground conditions on-site can result in fire and rescue service personnel inadvertently coming close to overhead power cables. Ladders and other equipment can accidentally come into contact with power supplies.

As voltage increases, so does the ability of electricity to jump gaps. This may also increase as smoke is produced and water jets applied.

Where an electrical hazard that could pose a realistic risk to fire and rescue service personnel is identified, it should, if possible, be isolated and earthed or otherwise made safe by a competent person.

However, where electrical isolation cannot be achieved, the incident commander must ensure that fire and rescue service personnel operate at a safe distance from the electrical hazard.

Strategic actions

Fire and rescue services should:

- Ensure fire control room records include emergency 24-hour support contact details for all local power networks
- Consider carrying out pre-incident familiarisation visits and provide personnel with information on electrical hazards and risks

Tactical actions

Incident commanders should:

- Consult all available sources of risk information
- Refer to Site-Specific Risk Information (SSRI), en route if possible, regarding electrical hazards
- Gather information from responsible person, site specialist or industry experts
- Construct cordons using natural barriers and/or traffic tape, etc. Over and above the normal cordon requirements of an incident, the following safe distances need to be implemented if there are high voltage lines, carrying 132 kV, 275 kV and 400 kV (kilovolts):

Activity	Minimum safe approach distance
When using ladders, aerial appliances or tall	10 metres

equipment	
In dense smoke or flames approaching conductor	A corridor 10 metres either side of high voltage lines
When using handheld jets or hose	A corridor 20 metres either side of high voltage lines
When using monitors (ground or aerial)	A corridor 30 metres either side of high voltage lines

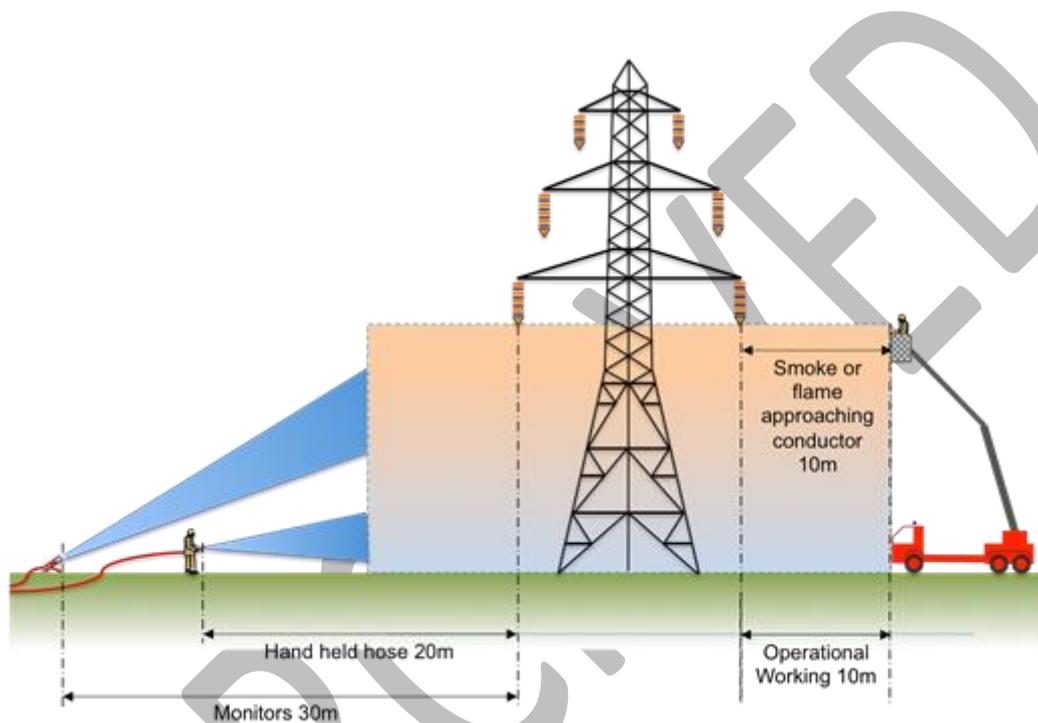


Figure 3: Diagram showing minimum safe approach distance to high voltage lines

- Identify, implement and manage safety distances for power sources that cannot be isolated
- Brief all fire and rescue service personnel and other people entering the hazard areas on the safe distances
- Consider requesting that the supply is isolated.

Control measure – Implement safety management

Control measure knowledge

Management and control are key elements in achieving safety on the fireground. Effective safety management should be implemented to deal with the hazard posed by electrical energy that may be present on waste sites.

Strategic actions

Fire and rescue services should:

- Ensure fire control room records include emergency 24-hour support contact details for all local power networks
- Identify operational plans and pre-planning for on-site electrical installations and suitable isolation points

Tactical actions

Incident commanders should:

- Consult all available sources of risk information
- Consider methods to isolate:
 - Any power sources that are, or could be, involved – should be isolated where safe to do so
 - High voltage distribution systems – should be isolated by an authorised and competent person
 - Breakers or switches – locked off
 - Equipment – should be assessed for alternative power sources and then isolated from them
- Communicate by:
 - Notifying the fire control room
 - Notifying and requesting attendance of the local power network distributor
 - Briefing all personnel when deployed to risk areas
 - Providing electrical hazard information to anyone at risk on-site

Impact on the environment and health

Hazard	Control measures
Impact on the environment and health	Refer to: Environment Agency and DCLG Environmental handbook National Operational Guidance: Environmental protection

Hazard knowledge

Fire and rescue services attending any fires in waste sites should be aware of two serious issues that can impact on the environment, the health of those attending the incident and the wider community.

Incident commanders should liaise with the environmental agency and public health agency early in the incident, to assess the level of hazard and agree a tactical plan to manage the hazards of:

- **Smoke plumes** – waste fires can produce large smoke plumes that carry airborne particles long distances

- **Fire water run-off** – the fire water run-off from waste fires is likely to be particularly toxic and damaging to the environment

Well-managed and regulated waste sites should have drainage systems fitted with pollution control features that can prevent or limit fire water or pollutants leaving sites or soaking away. These can assist firefighters in controlling the impact of fire water on watercourses and groundwater.

Illegal or poorly-managed sites may have drainage systems that discharge directly into foul water, storm water drains or directly into water courses. If a drainage system is present it is unlikely to have any pollution control systems fitted.

If there is no drainage system, or if a system is blocked, fire water may soak away, posing a threat to the groundwater. It may also create run-off, posing a threat to adjacent property and sites.

These issues are extensively covered in the [Environment Agency and DCLG environmental handbook](#) and National Operational Guidance: [Environmental protection](#) – Smoke plumes and Fire water run-off.

Running or pooling fuel fires

Hazard	Control measures
Running or pooling fuel fires	Apply generic control measures [as detailed for Hazard – Fires in waste sites] Provide safety jets or other appropriate firefighting media Create bunded areas

Hazard knowledge

On some waste sites, such as end of life vehicle sites, there may be large quantities of waste fuel and oil stored. If involved in fire these may create running fuel fires.



Figure 4: Running fuel fire – courtesy of West Sussex Fire and Rescue Service

Some waste fires that involve chipped rubber, plastics or tyres can produce the same characteristics as running or pooling fuel fires. The intense heat from these types of fire can result in the waste becoming molten within the stack. The outer layer can form a hardened crust, either as a result of cooling by firefighting media or by being exposed to cooler atmospheric temperatures.

If the outer crust splits or becomes damaged by other forces, the molten fuel will run freely away, following the contours of the ground. This places fire and rescue service personnel and equipment, particularly in low-lying locations, at risk.

Control measure – Provide safety jets or other appropriate firefighting media

Control measure knowledge

Dedicated safety jets, or other appropriate firefighting media provided for the protection of personnel and equipment, should be laid out and kept charged, available and ready for immediate use. For information on firefighting media and techniques refer to National Operational Guidance: [Fires and firefighting](#).

Control measure – Create bunded areas

Control measure knowledge

In areas of the incident where a running fuel fire or pooling fuel fire could occur, creating small bunded walls using suitable waste from the site may control and contain running fuel fires. This may also protect fire and rescue service personnel and equipment.

Tactical actions

Incident commanders should:

- Develop a tactical plan that takes this occurrence into account
- Monitor fire and rescue service personnel undertaking tasks in hazard areas
- Where possible, use plant and equipment to avoid manual handling issues when building small bunded areas
- Use suitable waste from the site to build these containment areas

Glossary

Term	Acronym	Description
Anaerobic digestion	AD	Renewable energy process involving a collection of processes by which micro-organisms break down biodegradable material in the absence of oxygen to produce fuel (methane).
Biomass		This is a biological material derived from living, or recently living, organisms. In the context of biomass for energy this is often used to mean plant-based produced, but biomass can equally apply to

		both animal and vegetable derived materials.
Detection identification and monitoring equipment	DIM	DIM vehicles carry a range of equipment that can be deployed to provide substance detection, analysis and identification.
Digestate		This is the material remaining after the anaerobic digestion of a biodegradable feedstock.
End of life vehicle site	ELV	Commonly referred to as a scrapyard.
Environmental agency		<p>An agency specifically established to protect, manage and improve the environment. Examples of environmental agencies include:</p> <ul style="list-style-type: none"> • English Heritage • Environment Agency (England) • Natural Resources Wales • Northern Ireland Environment Agency • Scottish Environment Protection Agency • Scottish Natural Heritage
Fire prevention plan		A written plan to minimise the risk and impacts of fire at a permitted waste site. It should be carried out in conjunction with other agencies.
Heat flux		This is the rate of heat energy transfer through a given surface, per unit surface. The greater the heat fluctuates, the greater the radiated heat given off.
Leachate		This is any liquid that, in the course of passing through matter, extracts soluble or suspended solids or any other material through which it has passed.
Leptospirosis		An infectious bacterial disease occurring in rodents, dogs and other animals, which can be transmitted to humans.
Local emergency planning groups		<p>Known as:</p> <ul style="list-style-type: none"> • Local resilience forums (England and Wales) • Regional or local resilience partnerships (Scotland) • Emergency preparedness groups (Northern Ireland)
Microbes		Single-cell organisms.
Mutagenic		This is a physical or chemical agent that changes the genetic material, usually DNA, of an organism and thus increases the

		frequency of mutation, which can cause cancer. Mutagens are therefore likely to be carcinogenic.
Refuse derived fuel	RDF	These are the combustible components of domestic waste, such as plastics.
Responsible Person		The person responsible for a site, building, or similar. Used in a legislative context they are known as: <ul style="list-style-type: none"> • Responsible Person (England, Northern Ireland and Wales) • Duty Holder (Scotland)
Site-Specific Risk Information	SSRI	This is fire and rescue service related risk information, gathered for the benefit of responding personnel attending a specific address.
Solid recovered fuel	SRF	A higher grade of refuse derived fuel that has been sorted and processed to meet stringent European standards.
Uninterruptible power supply	UPS	This is electrical apparatus that provides emergency power to a load when the input power supply, typically mains power, fails.
Urban search and rescue	USAR	Urban search and rescue teams primarily aimed at a national response to large scale disasters.
Waste Industry Safety and Health forum	WISH	Representatives from the waste management and recycling industry. Members include the Health and Safety Executive, professional associations, trade unions and government bodies involved in waste management and recycling.

Bibliography

Containment systems for the prevention of pollution (C736): Secondary, tertiary and other measures for industrial and commercial premises, CIRIA
Managing health and safety in civic amenity sites, Health and Safety Executive, 2013
Operational guidance for the fire and rescue service, Generic risk assessment 3.7: fighting fires in refuse, 2011
Operational guidance for the fire and rescue service, Generic risk assessment 3.4, fighting fires in open rural locations, 2011
Operational guidance for the fire and rescue service, Generic risk assessment 5.1: incidents involving electricity, 2013
Operational guidance for the fire and rescue service, Generic risk assessment 5.10, working at heights, 2009
Operational guidance for the fire and rescue service, Generic risk assessment 5.2, incidents involving acetylene, 2004
Reducing fire risk at waste management sites, Waste Industry Safety and Health Forum, 2014
Review and Investigation of deep-seated fires within landfill sites, Science Report: SC010066, Environment Agency, 2007
Working safely with slurry, Health and Safety Executive Northern Ireland, 2013

Websites (accessed July 2015):

<http://www.waste-management-world.com/articles/print/volume-11/issue-4/Features/understanding-landfill-fires.html>

<http://www.biogas-info.co.uk/about/biogas/>

<http://www.biogas-info.co.uk/about/ad/>

<http://www.biogas-info.co.uk/about/digestate/>

<http://www.hse.gov.uk/confinedspace/index.htm>

<https://www.gov.uk/government/publications/permitted-sites-fire-prevention-plans>

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292632/bis-14-604-weee-regulations-2013-government-guidance-notes.pdf