DRAFT FIRE CONTROL GUIDANCE
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REDUCING FIRE RISK AT WASTE MANAGEMENT SITES

This guidance has been prepared by safety professionals and ESA (Environmental Services Association), with input from the Environment Agency (EA), The Health and Safety Executive (HSE), the Health and Safety Laboratories, the Chief Fire Officers Association (CFOA) and other bodies. It is endorsed by the EA, HSE, CFOA, ESA and WISH (Waste Industry Safety and Health) Forum. In addition, the main insurance companies involved in waste management have been consulted for their views on some aspects.

For ease of reading this guidance is split: The first part covers general issues such as scope and fire risks. The second part covers specific fire control guidance for sites in four areas: whole site issues, issues in reception, during treatment and for the storage of wastes. Finally, a series of appendices is included on issues such as maximum stack sizes in external storage, producing an accident/emergency plan and checklists to help you assess whether your fire control is adequate.

This guidance is intended as an umbrella: It gives general advice which will be applicable to a wide range of waste management and similar sites which handle wastes, but it cannot cover every specific aspect of all forms of waste management type operation. Future guidance produced by sector specific bodies or on specific waste management technologies will sit under this guidance to add detail to the general considerations provided below.

It is not the intent of this guidance to be inflexible, and options and considerations have been given throughout the guidance to allow operators to tailor it to their circumstances. Nor is it the intent to provide a one-stop-shop for waste management and similar sites on fire risk – existing guidance and standards on general fire management and control should be read in conjunction with this guidance. However, it is the intent of this guidance to provide a framework through which operators can reduce the risk of fire on their sites.

Contents

Tips – throughout this publication you will find 'tips' in text boxes. These are from the experience of various waste management operators. They should not be considered part of formal guidance and are there simply to provide informal advice. They are intended to inform and share knowledge and you should consider these tips in the light of your own site specific requirements and your own individual situation.

1. Introduction and risks

Fire is an ever-present possibility at most waste management sites, if only because many wastes are readily combustible. Waste management operators should therefore ensure they have adequate controls in place to prevent fires and, should a fire occur, that any risk to human health and the environment is minimised.

This guidance aims to give an overview of fire management on solid waste management sites (see scope of guidance below) and to provide advice applicable to such sites. It is not the intent to provide a comprehensive guide on all aspects of fire safety; to duplicate general fire management guidance which is available elsewhere or provide in-depth technical advice. You should consult your competent advisor and other sources. Basic checklists, and a further reading list, is included in this guidance, but it is your responsibility to ensure that your management of fire safety is adequate. For guidance on sources of competent advice see the glossary section of this guidance under ‘competent advice’.

Fires involving combustible wastes can cause significant harm to people and the environment:

- There is the risk of death and/or serious injury and health damage associated with high thermal energy and smoke inhalation
- Combustion products, even those from non-toxic materials, release airborne pollutants which can cause both short and long term effects on human health and the environment
- Firewater run-off which can transport pollutants into drainage systems, rivers and lakes, groundwater and soil, threatening water supplies, public health, wildlife and recreational use
- Explosions, sparks and projectiles can harm people and spread any fire to unaffected areas

There are also some less direct sources of harm, such as:

- A significant burden for the Fire and Rescue Services (FRS)and other public agencies when responding to a fire may be both immediate and/or long lasting
- Civil claims from third parties relating to nuisance or potential health effects and fines and/or costs levied by environmental, fire and health and safety regulators through the criminal or civil courts
- You may be responsible for the costs of clean-up, both on and off-site under the principle of the polluter pays. This can be expensive, as in many cases the solid remains of combustion products and partially burnt material can be classified as hazardous/special waste
- Damage to your property and interruption to your business
- Insurance premiums are likely to rise substantially following a major fire, or you may not be able to secure insurance renewal at any economic cost – a major fire could effectively put you out of business
- Reputational costs can be substantial and may affect how the local community and others view your operations
- A major fire could affect your environmental permit/licence/exemption including any subsistence or other fees you pay. Many environmental permits/waste management licences have a requirement for you to operate your site to a written management plan. Even if your permit/licence/exemption does not explicitly state this you will still have a duty to prevent damage to the environment

No one wants to have a fire. But, the consequences of a major fire can be disastrous. Simply ignoring or underestimating the risk is not acceptable (legally, morally or operationally). This guidance aims to give you the basic information you need to control these risks. However, no guidance can be comprehensive and you should also seek further advice (see further reading section below or consult your safety advisor or other competent source).

Tip – gaining advice on the technical aspects fire safety can be expensive. Insurers and insurance brokers can often be a good source of free or low charge advice. Many insurers have in-house fire technical experts and they have a vested interest in you not having a fire – if you have a major fire your insurer will also suffer cost implications. Insurers are an important stakeholder in your fire plans and can often offer good advice.

2. Scope of guidance

This guidance applies to waste management sites and other sites where wastes are handled and/or stored. It applies to sites where more than 50 cubic metres of solid combustible waste material is stored at any one time. This includes the storage, treatment and handling of wastes such as, but not limited to:

- Paper, cardboard, plastics, wood and wood products of all types
- Rubber (natural or synthetic), including whole, shredded, crumbed tyres
- Fragmentiser wastes, such as from vehicle dismantling
- Refuse derived fuels (RDF), solid recovered fuels (SRF) and similar
- Waste electrical and electronic equipment containing combustible materials
- Any other waste which may pose a fire risk similar to the above

And, in the absence of:

- A relevant sector specific fire code of practice recognised by the appropriate environmental regulator or other appropriate regulatory body
- A site accident/emergency plan, which has been agreed with your local Fire and Rescue Service (FRS)

This guidance supplements but does not replace any statutory requirements for sites controlled under Local Acts of Parliament, the Regulatory Reform (Fire Safety) Order 2005 or other applicable legislation. Because of specific fire control issues and existing, other guidance this document does not apply specifically to:

- Landfill sites (but, it would apply to, for example, a recycling plant at the entrance to a landfill site)
- Composting sites, including in-vessel composting and anaerobic digestion plants
- Hazardous/special waste treatment and transfer facilities
- Waste to energy plants, incinerators and other similar thermal treatments to the extent of the thermal treatment being applied. But, it would apply to, for example, a recycling plant as pre-treatment, the reception/storage of wastes and the mechanical handling of wastes etc at such a facility
- Some specific aspects of ELV (end of life vehicles) operations, such as air-bag dismantling. However, the general principles, stacks sizes and separation distances in this guidance do apply to ELV operations
- Waste management sites which fall under the COMAH (Control Of Major Accidents Hazards) Regulations. This is highly specialised legislation and is not covered in this guidance

This guidance applies to fire risks associated with combustible wastes. It does not provide detailed guidance on reducing fire risk from:

- Ancillary facilities on your site such as welfare facilities, offices and similar
- Specific fire risks such as diesel storage tanks, gas cylinder storage and similar

You must refer to appropriate general and specific guidance for the control of fire risks associated with these non-solid waste aspects. You must also consider the risk from, and to, these facilities in your overall fire plan and assessment because they could be the source of a fire, contribute to its severity or be affected by a fire.

If you do not follow this guidance or appropriate sector specific guidance, you should be able to justify why not and show that the site specific measures you've taken instead are equivalent or superior.

3. Assessments, plans and technical standards

The law on fire control is complex and it is not the intent of this guidance to cover technical fire issues which are addressed elsewhere. However, a brief overview of current fire management requirements and who are the major regulators/stakeholders may assist you.

Regulators and insurers

In most workplaces, including most solid waste management sites, your local Fire and Rescue Authority (FRA) is responsible for enforcing general fire safety (under the Regulatory Reform (Fire Safety) Order) and if you need advice you should first contact them.

However, other regulators also have responsibilities: The HSE (Health and Safety Executive) covers specific risks and legislation such as DSEAR (Dangerous Substances and Explosive Atmospheres Regulations) and environmental regulators (such as the Environment Agency and Scottish Environment Protection Agency) cover environmental risks from fires at waste management sites and other permitted sites handling the waste types described above.

In addition, and while not a regulator, insurers have a role to play and may set their own standards. You should consult with your insurer to ensure that they are involved in your decision-making process and assessments. You may achieve a standard that your regulators are content protects human health and the environment adequately, but which your insurers may not be content with because of property and business interruption issues – different stakeholders may concentrate on different issues.

Assessment and plans

In general under fire legislation you must carry out an assessment of fire risks at your site, and based on this assessment put in place appropriate controls and measures. General guidance on fire risk assessments and plans is available on the gov.uk web site (see appendix 4 on useful links and further reading). However, in general a fire risk assessment involves:

- Identifying where on your site you have combustible and/or flammable materials
- Identifying where on your site you have potential ignition sources
- From the above information put in place your plan of controls and measures aimed at reducing the risk of a fire occurring and the impact should a fire occur

Assessments on fire risk are required under various items of law/regulation/guidance/good practice documents. Some of these may, rightly, concentrate on arriving at measures to protect people. However, environmental, business interruption and other factors are relevant and you may want to combine these factors into one assessment rather than producing multiple assessments.

Controls and measures may be physical, such as fire fighting equipment or segregation of combustible materials to prevent fire spread, or procedural, such as evacuation plans. For example:

- Your fire risk assessment may identify that wastes in reception areas (a combustible material) may be set on fire by hot exhausts on heavy mobile plant (an ignition source). You may decide that an appropriate control would be to instruct plant operatives to clear wastes from around exhausts at the end of each shift – and you should include this in your instructions/procedures to plant operatives
- You may identify that wastes (a combustible material) going through a shredder at your site (potential ignition source for reasons of friction and/or sparks) may be a fire risk. You may decide that an appropriate control measure would be to install a water drench system at the shredder
- You may identify that stored baled wastes (a combustible material) in your external storage yard may be set alight by arson. You may decide that enhancing your security arrangements would be an appropriate control. You should also consider how a fire could spread (the separation distances and stack size information in appendix 1 of this guidance should inform you in doing this)

Fire risk assessments need not be complicated, although you must ensure that you have identified all possible sources of fire and that you have appropriate controls in place.

You must also include in your assessment who and/or what (such as the environment) may be harmed by a fire and/or the consequences of a fire. To do this you should use the established model of source, pathway receptor. For example, if a fire occurs it is likely that water will be used to fight it, at least initially. This firewater will be contaminated with combustion products and other harmful substances. Where will this firewater run to and could it cause environmental damage? Your controls and measures should address this type of consideration. Guidance on the management of firewater is contained in CIRIA Report 164 (see further reading section in appendix 4 below).

It is also recommended that as part of your plan that you discuss with your local Fire and Rescue Service (FRS) their likely fire fighting strategy for your site, which may include a controlled burn to reduce firewater run-off and or for fire fighter safety, and if water is to be used an estimate of the likely volumes of firewater that will be produced to help you determine how much containment will be required (see also section 4 whole site considerations on firewater). Likely FRS fire response should be part of your assessment process.

For waste management sites there may also be conditions in your environmental permit/waste management licence/exemption regarding issues such as maximum waste input and/or storage limits, requirements for environmental protection etc. These are a valid input into your assessment and must be included.

For some aspects of your fire management you may need to consult specialist guidance or take competent advice. For example, if you store gas cylinders (either for your use or waste cylinders) then you need to take account of this in your assessment and seek advice on issues such as cylinder cage construction and separation distances for cylinder stores. Or, if your waste processing plant includes dust extraction you may need to conduct a hazardous area classification (zoning) exercise under DSEAR.

Whatever the complexity or otherwise of your assessment the aim should be to ensure you have considered all of the risks and put in place appropriate controls and measures.

Technical standards

In common with many other areas of health and safety and environmental practice there is no shortage of technical standards applied to specific aspects of fire control: These include:

- British Standards (BS Standards)
- European Standards (EN or BSEN Standards)
- Building Regulations
- Insurance industry standards (see tip-box below)

For such technical aspects of fire controls, such as specialist fire fighting equipment and standards such as for the installation of detection systems, you are very likely to require external specialist advice unless you hold specialist competence in-house. For example, there is little point in installing a complex sprinkler or drench system if it is not to an adequate technical specification, has not been installed correctly and/or does not meet your specific fire fighting needs.

Tip – the insurance industry has produced its own guidance on many aspects of fire management, including technical standards: Ask your insurer for advice as they may have access to these standards. Chief amongst these are the standards produced by NFPA (National Fire Protection Association) and FM (Factory Mutual). These standards are generally accepted by insurers and their technical experts. If your site does not meet these standards then gaining insurance, or insurance at an economic cost, may be difficult. Asking for insurer advice on technical standards in advance is likely to be better than arguing afterwards.

Tip – for technical standards relating to issues such as the installation of detection and/or fire fighting equipment the suppliers of such equipment can often be a useful (and likely free) source of advice. Such suppliers need to know the standards applicable to the products they supply and how they should be installed. However, be careful in your choice of supplier and make sure that they really know what the standards applicable to your site are. For example, an installer of domestic fire equipment may not be that familiar with the standards required for industrial applications.

Overall the technical standards applied to fire controls are complex and you need to be reassured that whatever controls you put in place meet these standards. If in doubt contact your local Fire and Rescue Service (FRS) who should be able to advise you.

4. Whole site considerations

Typically, most waste management sites have three main areas of operation:

- A reception area/s where incoming wastes are discharged
- Treatment/processing area/s where wastes are sorted, shredded, dried, sized etc
- Storage area/s where both incoming wastes and outgoing wastes may be stored

The following three sections of this guidance consider these three areas and the specific fire risks which may arise in these. This first section covers considerations which may apply to the whole of your site. You should start with these general whole site considerations and then move to the specific aspects applicable to waste reception, treatment and storage as given in the following three sections. Issues considered in this section are:

- Protection of human life
- Location and neighbouring sites/businesses/environment
- General ignition sources and precautions
- Housekeeping and dusts
- Heavy mobile plant
- Hot works
- Water supplies
- Firewater
- Fire detection, alarm and suppression systems - general
- Non-waste facilities on site
- Fire appliance access

Protection of human life

As stated above, it is not the intent of this guidance to repeat what is contained in existing general fire safety guidance and standards. However, fire management processes must start with the protection of human life. This would include having adequate fire escape provision which is clearly marked, not blocked and which is kept unlocked during operational hours and effective evacuation procedures which are trained to all staff. You must ensure that you consult with existing guidance and your competent advisor to ensure that your fire management starts with the protection of human life.

Location and neighbouring sites/businesses/environment

If you suffer a fire it may have an impact on your neighbours, such as smoke being blown towards a residential area. Conversely, a fire at neighbouring premises may affect you and may even spread to your site. Your general location may also affect the level of fire controls you put in place. For example, if your site is isolated it may take some time for the Fire and Rescue Service (FRS) to respond to any alarm call.

Factors which you may need to consider in your fire assessment include, but are not limited to:

- Are there any sensitive receptors including schools, hospitals, major transport infrastructure (such as main roads), other businesses, shops, residential areas, rivers, canals and protected habitats that could be effected by a fire at your site?
- Where your assessment indicates that there is a risk to sensitive receptors, then you must work with your local FRS and the Environment Agency/Scottish Environment Protection Agency to reduce the risk and potential consequences of a fire
- Do any neighbouring premises pose fire risks to your site or could a fire at your site have a catastrophic effect on neighbouring premises? For example, gas storage facilities or other hazardous material storage/treatment site, garages and workshops storing fuels and similar. If this is the case you should liaise with these neighbours to ensure your and their accident/emergency plans take account of the possible risks. And, you may decide to arrange storage so that it is adequately separated from any higher-risk neighbouring premises
- How isolated is your site and what is the likely response time of the local FRS? Are your on-site fire fighting provisions and water supply adequate to any delay in the FRS arriving?

General ignition sources and precautions

As stated above, it is not the intent of this guidance to be a one-stop-shop for advice on general fire management. However, from industry experience, it is worth noting the below issues and precautions:

- While your employees may know your site rules and what to do in the event of a fire, you must also ensure all visitors, contractors and drivers using your site are aware of the correct safety and fire prevention procedures to follow whilst on site
- Discarded smoking materials are a major ignition source. You should apply a no smoking policy or ensure suitable designated smoking areas are provided, situated away from combustible materials. Any designated smoking areas should be signposted and supplied with a sand bucket or similar for discarded smoking materials
- You must control general sources of ignition such as heating pipes, naked flames, light bulbs, space heaters. These must be kept at least 6 meters away from stacks of combustible and flammable materials such as waste stacks and fuel storage areas
- As appropriate to your location you should put site security measures in place, such as security fencing, intruder alarms and CCTV, to minimise the risk of vandalism and arson. Your arrangements should cover both the working day and outside normal hours
- Electrical faults, both in processing equipment and general electrical systems such as lighting and heating, can be a source of ignition. You should have regular and planned inspections of your electrical systems. This should include portable electrical appliances (PAT) testing and fixed electrical equipment. You should also seek competent advice on issues such as grounding and bonding controls for electrical systems
- Fires may smoulder undetected after the end of the working day/shift. You should consider formal site ‘close-down’ procedures including inspection of the site after work has ceased to reduce the risk of a smoulder being undetected and turning into a fire

Housekeeping and dusts

In general the smaller the particle size of a combustible material the easier it may be to set alight and the more fiercely it may burn. Likewise it is generally easier to set alight loose and free/discarded materials than compacted materials. In particular dusts may pose a distinct fire risk if they come into contact with hot surfaces and other ignition sources.

Some specific aspects of dust control and fire are included in the section on waste treatment below. However, in general on dusts, small particle size combustible wastes and loose wastes and on housekeeping in general:

- You should introduce a regular maintenance and cleaning programme for all site areas including site machinery and buildings and ensure good house-keeping. This should aim to keep levels of dust, loose fibre and paper and other combustible materials in buildings and around the site to a minimum
- You should ensure that as part of your housekeeping that flammable materials, such as oils, greases, fuels, paints etc, are always stored correctly and put back in store after use
- You should include housekeeping in your routine site inspections and act to keep your site as free from loose/discarded combustible wastes and dusts as practical

Heavy mobile plant

Most waste management sites use heavy mobile plant, such as loading shovels, grabs and telescopic handlers. This plant can lead a hard life and is inevitably in direct contact with waste, much of which may be combustible. Heavy mobile plant can pose ignition risks to the wastes they come into contact with:

- Hot exhausts can ignite wastes trapped near them. You should instruct plant operators of this risk and ensure that wastes are cleared from around exhausts at the end of each shift
- Mobile plant should be fitted with fire extinguishers and you may wish to fit automatic fire extinguishing equipment under plant engine bonnets and other high risk areas
- You should ensure that mobile plant is well maintained, in particular electrical systems which may be a source of fires
- Mobile plant should be parked after use away from waste stacks, waste left in reception areas and other places where wastes may be present
- Mobile plant shovels, blades and similar may produce sparks such as when scraped along a concrete or metal surface/wall. You should consider this during your assessment and plant operators should be aware of the risk. For high-risk areas and materials you may even want to consider precautions such as specialist coatings for mobile plant shovels and blades to limit or prevent the generation of sparks

In addition to the potential fire risk heavy mobile plant poses, they may also be useful in fighting fires. For example, spreading wastes out so that a fire can be more easily tackled. Heavy mobile plant can also be used in other ways to tackle fires:

- By removing wastes which are not on fire from the location of a fire to prevent fire spread, such as by 'sweeping' un-ignited wastes away from a pile of waste which is partially on fire or by moving waste stacks away from a stack which is on fire
- By removing wastes which are on fire to a different location where fire fighting may be easier, such as by moving waste from inside a covered reception hall to the outside: In essence taking the fire outside where it can be fought more effectively, although consideration should be taken as to where burning waste is moved to as it could spread a fire through means such as wind-blown embers
- By pushing soils or other inert material over a fire to starve it of oxygen

However, if you intend in your accident/emergency plan to use heavy mobile plant in this manner you must ensure:

- That plant operatives are trained and competent in the task – and that they are completely aware that any such action must only be done without risk to their own health and safety
- That the heavy mobile plant is suitable to the task, such as by having completely enclosed cabs, fire and heat protected hydraulic systems etc
- Such action is included in your site accident/emergency plan

Tip – if you intend to use heavy mobile plant to fight fires you should conduct drills with plant operators. For example, by practising sweeping wastes away from a pile or pushing inert materials over wastes. The retro-fitting of fire and heat protection systems to heavy mobile plant can be expensive. But, is often an inexpensive addition to the specification at the point of manufacture. When replacing your heavy mobile plant think about its specification in advance.

Hot works

Hot works, such as welding, grinding and cutting, take place at waste management sites on a regular basis, such as during maintenance and repair. You should at least:

- Ensure staff and any contractors follow safe working practice when undertaking hot working, such as welding, grinding and cutting
- Ensure that fire extinguishers, hoses etc are provided at the scene of any hot work so that they can be used immediately should a fire occur. Such equipment should be stationed adjacent to the pathway of escape from the work area and not in a place where staff using them could be trapped by fire
- In areas where wastes or other combustible materials are present, hot work should be a two-person job: One person doing the hot work and a second watching – someone who is welding will rarely look behind them at where any sparks may land
- So far as practical wastes should be cleared away from the area of any hot work before hot work starts
- Potentially combustible materials, including mobile plant hydraulic lines, should be covered by a fire blanket and/or damped down with water as appropriate before hot work starts
- Conduct a fire watch at the scene of any hot work at least one 1 hour after hot work has finished – sparks from hot work can smoulder for a significant time period

- You may want to put in place a permit to work system to ensure that appropriate controls are in place before, during and after any and all forms of hot work

Water supplies

While fire extinguishers may be useful in tackling small fires, the majority of larger waste fires are likely to be fought with water. If you do not have a sufficient water supply the outcome is likely to be predictable.

Fire fighting a 300 cubic metre stack of combustible material will normally require a water supply of at least 2,000 litres a minute for a minimum of three hours. This is a total of 360,000 litres of water – 360 cubic metres/tonnes of water.

To put this into context, if you have three stacks of baled combustible waste of 300 cubic metres each (approximately three stacks of bales each 20 metres long, three bales high and 4 metres wide) it would take a tank/pool of water 5 metres deep, 15 metres long and 15 metres wide to fight a fire in all three stacks.

- How good is the water supply to your site? If it is only a standard industrial supply it is unlikely to be able to provide sufficient water for significant fire fighting purposes
- How close is the nearest public hydrant to your site?
- If the nearest hydrant is not close (more than 100 metres away), or your site is large, you should consider an on-site hydrant/s and/or installing a fire main to allow sufficient water to be available
- If the above is not practical, do you need to install fire water storage tanks on your site?
- Are there alternative water sources near to your site, such as rivers, lakes, lagoons etc? And, could the Fire and Rescue Services (FRS) use these alternative sources?

Tip – if you intend to use an alternative water source such as a lagoon, then consider particulates which may be in this source (such as mud, silt etc). You may need to consider large capacity filters to allow such water to be used – or face the potential for pipes and the pumps handling water from such sources blocking entirely or working at a much reduced effectiveness.

You should check you have adequate water supplies when you carry out your fire risk assessment. If you have any questions consult your local Fire and Rescue Service (FRS). As above, on larger sites the provision of a private fire hydrant system with the necessary supply of water may be required.

You should include in your assessment whether you would plan to use water to damp-down waste materials (such as stacks) which are not on alight during a fire to minimise the risk of fire spread – if this is the case then your water supply will need to be adequate to do this in addition to fighting a fire.

The location of hydrants, on or off site, should be included in your accident/emergency plan and should remain easily accessible. Hydrants should also be tested periodically to ensure they work.

If you have, or plan to, install fire fighting equipment such as deluge systems, sprinklers, fire cannons etc then these will also have their water supply requirements. You should seek competent advice on your water supply requirements for fire fighting equipment to ensure it is adequate.

Tip – the technical standards on required water supplies for sprinklers, drenches etc are complex. Your insurer may have access to such technical standards (such as the FM and NFPA standards mentioned above and relevant BS and EN standards) and may be able to provide such advice to you at low or no cost.

Firewater

Should a fire occur it will most likely be fought using water. This water will very likely be contaminated once it has been used to fight a fire. If this firewater escapes your site it may cause pollution – pollution you may be responsible for both in terms of clean-up costs and potential civil or criminal action:

- All waste storage and stacks should be on an impermeable/fire resistant surface
- You should consider installing secondary and tertiary containment facilities for firewater run-off such as:

    - Bunds
    - Storage lagoons
    - Shut-off valves/penstocks
    - Isolation tanks
    - Modified areas of your site, such as a car park
    - Block drains and/or divert firewater to a containment area or facility using pollution control equipment such as: firewater booms and drain mats

You may also wish to consider in consultation with the Fire and Rescue Services (FRS):

- Reducing the amount of firewater run-off generated by using sprays and fogs rather than jets in fire fighting equipment on site (provided it would still be effective in fighting a fire)
- Recycling firewater if it is not hazardous and it is possible to reuse
- Separating burning material from the fire and quench it with hoses or in pools, or in tanks of water. This has the advantage of reducing the amount of firewater produced
- A controlled burn – any decision to attempt a controlled burn must be taken by the FRS and should not be attempted by a site operator
- Burying the fire using soil, sand, crushed brick and/or gravel. This may be appropriate if there are limited water supplies and smoke is threatening local people, but it can only be used when:

    - Groundwater vulnerability is low
    - You have consulted the Environment Agency/Scottish Environment Protection Agency about this option beforehand
    - Contaminated material is removed and legally disposed of as soon as it's safe to do so

Tip – Before deciding to smother or bury a fire consideration should be given to the likely timescales for the cooling and removal of the resulting entombment. Materials entombed in this way are likely to be highly insulated from heat loss and therefore liable to reignite upon re-exposure for periods of weeks, months or even years. If the decision is taken to smoother a fire with a layer of inert material consideration should be given to ways of minimising the insulating effect of the smothering layer.

To decide which of these options, or combinations of options, is appropriate you should take account of the:

- Scale and nature of the environmental hazards on your site and the activities that take place on it
- Risks posed to people, the environment and property
- Type of materials you store on site, the form they are stored in and the length of time and the best strategy needed to extinguish a fire involving them
- Availability of firewater containment facilities
- Local topography and different weather conditions and fire scenarios that could be reasonably expected at the site

The containment facilities and pollution equipment you need will depend on the size of your site, the amount of material you store and the fire fighting strategy. CIRIA 164 (see further reading and links section of this guidance) will help you identify the facilities and equipment you need for your site.

If you make a polluting discharge to the water environment you will be committing an offence, unless you have a permit/consent to do so and the discharge meets the conditions of that permit/consent.

Fire detection, alarm and suppression systems - general

All fire detection, alarm and suppression systems must be installed and maintained to the relevant standards by competent persons, such as specialist LPS and LPCB approved fire protection and fire alarm systems designers/contractors:

- For plant and equipment (such as recycling and recovery plant) fire detection, alarm and suppression must be part of the design risk assessment. For larger facilities the development of a separate fire strategy document is recommended
- Consider multiple approaches to detection and suppression rather than simply choosing a single item. For example, in some cases using more than one type of detector may be more effective than relying on a single type of detector
- For buildings systems should be compliant with the relevant building regulations, as supplemented by your risk assessment to take account of waste management use
- All fire detection, alarm and suppression systems should be maintained in good order and tested and checked as required – seek the advice of your competent person to ensure you are maintaining and testing/checking your systems as required

- For larger sites and/or isolated sites, or if your risk assessment identifies such, fire alarms should be monitored remotely at a permanently occupied location. This may be another site you operate which is open 24/7, your security alarm provider or specialist contractor. Whichever is the case you should lodge your accident/emergency plan with them so that they know who to contact in case of a fire

Advice on suitable fire detection, alarm and suppression systems can be obtained from your competent person (such as specialist suppliers/contractors/designers as above), your local Fire and Rescue Service (FRS) and your insurer. However, in the end you are responsible for ensuring that your fire detection, alarm and suppression systems are adequate and you should devote sufficient time and resource to ensure that they are.

Once you have installed appropriate fire detection, alarm and suppression these must be checked, tested and maintained to ensure they remain effective. Some checks can be performed by site staff, such as routine weekly alarm tests. However, other tests and checks should be performed by a competent supplier. Maintenance must be carried-out by a competent supplier.

Should your fire detection, alarm and/or suppression systems be impaired at any point (such as by damage, break-down etc) you should inform your insurer. If you do not and you have a fire you may find yourself uninsured. You may also want to inform your local FRS and initiate additional controls, such as a fire watch after operational hours.

Tip – fire detection and suppression system technology is developing all of the time. Your competent advisor, insurer and/or the suppliers of fire equipment should be able to give advice on what is available on the market – just because you have always used a particular type of detector etc in the past does not mean that there is not something newer on the market which is better.

Non-waste facilities on site

Virtually all waste management sites have office, weighbridge and welfare etc facilities. While these are not included specifically in this guidance, you should seek competent advice on fire management in these general facilities and you must ensure you comply with the relevant standards such as those in buildings regulations:

- Such buildings should be provided with fire/smoke detection and, as required, manual break-glass points unless all areas of the building can been seen from any other area (such as a single room cabin)
- Detection and alarm systems should be connected to the overall system for the site – that is any alarm will cause an alarm across the whole site and visa-versa
- At the least fire extinguishers of an appropriate type and number should be provided, along with training for personnel to use them
- Building standards requirements must be met for all such buildings
- In general waste stacks should be separated from such buildings by a gap of at least 10 metres, unless the building is protected in another suitable manner, or the waste is contained in a suitable bunker/enclosure with appropriate height and construction walls – even then such bunkers should not be right against buildings. Note – the 10 metres quoted above may not be sufficient for some types of waste and you should consult with your competent advice

Fire appliance access

If Fire and Rescue Services (FRS) vehicles such as fire tenders, cannot get onto your site and/or cannot access all areas of your site to fight a fire then the outcome may be disastrous should a fire occur.

Access for the Fire and Rescue Services (FRS) vehicles to your site and around your site should be unobstructed at all times and meet as a minimum the requirements in the table below. You should also consider how fire appliances can turn around once they have entered your site. Points you may want to consider include:

- If the FRS cannot access all parts of your site (see distances etc in table below), can the FRS access around the edges of your site via a public highway or similar? If not, such as if your site is right against a neighbouring building, then you will need to consider stand-off between stacks and the edge of your site to allow access
- Is there more than one entrance to your site which FRS vehicles can use? Or, are you restricted to one entrance and therefore have a need for easier access around your site?
- Are there on-site height restrictions, such as overhead power lines, bridges etc

Table: FRS vehicle access requirements

Type of FRS appliance	Min width of road (metres)	Min width of gateway (metres)	Min clearance Height (metres)	Min weight restriction (tonnes)
Water tender	3.7	3.2	3.7	12.5
High reach vehicle	3.7	3.2	4.0	24

If you have any doubts regards how FRS vehicles may be able to access your site, you should contact your local FRS and seek their advice.

Note – the above distances are for access to fight a fire by FRS vehicles. They are not distances primarily aimed at preventing or reducing the risk of fire spread such as between stacks of stored wastes. For guidance on such distances in external storage see appendix 1 below, and for general considerations on storage (both internal and external) see the section on storage below.

5. Waste reception

All waste management sites have reception facilities. These may be:

- Enclosed tipping halls where waste is discharged prior to being fed into recycling or similar plant
- Split level reception areas
- Reception pits, where waste may be fed into processes by grab crane, conveyor or similar
- Open reception areas for wastes such as wood prior to processing

Note – this section is aimed at the temporary storage of wastes in reception for short periods of time typically not exceeding 72 hours or shorter prior to treatment and/or transfer to another site (you must comply with any limits set in your environmental permit/licence on this aspect). It does not cover specifically wastes stored prior to treatment or transfer for longer periods of time. If you store wastes for longer periods of time prior to treatment or transfer then you should refer to the section on storage of wastes below.

Issues considered in this section are:

- Hot wastes and other hazards in reception
- Fire detection/alarm at reception areas
- Fire suppression systems at reception areas

Hot wastes and other hazards in reception

One of the main causes of fires in reception areas is the receipt of hot loads, or loads with hazardous materials in them such as gas cylinders, which subsequently cause a fire. You should ensure you have robust waste acceptance procedures that prevent unauthorised waste being accepted:

- Consider implementing a fire-watch at the end of the shift/operational day
- Consider not accepting higher-risk loads late in the working day, or processing such quickly rather than leaving them in reception over-night
- All employees in reception areas should be instructed to look for fires, hot loads, smoke and signs of smoulders – and what action to take if they see one (such as the use of heavy mobile plant to move suspect loads to a safe area, dousing suspect loads with water from a fire hose etc)
- Consider instructing your mobile plant operators to spread wastes out when they are received to make identification of smoulders and hazardous items easier
- Consider the provision of an ‘emergency/quarantine area’ for suspect loads. Note – this must be different from your normal quarantine area for non-conforming loads as these may contain hazardous materials which you do not want to expose to hot wastes

Tip – there will be times when the delivery of hot loads will be more likely and specific reminders to reception staff would be useful. Examples are the increased likelihood of "hot" barbecues and ashes in wastes delivered to HWRC's and from domestic sources after bank holiday weekends or during warm weather. Plus consider the likely increase in the appearance of hot ashes and other wastes from garden burners after the first warm dry weekends of spring and the potential presence of hot ashes from bonfires and the residue from fireworks in early November or at other times of celebration where bonfires and/or fireworks may be an issue.

Fire detection/alarm at reception areas

For enclosed reception areas in buildings, reception pits and similar waste reception areas fire detection should be provided. This may be, dependent on your fire assessment and the advice or your competent person or the Fire and Rescue Services, include:

- Aspirating fire detection system
- Spark, infrared or ultraviolet detection
- CCTV visual flame detection systems
- Flame detectors
- Linear wire heat detection (but, should be located away from potential damage by mobile plant)

If acceptable from your risk assessment the system can be programmed with a timer arrangement to be active only during non-operational hours. Fire/smoke detection systems in reception areas may be subject to false alarms because of dusts etc and during operational hours the reception area will be occupied at least by plant operators who will spot a fire. However, think carefully before considering this option – will your reception area always be occupied during operational hours?

In addition all exit doors from enclosed reception areas should be provided with manual break-glass points.

Tip – conventional security CCTV arrangements can often be upgraded to include flame; fire or hot spot detection at fairly low cost, even as a retrofit.

For external waste reception areas providing fire detection may be more difficult. However, detection is possible and some sites have successfully installed camera type detectors over external reception bunkers and similar. Just because your reception area is outside does not mean that you should not consider detection in your assessment.

While this section applies to wastes in reception only for short periods of time, the greater the amount of waste in reception at any one time the higher the likely consequences should a fire occur. For large waste management and similar facilities where large amounts of waste are stored you should consult your competent advice regards detection.

Fire suppression systems at reception areas

You should seek advice regarding suitable fire suppression systems for your reception area. However, the below are options dependent on the design and layout of your reception area:

- Manual open deluge system **-** an open deluge nozzle line installed on the walls around the waste in the waste reception area connected to a FRS breeching inlet connection. This type of installation would not need a fixed water supply and would enable the FRS to apply water/foam directly into the waste. Note – you will need a fire hydrant (on or off site) within 100 metres for this to be a viable option
- Deluge system – as above, but already connected to a suitable water supply (fire main, pumped water storage tank etc). Systems can either be manual or automatic (if automatic the reliability of your fire detection system is critical to avoid false activations)
- Mobile foam trolley- with aqueous film-forming foam (AFFF) concentrate, proportioned at the appropriate rate. Water supply to the trolley is via hydrant or other suitable supply
- Hose reel systems – fire hoses from a suitable water supply. Hoses should be sufficient in terms of number and length to reach all parts of the reception area
- Water cannon – fire fighting water cannons at appropriate fixed points (if practical) fed by an appropriate water supply. However, beware of such systems if they are high-pressure as they may 'blow' wastes which are already alight around reception so igniting other wastes
- Sprinkler systems - sprinkler systems where installed should be designed, installed, commissioned and maintained in accordance with LPC Sprinkler rules incorporating relevant BS and EN standards. Sprinkler options need to take account of the distance to the waste and volume of waste in a reception area – targeted systems may be more effective than general area systems
- Foam additive to sprinkler and deluge systems may also be considered for sites accepting high volumes of plastics or other higher risk wastes. These will also reduce the volume of water needed to fight a fire

The option/s you choose should be informed by your fire risk assessment, and you would be wise to consult with your insurer to ensure that they are content with what you decide upon. Many of the above options are only practical at enclosed reception areas. For external reception areas the installation of fire hoses may be the most practical option. However, some sites have installed deluge and similar systems at external reception bunkers and similar successfully and you should at least consider such.

For some waste reception areas there is a direct feed into a processing area, such as a conveyor feed into a treatment system. In such cases you will need to consider such interconnection and the potential for a fire in a reception area being fed automatically into your processing area.

In some waste reception areas items of recycling/recovery equipment are located directly in the reception area. For example, a shredder as pre-treatment before waste is fed into a main processing area. In such cases you should consider protection such as listed below in the section on waste processing. For example, for a shredder located in a reception area installing a water deluge system at the shredder.

One potential problem with fighting fire in enclosed reception areas is smoke, which may obscure a fire and make it difficult for the FRS to direct water direct to the seat of a fire. You may want to consider, subject to your risk assessment, passive or automatic smoke vents in the roof over reception areas. However, you must consider this carefully as vents can cause interaction problems with sprinkler systems resulting in them not activating as early as may be desirable – you should seek competent advice on this issue.

If during abnormal situations, such as plant breakdowns, you need to exceed your normal reception area capacity you should put in place additional measures, such as a fire watch outside of operational hours. Ultimately you may need to cease accepting wastes so as not to compromise the fire safety of your site.

Finally on reception areas, your waste reception area has a finite, safe capacity and you should not exceed this. Determine during your assessment what this capacity is and stick to it (there may also be conditions in your permit/waste management licence which must be followed).

There may also be other practical considerations – if you have installed a sprinkler or deluge system it is unlikely to work effectively if the height you are storing wastes at means such systems are buried. Likewise think about height for other reasons, such as waste piled to such a height that electrical lighting may pose an ignition risk.

Tip – try to think of obvious visual methods to guide your operative regards the maximum safe capacity in your reception area. For example, painting an obvious line on reception bunker walls above which waste must not be piled.

6. Waste treatment and processing

Waste processing systems vary widely and this guidance cannot cover all technologies used. However, many recycling/recovery systems commonly include:

- Shredding, bag opening and similar devices which may themselves pose an ignition risk though friction, sparks from metal-on-metal contact, blunt blades and other similar causes
- Trommel, flat and other screens, air-separators and other gravity based sorting systems. While these may not pose a high ignition risk, they are often close to items such as shredders. If a fire starts in a shredder or similar it may be just a smoulder because of a lack of oxygen: When fed into a trommel, air-separator etc the waste is then agitated and receives sufficient oxygen to ignite fully
- Mechanical handling systems, such as conveyors if well maintained should not pose a high ignition risk, but they can transport already alight waste rapidly around a plant so accelerating the spread of a fire
- De-dusting, cyclone and other similar devices – there may be a risk of dust explosion and you should seek specialist competent advice on these items
- Mains/electrical plant rooms which may pose higher-voltage electrical ignition risks and control panels for items of recycling/recovery equipment

Each of the above common types of equipment is considered below. However, there are other items of equipment used in recycling/recovery systems such as optical sorting systems, magnetic and eddy current processes and other specific recycling/recovery equipment – you should assess any specific fire risks associated with other equipment you may use. You should seek competent advice on this

Issues covered in this section are:

- General ignition risks in processing
- Shredders, bag openers and similar
- Trommel screens, other screens, air-separators and similar
- Mechanical handling systems, conveyors etc
- De-dusting systems, cyclones etc
- Mains/electrical plant rooms and control panels
- General considerations and fire suppression in processing areas
- Fire detection/alarm in processing areas
- Protecting your plant by separation/segregation and plant close-down

General ignition risks in processing

In addition to the above specific risks, recycling/recovery plant may pose other general ignition risks (the presence of waste is a given as a potential fuel source), such as:

- Electrical faults, faulty or damaged wiring causing sparks and heating
- Friction from slipping conveyors, damaged or worn bearings, damaged or worn drive motors
- Direct heat from drive motors and other items which may generate heat
- Direct heat from specific items of equipment

You should seek advice from your competent person as to what fire suppression and management measures need to be taken. However, the following offers some general consideration for the common recycling plant and ignition risks noted above.

Note – at some waste management sites some processing equipment may be located outside, such as a wood shredder in an open yard, and the fire suppression etc systems listed below may not be practical in such applications. However, this type of equipment often already comes with its own fire fighting system installed, such as an automatic extinguisher system built-into a shredder. You may want to consider this type of system. At the least you should consider how you would fight a fire in such equipment. For example, would your fire hoses reach such equipment located in an open yard?

Shredders, bag openers and similar

This type of equipment poses a higher risk of ignition from friction and/or metal-on-metal and similar contact. In addition, as they are often well enclosed for valid machinery safety reasons, fighting a fire may be more difficult as it may not be easy to get at. You should consider installing water deluge or sprinkler type systems either in shredder etc housings to extinguish fires, or at conveyor outputs from shredders etc to prevent fire spread.

Trommel screens, other screens, air-separators and similar

While trommel screens and similar may not pose a high ignition risk they can aerate wastes resulting in a smoulder turning into a full fire. You should consider installing water deluge or sprinkler type systems either in trommel etc housings to extinguish fires, or at conveyor outputs from trommel screen etc to prevent fire spread.

Mechanical handling systems, conveyors etc

Conveyors and similar may carry a fire rapidly through your plant, and they may be an ignition source themselves as a result of friction:

- Consider a conveyor water deluge/sprinkler systems, as identified by your risk assessment. These may be under-conveyor, over-conveyor or to the side of conveyors with deflection plates to divert water onto the conveyor. Under-conveyor systems may pose issues such as being more open to damage and/or causing a restriction to maintenance activities and over-conveyor and side systems may be better
- Consider installing slip sensors on conveyors to determine if a conveyor is slipping on its drive roller – the friction caused by such slippage may pose an ignition risk
- Fire alarm and detection systems should be connected to plant control systems so that if a fire is detected the plant stops, so preventing burning wastes being transported through your plant

De-dusting systems, cyclones etc

The extraction/separation of dusts and fines using extraction systems, cyclones and similar may pose dust explosion risks. For some of this type of equipment areas of the system such as at bag filters etc may be classified as hazardous areas (commonly called 'zoning'):

- Such systems should be subject to an assessment under the DSEAR (Dangerous Substances and Explosive Atmospheres Regulations) and may require hazardous area classification (zoning) – you should seek competent advice on this
- Where required by a DSEAR assessment, controls such as spark detection/suppression, pressure release systems (such as blast panels) and water deluge systems or similar should be installed
- Any hazardous areas (zones) must be identified and signed – and employees should be aware of any such zones and the precautions to take
- The standards for electrical and other equipment in such systems are likely to be higher than for general electrical systems and you should seek competent advice on this
- Maintenance of DSEAR compliant systems should only be undertaken by a competent person, you may need to check on the competency of contractors or others undertaking this work – a general electrical contractor may not have the knowledge required

De-dusting and similar systems are often aimed at the beneficial control of dusts around a plant. However, such systems may also concentrate the hazard posed and de-dusting and similar systems need careful consideration and very likely specialist competent advice on their operation, maintenance and repair.

Mains/electrical plant rooms and control panels

- Mains/electrical plant rooms should be enclosed and constructed to appropriate fire resistance standards (consult your competent advisor)
- Thermal imaging cameras used in regular surveys can be of use to detect electrical faults early and reduce the risks involved
- Mains/electrical plant rooms should be supplied with suitable (usually CO_2) extinguishers and doors to mains rooms should have vision panels to allow a fire to be seen before entry
- Control panels should either be located in enclosed rooms or constructed to a suitable IP (protection) standard to prevent dust ingress

General considerations and fire suppression in processing areas

Examples of general considerations for fire management in waste processing areas include:

- Housekeeping in process areas needs to be of a good standard. Dust should be cleared from electrical conduits and systems and drive motors (and any other item of equipment which may produce heat or be an ignition source, such as optical sorting equipment)

- Thermal imaging cameras may be used to detect hot-spots around your plant, such as slipping conveyors, over-heating drive motors, faulty electrical systems etc. Such thermal imaging surveys need not be conducted every day, but can be part of routine maintenance and inspection regimes
- Hydraulic systems, including hydraulic oil tanks, may generate significant heat. In addition, hydraulic oil is flammable and leaks from hydraulic lines and systems may result in fire. Fires in mists and sprays of leaking hydraulic oils are a particular risk and can be highly dangerous. You should include hydraulic systems in your routine checking, testing and maintenance systems and you may want to consider installing fire suppression systems at/above hydraulic power packs

In terms of fire suppression systems, in addition to the above, the following may be considered based on the outcomes of your fire risk assessment and competent advice:

- Consider platform level sprinkler systems under picking cabins. This is only for bunkers under cabins containing combustible wastes, although if your bunkers are used for various wastes all bunkers should be considered for protection
- Roof level sprinkler system if identified as part of your risk assessment. Sprinkler systems where installed should be designed, installed, commissioned and maintained in accordance with the relevant rules and standards such as BS and EN standards
- Baler fire extinguisher coverage – while balers are generally well protected (being encased) aerosols and similar can result in fires during operation. The baler area and control position should be provided with sufficient fire extinguisher coverage
- Picking cabins, control rooms and similar should be provided with appropriate fire extinguishers

In summary, the fire suppression systems you decide upon should be appropriate to your own plant and the above are only examples. You should seek competent advice, decide on what you will do and then do it.

You would also be wise to consult with your insurer to ensure that they are content with what you decide upon. In terms of financial loss, the highest cost fires often occur when recycling/recovery plant is damaged or destroyed. As such, your insurer may have specific requirements to limit such losses and you should consult with them. The cost of installing fire suppression systems may be significant, but is unlikely to be as significant as the costs associated with a major fire and may bring savings in reduced insurance costs.

Tip – in general the most expensive (in cost terms) fires at waste management and similar sites are those which result in damage to plant and equipment. Your insurers are likely to concentrate on this aspect as this is where your highest likely financial losses may be in the event of a fire. You need to take account of this as your insurer is an important stakeholder. You should also be aware that you need to balance this loss/risk need with other aspects such as human and environmental protection.

Fire detection/alarm in processing areas

Processing areas should be provided with appropriate fire detection and alarm systems. Examples of the type of detection systems you may consider include:

- Aspirating fire detection system
- Spark, infrared or ultraviolet detection
- CCTV visual flame detection systems
- Flame detectors

If acceptable from your risk assessment the system can be programmed with a timer arrangement to be active only during non-operational hours. Fire/smoke detection systems in processing areas may be subject to false alarms because of dusts etc and during operational hours the processing area should be occupied by operators who will spot a fire. However, think carefully before considering this option – will your processing area always be occupied during operational hours? In addition all exit doors from picking cabins, control rooms and similar should be provided with manual break-glass points.

Picking cabins should be provided with suitable smoke/heat detection systems – and these must not be turned off during operational hours. Appropriate fire/smoke detection systems should also be fitted in mains/electrical plant rooms. Picking cabin exit doors should be provided with fire alarm break-glass points.

As stated above for conveyors, fire detection and alarm systems should be connected to plant control systems. Should a fire alarm be activated, either by a break-glass point or detection system, it should act in the same way as pressing an emergency stop and should stop the plant to prevent rapid fire spread.

Protecting your plant by separation/segregation and plant close-down

You should consider how your processing area is separated by distance and/or segregated by appropriately constructed barriers, such as walls, from waste storage and reception areas. This should be two-way:

- If a fire occurs in your waste storage and/or waste reception, how is your processing plant protected from fire spread?
- If a fire occurs in your waste processing area, how is fire spread to waste storage or waste reception controlled?

For example, you may want to consider the use of walls and/or push walls of an appropriate construction to segregate waste reception from waste processing to prevent fire spread, or to locate waste storage well away from waste processing.

A significant number of waste site fires in processing areas occur after working hours. To reduce this risk you should consider a formal close-down procedure including issues such as:

- Over-run of shredders, conveyors, screens etc to ensure that they are as clear of waste as practical
- Shut-off and lock-off of electrical power to the plant
- Shut-off of other electrical items such as heaters
- Clearance of waste which have accumulated under equipment
- Ensuring that any flammable materials such as fuels have been secured

- A fire-watch at least one hour after the end of operations
- Spread out any waste loads awaiting processing to ensure that there are no undetected hot items or other materials which could start a fire
- Check that mobile plant has been moved to a safe distance
- Check that fire detection systems have been activated
- Check that security systems have been activated and that fences, gates etc are secure

7. Waste storage

Many waste management sites store combustible wastes: Either wastes brought to site and awaiting processing and/or transfer or wastes/products which have already been processed and are awaiting transport off site. Examples of such wastes include, but are not limited to:

- Baled recyclates such as paper, cardboard and plastics
- Baled and wrapped SRF/RDF and other waste fuels
- Loose wood, hard plastics, tyres etc

Note - to avoid repetition, the term ‘stacks’ is used in this guidance for stored accumulations of all the above and similar stored wastes, whether baled, loose or otherwise stored.

Note – this section is not aimed at the temporary storage of wastes in reception for short periods of time typically not exceeding 72 hours or shorter prior to treatment and/or transfer to another site. Rather it covers longer-term storage of wastes. For guidance on waste reception areas see the specific section above.

Waste storage at waste management sites can be internal (inside a building) or external (such as in stock yard). Guidance is given below on both internal and external storage, and appendix 1 covers maximum stack sizes and minimum separation distances for stacks of externally stored wastes.

Areas covered in this section are as below, split into three basic parts covering: General considerations for all stored wastes, whether internally or externally, issues relating to internally stored wastes and, finally, issues relating to externally stored wastes:

- General considerations – safe storage capacity
- General considerations - fire and heat detection in storage areas
- General considerations - fire suppression in storage areas
- General considerations – self-combustion and storage times

- Internally stored wastes – overall considerations
- Internally stored wastes - bunkered/enclosed internal waste storage areas/bays

- Externally stored wastes – overall considerations
- Externally stored wastes – vandalism and other specific ignition threats
- Externally stored wastes - enclosing/bunkering stacks
- Externally stored wastes - turning open stacks

General considerations – safe storage capacity

The total amount of combustible waste stored and how it's stored will influence the likelihood, size, duration, and impact of a fire should one occur. As part of your assessment you should calculate the maximum safe volumes of waste you can store:

- For externally stored wastes use the information in appendix 1
- For internally stored wastes you should seek competent advice because of the differences in the type, size and construction of buildings that could be used to store combustible wastes. Some guidance is given below for internally stored wastes, but this is a baseline and you should seek competent advice
- For wastes stored in bunkers/enclosures (such as three-sided walled structures) capacity should be calculated accounting for waste 'slump' (many wastes will not store in neat cubes and the capacity of bunkers etc will not be a simple matter of height x length x width)
- For wastes stored in bunkers/enclosures (such as three-sided walled structures) capacity should be calculated with waste not exceeding the height of the retaining walls at any point (where wall height varies the lowest wall height should be used)
- If you store various different types of waste you should consider whether you need to include specific storage limits for each type of waste, in particular if a specific waste type poses a higher fire risk
- Your calculations should also take account any restrictions on amounts permitted and storage times in your site's permit/licence or other similar regulatory permissions

Based on your calculations you should be able to determine the maximum safe volumes of waste you can store on site at any one time, and in any one storage location. You should then compare this maximum volume with your waste inputs and processing capacity. Your management system should then be arranged so as to ensure that waste is transported off site before you reach your maximum safe capacity.

If the wastes on your site are subject to seasonal variation in demand and/or supply, it is important that you manage these variations to restrain waste volumes stored on site to within their safe levels. Such seasonal variations should be included in your management system. The same principles apply when variations in off-take markets lead to a build-up of stock levels.

Ultimately your site has a finite safe, storage capacity. You should not exceed this capacity and your site management systems should manage waste inputs and outputs to achieve this end.

Note – all of the maximum stack sizes and stack separation distances quoted in this section of this guidance and in appendix 1 are for 'standard' storage of wastes on the ground: For example, a stack of stored bales of waste on the ground in a storage yard, or a open 'pile' of wastes on the floor in a building. They do not apply to specialised systems such as the sunken waste reception pits of a large waste to energy plant, enclosed silos used to store wood chip or a large drying hall at a mechanical, biological treatment (MBT) plant. For this type of specialised waste storage system competent advice should be sought and it is very likely that enhanced fire suppression systems will be required.

General considerations - fire and heat detection in storage areas

For external storage areas the use of automatic detection systems poses practical problems, although some types of detection system can be fitted externally and you should consider these if practical. Some sites have fitted camera type detectors at external storage stacks and just because your storage is external this does not mean that you should not at least consider detection systems.

For external storage you should at least visually inspect stored wastes frequently. Frequency should be determined by your risk assessment, but you should start with no less than once a week and you may want to increase frequency during the summer months, if you have time dependent security/arson issues or other similar higher risk times.

For internal storage areas the same options for fire detection exist for you to consider as for reception and processing areas, such as:

- Aspirating fire detection system;
- Spark, infrared or ultraviolet detection;
- CCTV visual flame detection systems; and
- Flame detectors
- Linear wire heat detection (but, should be located away from potential damage by mobile plant)

For specialised storage systems, such as silos used to store wood chip or a large drying hall at an MBT plant other fire detection systems may be appropriate, such as carbon monoxide or other combustion gas sensing equipment. This is a matter for specialist input and you should seek competent advice.

General considerations - fire suppression in storage areas

For internal storage areas you should seek competent advice on fire suppression systems, and use this advice as an input into your fire risk assessment and control measures to be used. The options for consideration with the internal storage of wastes are similar to those for waste reception areas:

- Manual open deluge system - an open deluge nozzle line installed on the walls around the waste storage area connected to a fire brigade breeching inlet connection. This type of installation would not need a fixed water supply and would enable the FRS to apply water/foam directly into the waste. Note – you will need a fire hydrant (on or off site) within 100 metres for this to be a viable option
- Deluge system – as above, but already connected to a suitable water supply (fire main, pumped water storage tank etc). Systems can either be manual or automatic (if automatic the reliability of your fire detection system is critical to avoid false activations)
- Mobile foam trolley- with aqueous film-forming foam (AFFF) concentrate, proportioned at the appropriate rate. Water supply to the trolley is via hydrant or other suitable supply
- Hose reel systems – fire hoses from a suitable water supply. Hoses should be sufficient in terms of number and length to reach all parts of the storage area

- Water cannon – fire fighting water cannons at appropriate fixed points (if practical) fed by an appropriate water supply. However, beware such systems if they are high-pressure as they may 'blow' wastes which are already alight around storage areas so igniting other wastes
- Sprinkler systems – only where identified by your risk assessment, sprinkler systems where installed should be designed, installed, commissioned and maintained in accordance with relevant rules and standards. Sprinkler options need to take account of the distance to the waste and volume of waste in a storage area – targeted systems may be more effective than general area systems
- Foam additive to sprinkler and deluge systems may also be considered for sites storing high volumes of plastics or other higher risk wastes. These will also reduce the volume of water needed to fight a fire

For external storage areas you should at least consider whether on-site fire hydrants are required (see above section on water supplies). You may also wish to consider drench, sprinkler or other systems for external storage areas as part of your assessment.

For specialist storage systems the options for fire suppression will depend on the specific situation. For example, a drench system fitted to a silo for storing wood chip, or a foam suppression system at a large MBT plant. For specialist systems you should seek competent advice.

General considerations – self-combustion and storage times

Some materials can spontaneously combust under certain conditions, and the risk generally increases when materials are stored for prolonged periods, whether inside or outside, and in general the smaller the particle size the higher the risk.

In general the storage time limits shown below should be used to inform your stock rotation.

Combustible waste type	Maximum storage time on site
Non-shredded or similarly treated wastes (that is wastes whose particle size has not been reduced) and larger particle size wastes	6 months
Baled and compacted wastes (if kept for longer you may wish to break the bales and re-bale to reduce risk)	6 months
Shredded and similarly treated wastes (that is wastes whose particle size has been reduced) and smaller particle size wastes	3 months
Combustible fines and very small particle size wastes	1 month

Note – the above time limits are starting points for your considerations on storage. If you wish to exceed these times you should seek competent advice. In addition, for some wastes the above storage times may be too long and you should consider your waste types carefully for self-combustion. You may also wish to consider whether enhanced fire suppression systems may allow you to extend waste storage times, but you should seek competent advice before making this decision.

If baled wastes seem likely to exceed the above time limits you should consider breaking the bales and re-baling them to reduce fire risk. Likewise, turning of stockpiles can reduce the risk (but, see below on turning of stockpiles).

You should also communicate with your waste off-takers as appropriate. If a waste is stored at your site for a period of time and is then transported to an off-taker site (or other site), how long will it be stored at the off-taker's site? The risk of self-combustion does not cease if a waste is transported from one location to another.

In general on the risks of self-combustion and how you may seek to minimise these:

- You must use a clear recording method to show how long all wastes have been on site for
- You should rotate stock to ensure older wastes are not retained for excessive periods. For example, taking older bales from the rear of a stack before newer bales at the front and emptying storage bunkers to ensure that older waste at the rear of a bunker is exposed and removed
- Keep material in its largest form prior to processing for its end market, for example keeping waste wood in bulk storage and only chipping it prior to transport off site
- Inspect stored wastes frequently (at least once a week as a minimum)

Tip – temperature probes and thermal cameras can be used to check on stacks, such as to assess whether hot spots are starting to occur, in particular for older wastes. However, detecting a hot spot is one thing – you must plan in advance what you will do to address any hot spots, such as drenching with water.

Smaller particle sized wastes may be more prone to self-combustion and there may also be a relationship with density: That is the less dense the waste the more possible an oxidising mechanism and self-heating may occur. If you are storing wastes, such as RDF/SRF and/or smaller particle size wastes in open storage you should consider this – you may need to seek competent specialist advice. Other more specialised wastes may also have self-heating properties which you may need to be aware of and take account of in your controls.

The document Spontaneous Heating of Piled Tyre Shred and Rubber Crumb (Health and Safety Executive – see further reading section) provides further advice on how you can control the risk of spontaneous combustion. Although written for the operators of tyre recovery facilities much of the guidance is applicable to the storage and treatment of other materials that can self combust.

Internally stored wastes – general considerations

In general less waste is stored inside buildings than outside, although this can vary from site-to-site. At many sites internally stored wastes are contained in walled bunkers and similar (see below on bunkered internally stored wastes). However, some waste sites do store baled and other wastes inside buildings open and not contained in bunkers and similar.

If you are storing wastes internally in very large quantities, such as in warehousing then you must seek competent advice on the precautions to be taken. These will depend on the type of building used, the types of waste being stored and what fire precautions are already in place.

If you are storing baled or loose wastes internally not in bunkers or similar, whether in large quantities or not:

- Individual storage stack floor area should not exceed 100 metres^2. For example, a stack of stored baled waste 3 metres wide and 30 metres long would be within this limit
- Storage stacks should be separated by a fire break of at least 5 metres. Using the above example, each stack of baled waste 3 metres wide and 30 metres long should be separated from the next stack by a gap of at least 5 metres
- You must also take account of any storage limits set in your site's environmental permit or similar regulatory permission – these must not be exceeded
- Consider maximum storage height as well as overall quantity. For example, if you have installed sprinkler systems waste which is piled too high may compromise their effectiveness. In general stack height should not exceed 5 metres

Table 1: Synopsis of internally stored wastes stack sizes and separation distances

Max individual stack area (metres^2)	Max guidance stack height	Min separation distance between stacks
100 m^2	5 m	5 m

Note – the above limits and distances are based on insurance industry guidance for baled paper and assume adequate fire detection and fighting provision is in place. You should treat the above limits as a starting-point only and if you wish to deviate from the above you should seek competent advice to justify your decisions. In a similar manner, installing enhanced fire suppression systems may mean that the above limits can be exceeded safely, but you should seek competent advice before making this decision.

Note – the separation distance of 5 metres given above will not apply if you store wastes internally in bunkers and similar (such as three-sided enclosures), provided that the walls of such bunkers are constructed appropriately and that waste height does not exceed bunker wall height. In essence, such walls replace separation by distance to prevent fire spread (see below on bunkered/enclosed storage).

Internally stored wastes - bunkered/enclosed internal waste storage areas/bays

Many waste storage areas inside buildings are enclosed (such as a three sided walled structure, or a series of such structures for different waste types).

Note – this section is not aimed at the temporary storage of wastes in reception for short periods of time typically not exceeding 72 hours or shorter prior to treatment and/or transfer to another site. Rather it covers longer-term storage of wastes. For guidance on waste reception areas see the specific section above.

When considering waste storage bunkers/bays:

- Bunker/enclosure size should not exceed 100 metres^2 floor area, as for open internal storage stacks as stated above (unless you have sought competent advice) – in essence, you are using walls to replace separation distances, but this does not remove the need to consider the amounts being stored in any one stack/location
- Consider the effect on being able to achieve full stock rotation to remove older wastes – bunkers/bays should be cleared to remove old waste from the back of the bay/bunker frequently to reduce the risk of self-combustion
- Temporary wall/side structures for bays/bunkers (such as mobile 'A' concrete frames or blocks, or bales of metal and other non-combustible wastes) need to be considered closely. If there are any gaps, such as between blocks or frames, then they will be ineffective at stopping fire spread. Permanent walls of a suitable construction are likely to be better at resisting fire spread, although tight blocks may also be effective
- Using combustible materials, such as using bales of paper to enclose loose stored paper, as the walls of a bunker or similar may not be effective in preventing fire spread – if you chose to use bales to separate waste then use non-combustible materials such as metals, or consider the whole of the bunkered area as one stack and the above stack area limit of 100 metres^2 should be applied (or seek competent advice if you wish to exceed this)
- Whatever construction method is used you will need to ensure that the walls are high and thick enough to stop fire spread from heat radiation. The Society of Fire Engineers Handbook 3rd edition, explains how to do this (see further reading and useful links appendix 4 SFPE Handbook)
- You should have in place inspection/checking processes to ensure that wastes do not exceed wall height at any point and that wastes do not spill out from bunkers/bays so defeating any segregation provided to resist fire spread
- Take advice on how to reduce the potential for fire to be spread by convection across the underside of roofs, through roof spaces and similar barriers to rising hot gases. In the Bradford stadium fire a significant cause of loss of life was the hot gasses rising under one part of the stadium roof, travelling along the roof and then descending many metres away at the other end of the stadium upon the spectators there causing asphyxiation and sparking significant secondary fires

Tip – when storing wastes in three-sided bunkers why not plan your bunker layout with fire spread in mind? For example, if you have three bunkers in a row, two of which have combustible wastes in and one with non-combustible wastes, then put the non-combustible waste bunker in the middle so separating the two combustible waste bunkers.

Tip – for ease of stock rotation, why not have two smaller bunkers rather than one larger? Two smaller bunkers will mean that you can completely empty one bunker while still accepting wastes into the other.

As above, specialised internal storage systems will require specific consideration and you should seek competent advice to justify any decisions you make for such specialised systems.

Whatever form of internal waste storage you have you must consider the risks to your building from such storage. Internal storage areas should be away from potential ignition sources and you should rotate sock out of internal storage areas as frequently as practical.

Externally stored wastes – general considerations

Typically more wastes are stored outside than inside buildings. This is for various reasons, such as available space and cost compared to internal storage. External storage has advantages and disadvantages, such as:

- Fires may be easier to fight than with internally stored wastes because of likely better visibility and easier access, provided that adequate stack size limits and stack separation distances are in place (see appendix 1)
- Fire suppression equipment, such as sprinklers, are typically harder to fit, and are likely to be less effective with external storage
- Fire detection equipment may be more difficult to arrange

You should consider the relative merits of internal and external storage when compiling your storage plan for your site.

One of the major disadvantages of external storage is that, in general, the volumes of waste stored are much higher than internally stored wastes. Some of the largest waste fires experienced have been in external storage yards – some of these fires have burnt for days or even weeks and have been extremely difficult to control and extinguish. Many of these fires have been exacerbated by the Fire and Rescue Services (FRS) not being able to access the fire adequately and spread of fire because there has been little in the way of stack separation or physical segregation, such as with walls etc.

If you store wastes externally you must consider stack size and separation between stacks. Appendix 1 gives guidance on maximum stack size and separation distances for waste stacks. You should use the guidance in appendix 1 to plan your external storage. For wastes stored externally in three-sided bunkers and similar guidance is given below.

Separation between externally stored wastes and buildings also needs to be considered:

- In general, non-bunkered/enclosed external waste stacks should be separated from buildings by a gap of at least 10 metres, unless the building is protected in a suitable manner (such as a deluge system)
- If the waste is contained in a suitable bunker/enclosure with appropriate height and construction walls then 10 metres separation may not be required – even then such bunkers should not be right against buildings

Note – the 10 metres quoted above may not be sufficient for some types of waste and you should consult with your competent advice. Your insurer may also have an input here from the viewpoint of property protection.

Externally stored wastes – vandalism and other specific ignition threats

Some ignition risks may be lower for external storage. However, others may be higher. In particular the risk of arson/vandalism may be higher. It is often more difficult to protect the external areas of a waste management site from trespass than it is for buildings:

- You should include arson/vandalism risks (for example, the nature of the location your site is in) and security arrangements in your fire assessment for external storage
- If your site has a history of trespass, theft and/or vandalism you should consider enhancing your site security arrangements

Vandalism may not be the only ignition threat externally stored wastes face:

- Are there any specific ignition risks posed by neighbouring premises, such as sparks from welding conducted outside and at your site boundary? Consider these and arrange your storage accordingly For example, one known recycling plant is next door to a firework factory which tests fireworks in an external area not far from the recycling plant's boundary – the recycling plant operator only stores wastes at the opposite end of their site to provide as much of a stand-off distance as possible

Externally stored wastes - enclosing/bunkering stacks

You may wish to consider enclosing your external stacks, such as by constructing three-sided open bunkers or a three-sided covered building with an open front. This is not a straightforward decision and there are advantages and disadvantages with each approach.

Note – this section is not aimed at the temporary storage of wastes in reception for short periods of time typically not exceeding 72 hours or shorter prior to treatment and/or transfer to another site. Rather it covers longer-term storage of wastes. For guidance on waste reception areas see the specific section above.

With external waste storage bunkers and similar you should consider the following factors:

- The effect on being able to achieve full stock rotation to remove older wastes (see above on internal storage for tips)
- The material used to enclose the stockpile, for example metal sheets could increase risk as they may absorb heat from sunlight more readily than block or concrete
- Stock capacity may be affected – or may be improved in some cases?
- Ability to ensure segregation of materials without using physical separation distances may be improved – a commercial advantage?
- Increased prevention of fire spread between stacks, provided the separating walls are of sufficient size/height and that their construction is adequate
- The ability of the Fire and Rescue Services to fight or contain the fire – may be more difficult if access is impeded?

Overall the enclosure/bunkering of wastes may provide improvements both in terms of segregation between combustible wastes and overall storage capacity. For example, providing bunkered storage will mean that the separation distances in appendix 1 below will not apply, provided that the walls used are of an appropriate construction, that stored waste height does not exceed wall height and that stored waste does not spill out from the bunker/enclosure. However, there are also potential disadvantages and you must consider these before making a decision.

If you do decide to enclose/bunker some or all of your external waste storage you will need to ensure that the walls are high and thick enough to stop fire spread from heat radiation, and are appropriately constructed (see above on internal storage for information). The Society of Fire Engineers Handbook 3rd edition, explains how to do this (see further reading and useful links appendix 4 SFPE Handbook). Also see above guidance for the storage of internally stored wastes in bunkers and similar.

Externally stored wastes - turning open stacks

If you use open stacks as storage you should consider whether to turn or not turn your open stacks. Turning will allow excess heat to dissipate and may reduce any local areas of high moisture, but can cause a fire which is already smouldering to flare because it allows oxygen to enter the stack.

Regular turning of open stacks is recommended and it is imperative that site staff understand the appropriate way to manage hot spots – that is what to do if a fire starts. How to detect and manage hotspots must be included in your accident plan/site procedures. Open waste stacks should be monitored regularly for temperature build-up. The longer any stack of materials that can self combust is left the more prone it is to self-combustion and therefore the more closely it should be monitored.

8. Disclaimer

This Guidance has been prepared by health and safety practitioners and ESA (Environmental Services Association) with input from the Environment Agency EA), the Health and Safety Executive (HSE), the Health and Safety Laboratories and the Chief Fire Officers Association (CFOA) to assist operators, contractors, managers and others make health and safety improvements in the waste management industry. It is endorsed by the EA, HSE, CFOA and WISH (Waste Industry Safety and Health) Forum and represents good practice some of which may go further than the minimum you need to do to comply with the law.

Nothing in this guidance constitutes legal or other professional advice and no warranty is given nor liability accepted (to the fullest extent permitted under law) for any loss or damage suffered or incurred as a consequence of reliance on this guide.

The guidance is not a substitute for duty holder judgment and/or professional safety advisor's judgment, Notwithstanding the good practice contained within this guidance, duty holders are responsible for ascertaining the sufficiency and adequacy of their internal and independent procedures for verifying and evaluating their organisation's compliance with health and safety, environmental or other law.

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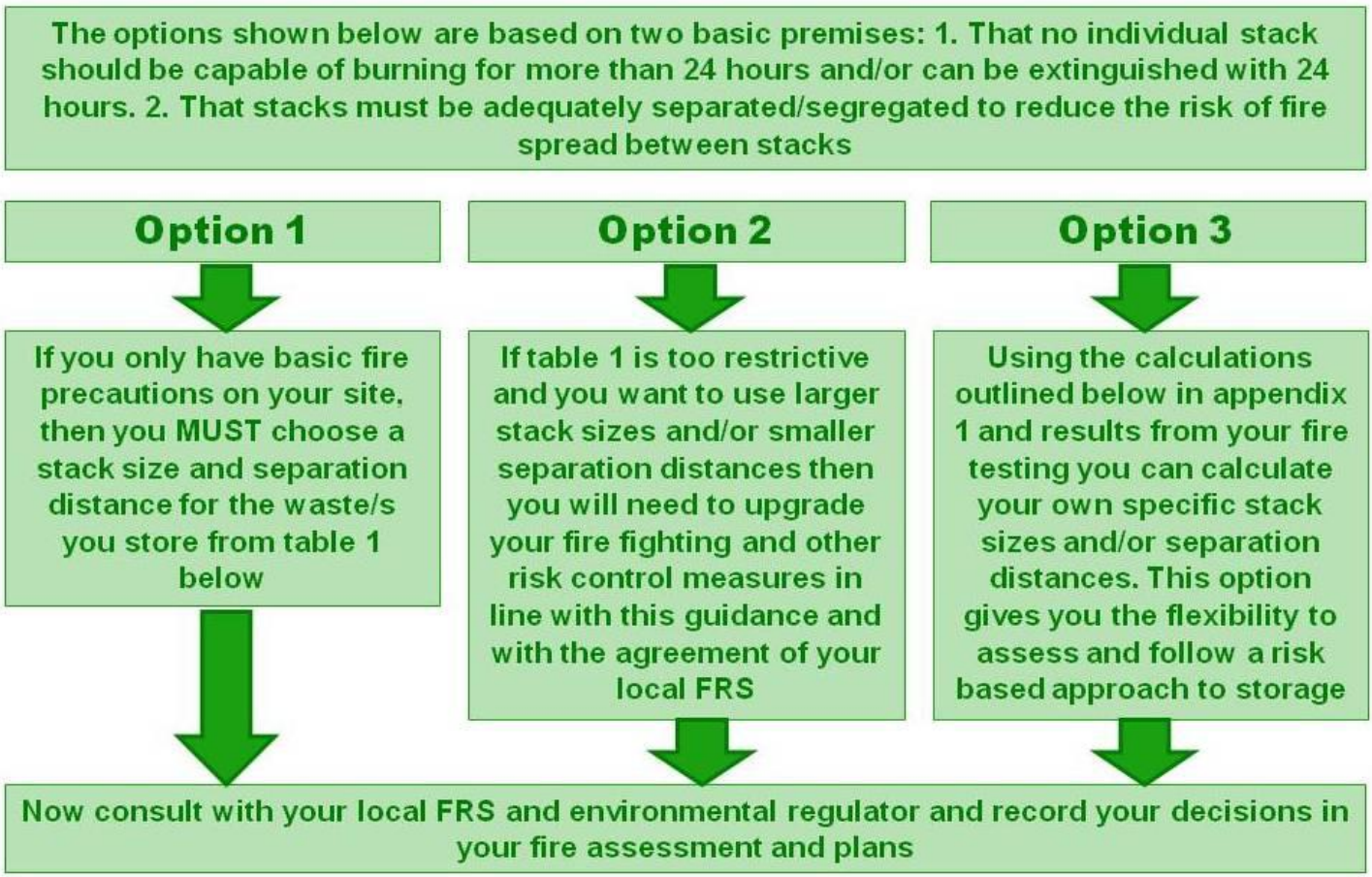
The Waste Industry Safety and Health (WISH) Forum exists to communicate and consult with key stakeholders, including local and national government bodies, equipment manufacturers, trade associations, professional associations and trade unions. The aim of WISH is to identify, devise and promote activities that can improve industry health and safety performance. www.hse.gov.uk/waste/wish.htm.

Appendix 1: Managing external storage stacks

This appendix is mainly concerned with maximum allowed stack sizes and minimum separation distances between open stacks for wastes stored externally. This is a complex issue and careful reading of this appendix is recommended.

The flow diagram below summarises the key points and options available to a site operator and should be used to decide which method of stack sizing and separation is most suitable for their site. Further guidance can be sought from your competent advisor or your local Fire and Rescue Service (FRS). The key aim is to balance the business needs of the site with a suitable and sufficient assessment of the risk of fire spread between stacks and the time which would be required for a stack to burn-out or be extinguished. These options are also discussed in more detail below.



Appendix contents

1. Scope and definitions

- This appendix is aimed at fire risks. It does not consider issues such as the stability of stacks (except where this may affect fire spread), structural integrity of walls at stack enclosures/bunkers etc
- This appendix is restricted to 'standard' external storage of wastes, such as open stacks of loose, baled or wrapped wastes stored on the ground and/or bunkered/enclosed stacks of wastes (such as wastes in three-sided bunkers/enclosures) and similar. For specialist storage systems such as silos you should seek competent advice
- This appendix only applies to wastes stored externally – that is outside of buildings. For internally stored wastes see the section above on internal waste storage
- The stack sizes given in table 1 below and those arrived at by calculation apply to both open stacks of waste (such as stacks of baled waste or open stacks of wood etc) **AND** wastes stored externally in bunkers/enclosures such as three-sided bunkers/enclosures
- **BUT**, the separation distances given in table 1 below and those arrived at by calculation **DO NOT** apply to bunkered/enclosed stacks of waste, provided that bunker/enclosure walls are of an adequate construction (in brief, such walls replace physical separation distances as a fire break/shield)
- This appendix is not aimed at the temporary storage of wastes in reception for short periods of time typically not exceeding 72 hours or shorter prior to treatment and/or transfer to another site. Rather it covers longer-term storage of wastes. For guidance on waste reception see the specific section above

Stacks - to avoid repetition, the term 'stacks' is used in this appendix for stored accumulations of all forms of stored wastes, whether baled, open or otherwise stored.

Bunkered/enclosed stacks – means 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 – means wastes (either loose or baled etc) which are not stored in bunkers/enclosures, such as an open stack of paper bales or an open stack of loose wood or tyres.

Loose – means wastes which have not been baled and/or wrapped, such as stacks of loose wood, tyres, plastic bottles etc. Such loose waste could be either bunkered, or open (such as an open pile of loose wood).

Baled/wrapped – means wastes which have been baled and/or wrapped, or similar, as discrete 'packages/items'. Such baled/wrapped wastes could be either bunkered or open stacked.

2. Managing external stacks

Basic premises used to determine external stack size and separation distances

The stack sizes and separation distances given in table 1 and the calculations provided below which can be used to determine bespoke stack sizes and separation distances are based on two simple and basic premises:

1. The greater the size of any individual stack of stored waste the longer it will burn for, and the greater the risk posed to human health and the environment. It is not acceptable that wastes are stored in such a manner that individual stacks can burn for days or even in some cases for weeks. Accordingly, the first basic premise is that **no individual stack of stored waste should be of a size that means it can burn for more than 24 hours, either by burning itself out or by being extinguished**

2. If individual open stacks of waste are too close together the risk is that a fire may spread from one stack to another, so extending the duration of the fire and increasing the risks posed to human health and the environment. Accordingly, the second basic premises is that **for open stacks not in bunkers or similar that adequate fire break distances between individual stacks must be maintained**

Options for determining loose stack sizes and separation distances

While access requirements for FRS vehicles are straightforward (as noted in the section above on whole site considerations), stack sizes and separation distances between open stacks are a more complex issue. The larger a stack of waste the more material there is to burn and the longer it will burn for and the more difficult it will be to control and extinguish. In addition, unless there is adequate separation between open stacks (or appropriately constructed bunker etc walls) the more likely it is that a fire may spread. These simple facts have been demonstrated by many waste fires, some of which have taken days to bring under control.

This appendix provides three options for operators and others who may store wastes to use when determining stack sizes and open stack separation distances for externally stored wastes on their sites (see also simplified version in flow diagram at the start of this appendix):

1. Table 1 gives guidance ‘standard’ stack sizes and open stack separation distances for common types of waste and waste product. These have been arrived at from existing guidance and data available from within the industry and elsewhere. It is anticipated that over time future testing by the contributors to this guidance, and the wider industry, will allow table 1 to be refined. In this case this guidance will be revised and reissued. **Option 1** is simply to use the sizes and distances given in table 1

2. The stack sizes given in table 1 assume that only the most basic of fire suppression is available on site. If your site has enhanced fire suppression provision at external stacks, such as deluge, water cannon, sprinkler etc systems, then you may be able to increase stack size if you can prove that a fire in any individual stack could be extinguished within 24 hours. Note – you will need to be able to justify any increase in stack size over those in table 1 with good fire science and any such decision will need to be agreed with your environmental regulator and local Fire and Rescue Services (FRS). **Option 2** is to start with the stack sizes given in table 1 but then modify these to reflect any enhanced fire suppression systems you may have on site

3. The following section below on a calculated method includes a simplified version of the fire science calculations used to determine stack sizes and separation distances. Waste management operators and others who may store wastes can arrange for their own tests to be carried out on their wastes and waste products and then apply these calculations to arrive at bespoke stack sizes and separation distances. **Option 3** is for you to conduct your own testing and have your own calculations performed to arrive at bespoke stack sizes and/or separation distances. As for option 2, this must be backed by good fire science and agreed with your environmental regulator and local FRS

This flexible approach allows operators to decide whether they want to simply accept the guidance standard sizes and distances in table 1, or whether they want to perform their own analysis. Whichever approach is taken, maximum stack sizes for all stacks and minimum separation distances for open stacks must be in place and part of your storage plan.

Note - in the absence of a site fire plan agreed by the Fire and Rescue Services or good evidence of compliance with options 2 or 3 below, the distances and sizes in table 1 is very likely to be applied by regulators.

Calculating stack size and mass

In order to interpret the sizes and distances in table 1, and during any calculations to determine bespoke stack sizes and distances, you will need to know the relationship between the mass (weight) of your wastes and their volume. Starting with volume:

For some types of stack calculating volume will be straightforward, such as for stacks of baled wastes which are arranged in a ‘square’ stack. In this case, volume will be: Volume = length x height x width. For other types of stack the calculation will be more complex.

For example, if you have an open stack of loose wastes (that is a 'cone' of waste) then its volume can be calculated as being volume = 1/3 x ((π x radius of stack^2) x height of stack)).

For bunkered wastes the situation may require some degree of thought. For example, loose waste in a three-sided bunker will slump so a calculation using simply the width, height and length of the bunker will give an over-estimation. You might try assessing the volume in three parts: The 'square' portion of the waste completely within the bunker, the 'cone' of waste sitting on top of the square portion and a triangular section at the front of the bunker's open side where the waste has slumped. That is, calculate the three separate volumes and then add them together to give a total volume. Whatever method you use, try to err on the side of caution.

Next you need to know the density of your waste – that is how much it weighs for any given volume. This is normally expressed as tonnes per cubic metre. You may be able to use weighbridge data to do this, such as by weighing some bales of your waste then using the dimensions of the bales to arrive at a density.

Alternatively, the Environment Agency, the Scottish Environmental Protection Agency and WRAP have all produced standard 'waste density conversion factors' which are available on their web sites. These give conversion factors for various wastes as classified under EWC codes which allow volumes of waste to be converted to weights.

Option 1 – standard guidance stack sizes and separation distances

Table 1 shows standard guidance minimum separation distances between open stacks and maximum stack sizes for individual stacks to minimise the risk of fire spread and ensure any fire does not burn for an excessive period. These stack sizes and separation distances assume that you only have the most basic fire precautions in place at your external storage area. When using table 1:

- Stack height should be taken as the greatest measurement between the base of the stack and the top. This may not be the highest point if the ground is uneven
- Stack width/length is the maximum width, including for open stacks
- Judging the height of stacks of loose waste, where waste may slump resulting in a 'hill' of waste may be difficult – but, you should measure height to the highest point in such stacks of loose waste

Table 1: Maximum external stack sizes and minimum open stack separation distances

Note – the stack sizes and separation distance given in table 1 are based on the best information currently available and may change over time. They are based on only very basic fire precautions being in place and, as stated above, if you have more advanced fire suppression in place then you may be able to vary from the below, but only having sought competent advice and after discussion with and the permission of your regulator.

Waste material	Max individual stack height (metres)	Max individual stack length / width (metres)	Max individual stack volume (metres^3)	Max individual stack area (metres^2)	Min separation distance between individual open stacks (metres)[1]
Baled paper	5	20	750	235	6
Loose paper	Stacks should not exceed 50 tonnes weight. This may be exceeded for short periods of time, such as over a bank holiday, provided waste is removed thereafter and additional precautions such as a fire watch are in place				6
Shredded paper (such as security shred)	Stacks should be bunkered/enclosed and not exceed 50 tonnes weight unless this has been agreed with your environmental regulator				
Baled paper and card	5	20	750	235	6
Baled card	5	20	750	235	6
Baled plastic bottle	5	20	450	235	6
Loose plastic bottles	Stacks should not exceed 50 tonnes weight. This may be exceeded for short periods of time, such as over a bank holiday, provided waste is removed thereafter and additional precautions such as a fire watch are in place				6
Baled plastic film	5	20	450	235	6
Baled hard plastics	5	20	450	235	6
Loose hard plastics	Stacks should not exceed 50 tonnes weight. This may be exceeded for short periods of time, such as over a bank holiday, provided waste is removed thereafter and additional precautions such as a fire watch are in place				6
Bagged plastic chip	5	20	450	235	6

Baled Tetrapak	5	20	750	235	6
Loose Tetrapak	Stacks should not exceed 50 tonnes weight. This may be exceeded for short periods of time, such as over a bank holiday, provided waste is removed thereafter and additional precautions such as a fire watch are in place				6
Wood – unprocessed or not shredded	10	20	1370	235	6
Wood - screened chips	Ideally wood chip should be stored bunkers/enclosures as soon after shredding as practical. Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your environmental regulator. Wood chip should also generally not be stored for more than 3 months (see section on self-combustion above)				6
Wood - un-screened chips	Ideally wood chip should be stored bunkers/enclosures as soon after shredding as practical. Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your regulator. Wood chip should also not generally be stored for more than 3 months (see section on self-combustion above)				6
Wood dust/fines	Dust/fines should not be stored outside except in fully enclosed conditions, such as silos or containers. Advice should be sought from your competent advice source and your environmental regulator. Wood dust should also not generally be stored for more than 1 month (see section on self-combustion above)				
Whole tyres	5	20	450	235	6
Loose shredded tyres	Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your regulator. Shredded tyres should also generally not be stored for more than 3 months (see section on self-combustion above)				6
Baled/wrapped shredded tyres	5	20	450	235	6

Loose tyre/rubber crumb	Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your regulator. Loose tyre/rubber crumb should also generally not be stored for more than 3 months (see section on self-combustion above)				6
Baled/wrapped tyre/rubber crumb	5	20	450	235	6
Loose automotive fragmentiser waste	Ideally loose fragmentiser waste should be stored in bunkers/enclosures. Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your environmental regulator. Loose fragmentiser waste should generally also not be stored for more than 3 months (see section on self-combustion above)				6
Baled/wrapped automotive fragmentiser waste	5	20	450	235	6
Baled SRF (solid recovered fuel)	5	20	450	235	6
Loose SRF	Ideally loose SRF should be stored bunkers/enclosures or similar. Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your environmental regulator				6
Baled RDF (refuse derived fuel)	5	20	450	235	6
Loose RDF	Ideally loose RDF should be stored bunkers/enclosures or similar. Stack size whether open or in bunkers/enclosures should be no more than 100 tonnes by weight, unless appropriate additional fire suppression measures are in place and this has been agreed with your environmental regulator				6
Bagged dry recyclables	Stacks should not exceed 50 tonnes weight. This may be exceeded for short periods of time, such as over a bank holiday, provided waste is removed thereafter and additional precautions such as a fire watch are in place				6

Baled mixed recyclables	5	20	750	235	6
Loose mixed recyclables	Stacks should not exceed 50 tonnes weight. This may be exceeded for short periods of time, such as over a bank holiday, provided waste is removed thereafter and additional precautions such as a fire watch are in place				6
Baled textiles (for fibre recycling)	5	20	750	235	6
16 stacks of any of the above in any one area	Each group of 16 stacks **MUST** be separated from any other stack or group of stacks by a distance of at least 20 metres				

As stated above separation distances only apply for open stacks and not those in three-sided bunkers etc, provided that bunker/enclosure walls are of an appropriate construction and wastes are constrained to such bunkers/enclosures and do not spread beyond them.

The use of table 1 may be confusing, but should allow you to arrive at the maximum stack size you can have and the minimum separation distances required.

For example, if you have an open stack of baled paper 20 metres long (the maximum allowed), a width of 10 metres and at a height of 3 metres then this equals a volume of 600 metres^3 – that is within the maximum volume allowed. However, if you increase the stack width to 13 metres this gives a volume of 780 metres^3 – that is more than the maximum allowed volume.

The same would apply to maximum stack area (footprint). If you have an open stack of loose wood 20 metres long and 20 metres wide (the maximums allowed in table 1) at 1 metre high the stack area would be 400 metres^2 – that is more than the allowed footprint size (even though stack volume at 400metres^3 is within the maximum allowed volume). Reducing stack width to 10 metres, but increasing stack height to 2 metres gives a footprint of 200 metres^2 – that is within the allowed footprint while maintaining a stack volume of 400 metres^3.

Tip – using the information in table 1 for the types of waste you store, you can create a simple Excel or similar spreadsheet. You can use this spreadsheet to explore different widths, lengths and heights of stack to calculate whether you are within the maximum volumes and areas. Using conditional formatting in Excel to highlight when volume and/or area are exceeded will make management easier.

Stacks consisting of a mixture of combustible materials (for example, a stack consisting paper and plastic bales) should be considered case by case during your risk assessment. Your assessment should take account of the proportion of the materials, the form the materials are stored in and the likely characteristics of any fire involving it. This means you can ensure you use appropriate separation distances, stack sizes and/or alternative risk reduction strategies.

If you are storing wastes other than given in table 1 you should consider the properties of these wastes to determine whether the volumes, areas and separation distances given are adequate. You may wish to use the calculation method below to determine these.

Tip – you may be able to reduce the separation distances shown in table 1 by using stacks of non-combustible wastes between stacks of combustible wastes. For example, separating two stacks of combustible wastes by a stack of non-combustible wastes (such as baled metals). However, you will still need access for fire fighting and the stack of non-combustible waste must be in place at all times at a suitable height. Rows of non-combustible baled wastes may also be used within stacks to slow the spread of fire within any individual stack.

Option 2 - modifying distances and sizes in table 1

If you have more extensive fire systems in place, such as drench or sprinkler systems, at your external storage area then you may be able to reduce the separation distances quoted and/or increase stack size. In brief, if you put additional controls in place then the guidance sizes and distances in table 1 may not apply fully to your external storage – but:

- You should seek competent advice on this
- Your reasons must be based on sound fire science
- You must discuss the issue with your environmental regulator and local FRS in advance and be prepared to provide your reasoning for varying from table 1
- You should not vary from table 1 without gaining the permission of your environmental regulator in advance

Note – it is unlikely that additional fire systems will reduce the separation distances for open stacks given in table 1, unless the additional systems are in the form of water/foam fire curtains or similar. However, additional systems may result in larger stack sizes being appropriate. The basic premise of a stack not being able to burn for more than 24 hours will still apply: What you will need to prove is that your provision of additional fire fighting systems means that a fire in a stack could be extinguished in less than 24 hours. You must have good fire science to support any such argument.

The calculations to prove that additional fire suppression systems would result in a burn-time of less than 24 hours are complex and you are very likely to need specialist advice.

Option 3 - a calculated method for stack sizes and separation distances

If you decide that you do not wish to use the stack sizes and separation distances in table 1, then you will need to justify why not. Enhanced fire fighting/suppression systems at your external storage area may assist in this, as noted above. However, as an alternative to using the limits in table 1, you can consider conducting your own tests on your own stored wastes and then calculating your own specific maximum stack sizes and separation distances.

This is not a simple option and will require the testing of your wastes to determine their combustion properties and then the use of the results to calculate stack sizes and separation distances. The testing of your wastes is very likely to require specialist input. If you do decide to conduct your own testing:

- You are likely to need to have multiple tests conducted on your wastes. Wastes can be highly variable and one test result may not give you sufficient valid information with which to calculate stack sizes and separation distances
- If you do have multiple tests conducted, do not simply take the best result and use this to calculate stack sizes and separation distances
- Issues such as density may affect test results. For example, test results for baled waste may not be applicable to a loose waste
- You are very likely to need competent advice in the interpretation of test results and to perform the calculations required to arrive at stack sizes and separation distances

Note – the methods for calculation and factors to take into account given below use practical experience and fire science as their basis. However, you need to ensure that you account for all factors relating to your wastes if you decide to use a calculated method.

Calculating maximum stack size

Different materials will burn at different rates, and factors such as density will also affect burn rate. For example, a baled waste is likely to burn more slowly than a loose waste. Using the basic principle that no individual stack of waste should burn for more than 24 hours, the below calculation can be used:

$$t_B = {}^{M_s}/_{Q_{rate}}$$

Where t_B = burn time, M_s = the mass of the stack in kg and Q_{rate} = mass rate of burning.

The rate of mass burning needs to be derived where possible from experimentation – that is burning wastes in controlled conditions to establish its burn rate. As stated above, this burn rate will vary from waste to waste and will be dependent on its density and other factors.

Currently little data is available on burn rates for materials, and virtually none for wastes. It is anticipated that this data will be produced over time as the result of testing by the contributors to this guidance and the wider waste management industry. And, that this will allow the production of a wider range of standard maximum stack sizes for different waste types and densities (that is typically baled and loose).

Note – the above calculation assumes that only very basic fire fighting provision is in place. If it can be proved that enhanced fire fighting provision is in place then the above calculation can be modified to reflect this, which may allow for larger stack sizes at sites where good fire fighting provision is in place (see option 2 above).

Calculating separation distances

From FRS experience of fighting waste fires and fire science, there are three principle methods by which a fire could spread from one waste stack to another:

- Wind-blown or otherwise propelled ‘brands’ – such as burning fragments of waste being blown from a stack which is on fire to a stack which is not
- Heat radiation between a stack which is on fire to a stack which is not so causing it to ignite
- Collapse or partial collapse of a stack which is on fire resulting in burning materials travelling to another stack (or resulting in burning material escaping a site at its boundary)

Note – in addition to the three methods above for some wastes, such as plastics, there is also the possible method of liquid spread. For example, plastics which can melt leading to a ‘pool’ of molten plastic which can then flow from one stack to another. If you store significant volumes of plastic and similar wastes you may need to take account of this in your calculation of separation distances and accident/emergency plan.

The issue of brands is a high variable and likely best considered in terms of what fire suppression systems are in place, such as sprinkler, drenches, water curtains etc, and the fire-fighting strategy which the FRS adopt to reduce the risk of brands causing fire spread. In brief, while brands are an important factor in fire spread, calculating separation distances based on brands is not practical and there are methods to reduce the risk available to the FRS attending a fire.

However, radiation in the form of heat flux can only be tackled by limiting the exposure time, providing a suitable distance between the emitter and the receiver or by providing shielding. As waste stacks are unlikely to be very mobile there is little which can be done with regard to limiting the exposure time and shielding is also likely to be impractical for open stacks once a fire is in progress.

Note – shielding is exactly what a waste operator is doing if they decide to store their wastes in bunkers, three-sided enclosures etc. The walls of the bunker, provided they are constructed appropriately, act as a fire shield between the bunkered wastes so preventing, or at least limiting, heat transfer.

Heat radiation

Because of the above, the approach taken in the first part of this section is to concentrate on heat flux and the method of determining stack separation distances to prevent fire spread by heat. The approach taken below is detailed in CIBSE Guide E (3rd Ed)[2] paragraph 6.10.2.. It cannot be pretended that the calculations involved are easy and you are very likely to need the advice of an external competent person to perform the calculations and give you advice on their use.

However, to start:

$$I_r = \emptyset \, \epsilon_f \, \sigma \, T_f^4$$

Where I_r = heat flux (kW.m^{-2}), ∅ = configuration factor see SFPE method below, ε_f = flame emissivity, σ = 5.67 x 10^{11} kW.m^{-2}.k^{-4} (Stefan- Boltzmann constant) and T_f^- = flame temperature.

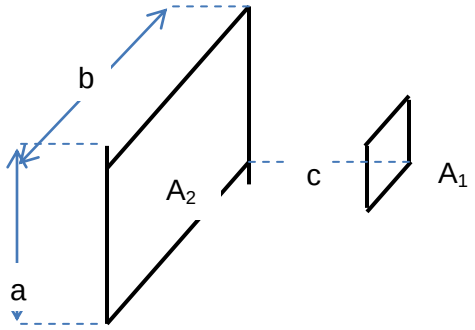
Regarding heat flux, shredded materials and plastics are thermally thin. CIBSE Guide E suggests thin material ignition as being at 10kW.m^{-2}. Therefore a shredded material parameter of 7kW.m^{-2} would seem appropriate. Approved document B suggest 12.6kW.m^{-2} for solid timber products. However both of these parameters assume intervention of the FRS as it is acknowledged that prolonged exposure to these heat fluxes will eventually lead to ignition. The table below gives some parameters for heat flux as a starting point, but for wastes you may need to perform testing to arrive at suitable heat flux data.

Material and FRS response time	Heat flux
Shredded materials with fire service attendance time of 10 mins or less	7 kW.m^{-2}
Shredded materials with fire service attendance time of up to 30 mins	4kW.m^{-2}
Solid materials with fire service attendance time of 10 mins or less	12.6 kW.m^{-2}
Solid materials with fire service attendance time of up to 30 mins	5.04 kW.m^{-2}

By re-arranging the above base equation we get:

$$\emptyset = \frac{I_r}{\epsilon_f \ \sigma \ T_f^4}$$

This equation will give us the configuration factor. The separation distance can then be derived from the configuration factor equation. The approach taken here is the differential area target equation detailed in the table 1-4.1 page 1-78 SFPE hand book [3]. A_2 and A_1 being the area of the surfaces, 'a' and 'b' being height and length and 'c' distance between the faces.



$$F_{D1-2} = \frac{1}{2\pi}\left[\frac{a/c}{\sqrt{1+a/c^2}}\ tan^{-1}\left(\frac{b/c}{\sqrt{1+a/c^2}}\right) + \frac{b/c}{\sqrt{1+b/c^2}}\ tan^{-1}\left(\frac{a/c}{\sqrt{1+b/c^2}}\right)\right]$$

Note – the above example formula assumes that the emitter face and receptor face are parallel (that is there is no angle between the faces of the stacks). As such no configuration factor is included in the above. If you use pyramidal stacking of wastes, or stacks are at an angle to each other, then a configuration factor (as calculated) will be required.

The main problem is that the height of the emitter is a combination of the height of the stack with the addition of the height of flame above the stack. The approach suggested in CIBSE Guide E [2] (Heskestad equation) is not valid for fires over a large area. There is some discussion on this subject in Drysdale page 118 [4]. There are two options that could be adopted: Selecting a percentage height factor, or use the CIBSE equation on the basis that a selected theoretical pool size of 1 meter.

The justification for this approach is the observation that combustible gases produced by the paralyzing material can only mix with a fresh oxygen supply vertically. This results in an oxygen controlled fire which is turbulent and fragmented across the large part of the surface area of a large stack fire. However, at the edges of the stack the flames have access to fresh air on at least one horizontal plane, in addition to the vertical mixing. This is therefore approaching the Heskestad conditions. This approach is still related to the specific material but obviously will over-estimate the flame height resulting in a conservative emitter area for the configuration factor equation.

Flame height: $Z_f = 0.235\, Q^{2/5}$ -1.02d_S

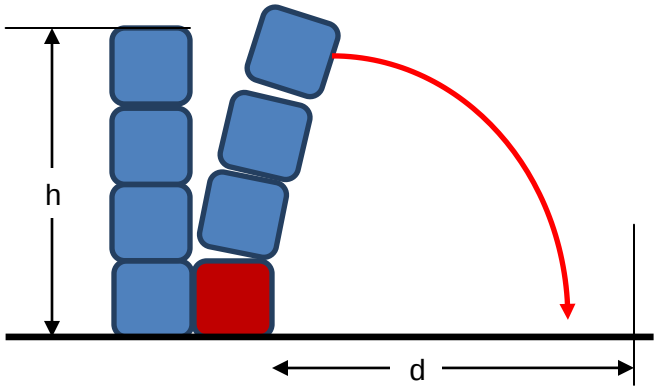
Where Z_f = flame height, Q = heat output of fire and d_S = diameter of the fire.

The above considers distances between stacks to reduce the risk of heat radiation causing a fire to spread between stacks. Another consideration is to calculate what should be the separation distance between stacks and the site boundary. The relevance of this calculation will depend on site location: If a site is in an isolated location with no neighbours then such a calculation may not be that relevant. However, if a site is in a residential area then the emergency services may have difficulties keeping people away from the site boundary, or there may well be residential properties at the site boundary itself.

To calculate such a distance a heat flux parameter to use could be less than 1000 $(kw/m^2)^{4/3}s$ "*Hockey, S.M. & Rew, P.J. (1996), 'Review of Human Response to Thermal Radiation*"[5], as the boundary condition for radiated heat, this assuming that members of the public could stand at this boundary without risk of injury.

Stack collapse

Another factor to consider is stack stability during a fire. There are various mechanisms through which a stack could collapse, but to take the most obvious one involving a stack of bales where material burns to the extent that a stack becomes unstable:

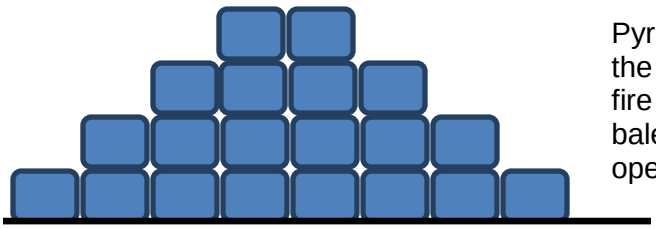


Assuming that the top bale will not roll significantly then a reasonable separation distance (d) would be at least 1 metre more than the height of the stack (h), given that the bale will split on impact with the ground. However, if the waste involved has significant elastic properties (such as tyres), there is the additional issue of the bale potentially bouncing.

Therefore the kinetic energy at 'h' = ½ IW^2. Where IW is angular Momentum, I = MR^2, W= angular velocity, M = mass and R = radius.

The material is likely to have a significant co efficient of potential elastic energy. Therefore the bale will bounce at the reflected angle of impact with the energy E = ½ k X^2, where x is the magnitude of the energy release described as a dimension and K is the constant of elasticity of the material.

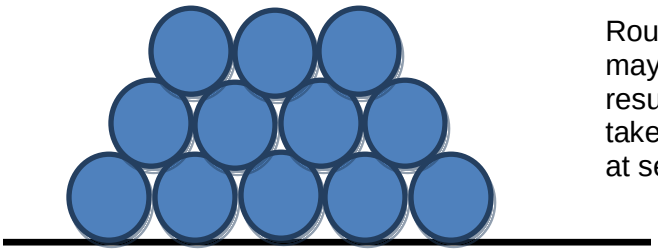
Alternatively the stack sides could be stabilised by terracing/pyramid stacking the sides. This can be seen to be more stable as the steps/slope lowers the centre of gravity of the stack.



Pyramid/terraced storage of bales may lessen the risk of a bale falling during a fire resulting in fire spread. However, this method may increase bale footprint relative to volume and may cause operational handling issues

This approach also has the benefit of changing the angle of the available plane of radiated heat resulting in a far more favourable configuration factor when it comes to calculating separation distances, although this approach may pose operational issues when moving materials from stacks.

However, if bales (or loose materials) are rounded then this needs to be taken into account. For example, some balers used to bale and wrap waste derived fuels result in tube-shaped bales. These can be stacked in a pyramid shape for stability reasons. If such a stack collapses in a fire bales may roll.



Round/tubular bales and loose materials which may roll should a stack collapse during a fire may result in fire spread – such factors need to be taken into account in your calculations to arrive at separation distances

As can be seen from the above the calculation of separation distances is a complex affair. Data on virgin raw materials (such as for wood) is available and can be used in the above heat radiation calculations. Data for wastes is less available. It is anticipated that over time additional testing by the contributors to this guidance and the waste management industry will allow the production of wider data which could result in the production of more standard tables for separation distances for various waste types and stack configurations.

1. *Approved Document B (Fire safety) – Volume 2 - Buildings other than dwelling houses (2006 edition incorporating 2010 and 2013 amendments)*
2. *Boughen D. et al Fire Safety engineering CIBSE Guide E, 2010, CIBSE London*
3. *DiNenno P.J et al editor (2008)"The SFPE Handbook of Fire Protection Engineering 4th ed, NFPA,Massachusetts*
4. *Drysdale Dougal ((2000) "An introduction to Fire Dynamics",2nd Ed, John Wiley & sons , Chichester*

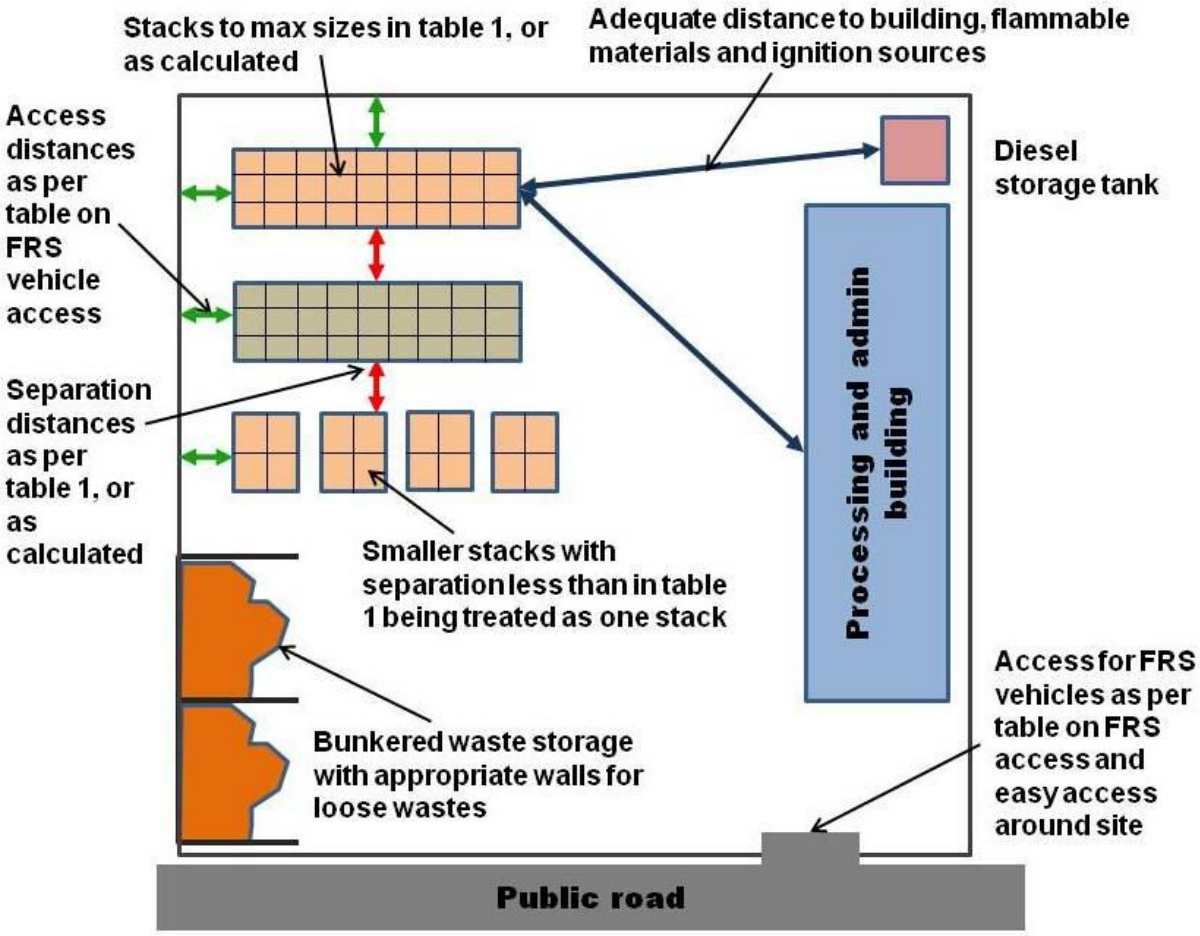
2. Layout of stacks

Once you have identified your maximum stack sizes and the separation distances required between stacks, either by using table 1 or by calculation, and taken account of the access requirement for FRS vehicles, you can start to plan storage at your site. Other factors need to be taken into account, such as but not limited to:

- Location of potential ignition sources
- Buildings, in particular occupied buildings
- Location of flammable and/or hazardous substances kept on site, such as gas cylinder cages, diesel tanks, quarantine areas which may contain non-conforming hazardous/special wastes and similar
- Prevailing wind, where firewater may flow towards and other environmental factors
- Proximity of neighbouring premises to which a fire might spread

Tip – use a map of your site with stacks cut out of card or similar to scale and move them around until you achieve the best layout you can. Remember to mark on your map potential ignition sources and locations of hazardous substances etc.

3. Basic example of good stack storage layout



Note – the above example assumes that the site does not have residential or other buildings direct at its site boundary. If this is not the case then the distance between open stacks and boundary may be different to those simply set by FRS access requirements.

Tip – why not create a simple map, similar to the example shown above, with stack sizes and separation distances marked on it. This can be used to instruct your employees and as a check tool during site inspections to ensure that you are complying with your storage plan.

Appendix 2: Producing an accident/emergency plan

Accident/emergency plans are about how you plan for a disaster, such as a fire, and are aimed reducing its potential effects. All waste management sites should have accident/emergency plans (often aimed at a series of potential disasters, including fire). Some organisations may want to go further than accident/emergency planning into disaster recovery and business continuity planning, but these topics are outside of the scope of this document. Accident/emergency plans are usually a requirement of environmental permits/waste management licences.

Although you are responsible for producing the accident/emergency plan for your site, liaison with your local Fire and Rescue Service (FRS) is recommended as it will assist the FRS with managing the risk in their area enabling them to respond more effectively should a fire occur.

In addition, the effectiveness of your plan will depend on how well you train your staff. All staff and contractors working on-site must be aware of your plan and what they must do during a fire. You should have regular exercises (drills) to test how well your plan works and that staff understand what to do.

Your plan should be available electronically and in hard copy**.** Give careful thought to where your plan is located. Employees need to have access, but the FRS also need to have access during an emergency. Many sites place copies of their plan in an 'emergency services box' located at the site entrance or similar so that the FRS can access the plan out of hours in an emergency. In the end, it is no use having a good plan in place if it is in the burning building and cannot be accessed.

1. Content of your plan

The content of accident/emergency plans may differ from site to site, but should at the least include:

- Communication arrangements, such as named emergency contacts, key holders, incident controllers etc with their telephone numbers and likely response time (for out of hours)
- Hazardous and combustible materials on site, including wastes. To include locations, likely amounts and other details (locations should also be marked on your site map as below)
- Specific hazards, such as gas cylinders, fuel stores etc – again mark on your site map;
- Normal number of people working on site and usual hours of work
- Fire fighting equipment on site and where this is located, such as location of hydrants, fire extinguishers, fire hoses, drench systems the Fire and Rescue Services (FRS) can plug-into etc
- Any other equipment on site which may be of use during a fire, such as heavy mobile plant which could be used to assist the FRS
- Any specific environmental issues, such as drainage issues for firewater, protected habitats neighbouring the site etc
- The procedures, such as evacuation, fire fighting and summoning the FRS, which employees and others on site must follow in the event of a fire. This must include the period before the FRS arrives. Outside of the normal procedures, such as how to call the FRS, these procedures should also include

- Incident controller identification – who will be your main point of contact with the FRS and how are they identified?
- Procedures to ensure access is clear for FRS vehicles
- Use of pollution control equipment to block drains and/or divert firewater to a containment area and/or operate any pollution control facilities, such as drain closure valves/or penstocks
- Any fire fighting processes outside of the normal, such as use of soils to cover fires, removing un-burnt materials using heavy mobile plant etc

Note – if you expect your employees to fight a fire until the FRS arrives on site then they must be trained to do so and any fire fighting by site employees must not be to the risk of their health and safety.

As part of your accident/emergency plan you should have a map of your site showing at the least:

- Layout of buildings (externally and internally, including fire exits and other access points)
- Any locations where hazardous materials are stored on site (location of gas cylinders, process areas, chemicals, stacks of combustible materials, oil and fuel tanks etc)
- Main access routes for fire engines and any alternative accesses
- Access points around the site perimeter to assist fire fighting
- Location of hydrants (on and off site) and water supplies, including lakes, lagoons, water tanks etc
- Location of fire extinguishers, hoses and other fire fighting equipment on site
- Any watercourse, borehole, or well located within or near the site
- Areas of natural and unmade ground
- Location of plant, protective clothing and pollution control equipment and materials
- Drainage systems, including foul and surface water drains, and their direction of flow and outfall points
- Location of drain covers and any pollution control features such as drain closure valves/penstocks and firewater containment systems

Your accident/emergency plan should also detail disaster recovery measures as appropriate including:

- The removal of burnt material using appropriate and lawful disposal
- The safe re-commission of plant

Following any fire your accident/emergency plan (and overall fire management measures) should be reviewed and improved as required.

It is not the intent of this guidance to be the comprehensive guide to accident/emergency planning and you should seek competent advice as to the detail content of your plan. Guidance is also available from various sources, such as the Environment Agency, your local FRS and the Health and Safety Executive.

Tip – involve your local FRS in the production of your plan, or at least lodge a copy with them. Inviting your local FRS to your site so that they can familiarise themselves with site access, location of fire fighting equipment, water sources etc and include this in their own plan for the site can also be of benefit – if your local FRS is familiar with your site this could save vital minutes should you have a fire.

Appendix 3: Checklists

The below checklists are not comprehensive, but they will allow you to make a simple and outline assessment of your fire management. If you have any specific issues relating to your site, you should consider these in addition to the below. In addition, the below may be adequate for a small site, but for larger and more complex sites greater depth is very likely to be required, although the below can be used as baseline to start from.

Issue/consideration	Yes/No	Your comments and actions
Advice and standards		
Do you have access to competent advice on fire management, and if so who?		
Have you consulted with your local Fire and Rescue Services on your site fire management?		
Have you consulted with your environmental regulator on your site fire management?		
Have you consulted with your insurer on your site fire management?		
Do you have access to technical fire management standards, such as BS, EN, building regulations and insurance standards?		
Has the advice of your environmental regulators, FRS, insurer been included in your fire management plans?		
Have any standards set in your environmental permit/licence/exemption been included in your fire management plans?		

Assessments and plans		
Do you have in place a fire risk assessment for your site?		
From this fire risk assessment do you have plans in place to control fire?		
Do these plans include consideration of environmental impacts such as fire water and emissions to air?		
Do these plans take account of the guidance given in this document?		
Do your plans include both physical aspects such as fire fighting equipment and procedural aspects such as instructions to employees and similar?		
Do you plans take account of the likely fire fighting strategy your local FRS may take should a fire occur on your site?		
Have you reviewed your plans to take account of your consideration and actions from this checklist?		
Have you included non-waste facilities such as welfare and offices in your plans?		
Have you included fuels and ignition sources outside the scope of this guidance (such as derv tanks and gas cylinder stores) in your plans?		

Whole site considerations – location and neighbours		
Are there any sensitive receptors (transport infrastructure, residential areas, schools, hospitals, water sources etc) which could be affected by a fire at your site?		
If yea, have you considered this in your plans?		
Do any neighbours pose a risk to your site, or could a fire at your site have a catastrophic effect on such higher-risk neighbours (such as petrol stations, gas storage facilities, workshops storing fuels etc)?		
If yes, have you liaised with your neighbours to ensure your and their plans take account of such effects, including communication issues?		
Do you know what the likely response time for your local Fire and Rescue Services will be to attend a fire at your site?		
If your local FRS would be unable to attend your site quickly, have you accounted for this in your plans?		

Whole site considerations – general ignition sources and precautions		
Have your employees been inducted on the fire precautions at your site, including emergency actions and escape?		
Do you include fire precautions in your site rules used with contractors, visitors, third party lorry drivers etc?		
Have you banned smoking on site and/or provided smoking areas away from combustible materials – and do you enforce this?		
Have you included general ignition sources such as lighting, heating etc in your plans?		
Do you conduct appropriate routine testing of electrical equipment (fixed systems and portable – PAT testing)?		
Do you have adequate security arrangements (including out of hours) to reduce the risk of arson/vandalism?		
Have you considered a formal site close-down procedure to detect smoulders which may result in a fire after work has ceased?		
Do you have a housekeeping regime in place aimed at minimising litter, dusts, loose paper/fibre etc		
Do you have appropriate storage for paints, solvents, derv etc and are these used?		
Have your employees been trained in the use of fire suppression equipment such as hoses and extinguishers?		

Are the means of escape from buildings and from your site in general adequate – do you have adequate fire escape provision?		

Whole site considerations – heavy mobile plant		
Do you instruct plant operators to clear combustible materials from around exhausts etc at the end of each shift?		
Is your mobile plant equipped with fire extinguishers?		
Do you maintain your plant to prevent electrical faults and similar?		
Do you park mobile plant away from waste storage and reception after use?		
Have you considered the role mobile plant can play in fighting fires?		
If so, have you trained your employees in the use of mobile plant to fight fires?		

Whole site considerations – hot works (welding, grinding, cutting etc)		
Do you have appropriate controls in place to minimise the fire risks of hot work?		
Do these include the provision of extinguishers and/or hoses at the scene of any hot work?		
Do you conduct a fire watch at least 1 hour after hot works?		
Have you considered a permit to work system for hot works to ensure all required controls are in place during work?		

Whole site considerations – water supplies		
Have you assessed the water supply to your site relative to your potential fire risk – and is it adequate?		
Do you know where the nearest public fire hydrant to your site is – and is this in your emergency plan?		
If the nearest public hydrant is >100 metres away have you considered an on-site hydrant?		
Have you considered potential alternative water supplies such as lakes, lagoons, rivers etc in your plans?		
If you have sprinkler, deluge and similar systems in place have you gained competent advice to ensure your water supply is adequate to feed these?		
Have you discussed water supplies with your local FRS during consultation with them?		

Whole site considerations – fire water and fire waste		
Do you have a drainage plan for your site which identifies all places water may run to?		
Have you included the potential environmental effects of fire water run-off in your plans?		
Do you need to put in place containment systems to prevent/reduce fire water escape?		

Have you considered ways to reduce the amount of fire water which may be produced in the event of a fire and have you consulted with your local FRS on this?		
If there are any potential sensitive receptors which fire water may run to from your site have you consulted with your environmental regulator?		
Have you considered in your plans how you would dispose of fire water and/or burnt materials which may remain on your site after a fire?		

Whole site considerations – general fire detection, alarm and suppression systems		
Has any detection, alarm and suppression equipment on your site been installed by suitably competent suppliers and to the required technical standards?		
Is all detection, alarm and suppression equipment on your site tested and checked routinely, including by a competent person?		
Have you included in your plans what you will do if your detection, alarm and suppression equipment on your site is impaired (such as broken) and any additional measures you will put in place should this occur?		
Is your fire alarm clearly audible across all of your site and in all locations?		

Is your fire alarm system connected across the site – for example, are your site offices connected to the same system as in your processing area?		
Do you review your detection, alarm and suppression equipment on your site periodically to ensure no better more up-to-date options have not become available?		

Whole site considerations – non-waste facilities		
Have you included non-waste facilities (offices, welfare facilities, weighbridge cabins etc) in your plans?		
Are waste storage stacks either at least 10 metres from such non-waste facilities, or are they protected in some other manner (such as the waste being in bunkers etc)?		

Whole site considerations – fire appliance access		
Have you assessed your site to ensure that FRS vehicles can access it easily?		
Have you assessed your site to ensure that FRS vehicles can move around your site easily?		
Do these assessments include access widths, weight limits and heights?		
Are there any obvious issues with access to and around your site. such as overhead power lines, bridges etc?		

Waste reception – hot loads		
Have you included specific issues relating to waste reception and reception areas in your plans?		
Does this include the potential for hot loads and/or hazardous materials in loads which may cause a fire?		
Have you put in place appropriate controls for hot loads etc such as a fire watch at the end of the day, not accepting potentially high risk loads towards the end of the day etc?		

Waste reception – fire detection and suppression		
Have you considered fire detection systems in your reception area/s? If so what did you decide?		
Have you included the options for fire detection listed in this guidance as part of your considerations?		
Have you considered fire suppression systems in your reception area/s? If so what did you decide?		
Have you included the options for fire suppression listed in this guidance as part of your considerations?		
Is you insurer content with your fire detection systems in reception?		

Waste reception – management		
Have you considered the potential for a fire to spread from your reception into other parts of your site/buildings?		
Have you considered the protection of any plant (such as shredders) located direct in your reception area/s?		
Have you considered abnormal situations (such as a plant breakdown resulting in more waste than usual in reception) in your plan and any additional precautions you will take in such situations?		
Have you determined the maximum safe amount of waste you can have in your reception area/s at any one time and do you have a management system to ensure this is not exceeded?		
Did your consideration of maximum safe amounts in reception include any environmental permit/licence limits?		

Waste treatment/processing – general considerations and detection		
Does your assessment include consideration of general plant/equipment fire risks such as direct heat and electrical and mechanical faults?		
Do you have an adequate maintenance programme in place to reduce the ignition risk posed by electrical and mechanical faults?		

Do you have a housekeeping regime in place to remove excess dust and loose materials from items such as drive motors and other potential ignition sources?		
Does your fire detection system result in a shut-down of your plant to prevent fire spread – have you considered this issue?		
Have you considered fire detection systems in your processing area/s? If so what did you decide?		
Have you included the options for fire detection listed in this guidance as part of your considerations?		
Have you consulted with your insurer on your fire control systems in processing areas and is your insurer content with the standard provided at your site?		

Waste treatment/processing – specific items of equipment considerations		
Have you considered fitting fire suppression to shredders, bag openers etc which may pose a friction/spark risk of ignition?		
Screens and trommels can provide air to a smoulder resulting in a full fire – have you considered fire suppression at screens and trommels?		

Conveyors and other mechanical handling equipment can spread a fire rapidly through a system. Have you considered this in your assessment and have you considered fitting fire suppression at conveyors etc?		
Have you considered slip-sensors on conveyors to detect potential friction issues?		
For de-dusting systems and cyclones etc have you considered dust explosion issues?		
For de-dusting and cyclones etc have you had a DSEAR assessment completed and as required zoned such areas?		
Where de-dusting and cyclone etc have been assessed as being 'zoned' have you put in place appropriate precautions such as blast panels, spark suppression etc as required?		
Have you included other specialised items of equipment, such as optical sorting systems, eddy-current devices etc, in your assessment and provided appropriate precautions?		
Are your mains/electrical plant rooms enclosed and appropriately constructed?		
Have you provided suitable fire detection and fighting equipment in mains/electrical plant rooms?		
Are control panels either in enclosed rooms or suitably protected from dust ingress?		

Have you included the risks posed by hydraulic systems (including fire spread should hydraulic fluid escape) in your assessment?		
Have you considered fire suppression at hydraulic power packs?		
Have you considered gantry level sprinklers and similar at picking cabins located above bunkers which may contain combustible wastes?		

Waste treatment/processing – protection of plant and equipment		
Have you considered whether a fire in waste reception of storage could spread to your processing area? If so, what have you done to protect your plant?		
Have you considered whether a fire in waste processing could spread to reception or storage areas? If so what have you done?		
Have you considered a formal plant close-down procedure including running the plant to clear excess wastes, ensuring electrical lock-off is in place and cleaning at the end of the day?		
Have you considered a fire watch at the end of the day to detect any smoulders which may result in a fire?		

Waste storage(internal and external) - general considerations - capacity		
Have you determined what is your site's overall maximum safe storage capacity?		
Have you split this into safe storage capacities for different wastes, different storage areas etc?		
Have you included issues such as seasonal variations and marketplace variations in your considerations?		
Have you included consideration of any higher-risk wastes in your storage capacity considerations?		
Have you included any environmental permit/licence standards in your storage capacity considerations?		
Have you a management system in place to ensure that you do not exceed your maximum safe storage capacity/ies?		

Waste storage (internal and external) – detection and suppression		
Have you considered fire detection systems in your storage area/s? If so what did you decide?		
Have you included the options for fire detection listed in this guidance as part of your considerations?		
Have you considered fire suppression systems in your storage area/s? If so what did you decide?		

Have you included the options for fire suppression listed in this guidance as part of your considerations?		

Waste storage (internal and external) – self-combustion and storage times		
Have you considered whether the wastes you store may self-heat and pose a self-combustion risk?		
Have you set maximum storage times for wastes which may pose a self-combustion risk?		
Are the maximum storage times you have decided on in line with this guidance?		
Do you have a management system to ensure that wastes are not stored for longer than your maximum storage times, and if they are what action you will take?		
Does this management system include the rotation of stock to ensure that older stock is transported off site before newer stock?		
As appropriate to the wastes you store, does this management system include keeping wastes as larger particle sizes and only shredding and similar shortly before off-take?		

Waste storage – internal storage areas – general considerations		
Do you have an internal storage plan which includes maximum amounts of waste to be stored in any one area?		
Does this plan conform to the maximum stack sizes for internally stored wastes in this guidance?		
If not, have you produced a justification backed with good reasons (such as enhanced fire fighting provision) to justify larger stack sizes?		
Does your plan include minimum separation distances between individual open stacks of waste (or bunkering of wastes as below)?		
Do these minimum separation distances for open stacks comply with the distance given in this guidance?		
Have you sought advice (such as from your insurer) on the protection of buildings from fires in internally stored waste stacks?		

Waste storage – internal storage areas – bunkered/enclosed storage		
Have you considered the use of bunker/enclosed storage for internally stored wastes?		
If so, are the walls of any bunkers/enclosures effective at preventing the spread of fire?		
Is the construction of your bunker/enclosure walls adequate – solid, no gaps, effective at preventing fire spread		

Do you have management systems in place to ensure that waste height does not exceed bunker/enclosure wall height?		
Do you have management systems in place to ensure that waste does not extend (spill) beyond bunker/enclosure walls so making them ineffective at preventing fire spread?		
Have you considered stock-rotation for bunkered/enclosed internal storage of wastes to ensure older wastes are cleared?		

Waste storage – external storage areas – general considerations		
Do you inspect your external waste stacks routinely to detect degradation and potential fire risks?		
Are you externally stored waste stacks at least 10 m from any building?		
If not, is the building protected (such as by a deluge system), or the waste contained in a bunker of similar so providing physical protection of the building from fire spread?		
Have you considered vandalism and arson as a cause of fires in your external storage? Are any additional security measures required?		
Have you considered more frequent inspections of externally stored wastes during times of higher risk for vandalism etc, such as holiday periods?		

Have you considered the turning of stacks of loose waste stored externally?		
Have you considered monitoring of temperature in loose wastes stored externally, such as by using a temperature probe?		

Waste storage – external storage areas – bunkered/enclosed storage		
Have you considered storing wastes externally in bunkers such as three-sided enclosures rather than in open stacks?		
If so, are the walls of any bunkers/enclosures effective at preventing the spread of fire?		
Is the construction of your bunker/enclosure walls adequate – solid, no gaps, effective at preventing fire spread		
Do you have management systems in place to ensure that waste height does not exceed bunker/enclosure wall height?		
Do you have management systems in place to ensure that waste does not extend (spill) beyond bunker/enclosure walls so making them ineffective at preventing fire spread?		
Have you considered stock-rotation for bunkered/enclosed internal storage of wastes to ensure older wastes are cleared?		

Waste storage – external storage areas – stacks sizes and separation distances		
Do you have an external storage plan which includes maximum amounts of waste to be stored in any one area?		
Does this plan include maximum stack sizes for open and bunkered/enclosed stacks in line with appendix 1 of this guidance: 1. Following the guidance stack sizes given in table 1 OR 2. Larger than in table 1, but backed by enhanced fire suppression and a valid justification for larger stack sizes OR 3. Bespoke stack sizes from testing and calculation, backed by fire science		
If you have more than 16 individual stacks on site, have you included a larger separation distance (as per table 1 in appendix 1) between these groups of stacks?		
Have you considered if you need separation distances between your stacks and site boundary to prevent fire spread beyond you site?		
Do you have a management system in place to ensure that your maximum stack sizes and minimum separation distances are complied with?		

Waste storage – external storage areas – storage layout		
Does your external storage plan include the layout of your storage stacks?		
Does this layout include at least the following factors, as relevant to your site: 1. Location of potential ignition sources 2. Buildings, in particular occupied buildings 3. Location of flammable and/or hazardous substances kept on site, such as gas cylinder cages, diesel tanks, quarantine areas which may contain non-conforming hazardous/special wastes and similar 4. Prevailing wind, where firewater may flow towards and other environmental factors 5. Proximity of neighbouring premises to which a fire might spread		
Does your layout include adequate access for FRS vehicles?		
Do you have a management system in place to ensure that your layout is complied with?		

Emergency/accident plan		
Do you have an accident/emergency plan for your site which includes fire issues?		
Does your accident/emergency plan include at the least: 1. Communication arrangements, such as named emergency contacts, key holders, incident controllers etc with their telephone numbers and likely response time (for out of hours)? 2. Hazardous and combustible materials on site, including wastes, including locations, likely amounts and other details? 3. Specific hazards, such as gas cylinders, fuel stores etc? 4. Normal number of people working on site and usual hours of work? 5. Fire fighting equipment on site and where this is located, such as location of hydrants, fire extinguishers, fire hoses, drench systems the Fire and Rescue Services (FRS) can plug-into etc? 6. Any other equipment on site which may be of use during a fire, such as heavy mobile plant which could be used to assist the FRS? 7. Any specific environmental issues, such as drainage issues for firewater, protected habitats etc?		

8. The procedures, such as evacuation, fire fighting and summoning the FRS, which employees and others on site must follow in the event of a fire? 9. Action to take in the period before the FRS arrives? 10. Incident controller identification – who will be your main point of contact with the FRS and how are they identified? 11. Use of pollution control equipment to block drains and/or divert firewater to a containment area and/or operate any pollution control facilities, such as drain closure valves/or penstocks? Any fire fighting processes outside of the normal, such as use of soils to cover fires, removing un-burnt materials using heavy mobile plant etc?		
Does your accident/emergency plan include a map/s of your site?		

Does this map/s include the locations (clearly marked) of at least the following as relevant to your site: 1. Layout of buildings (externally and internally, including fire exits and other access points)? 2. Any locations where hazardous materials are stored on site (location of gas cylinders, process areas, chemicals, stacks of combustible materials, oil and fuel tanks etc)? 3. Main access routes for fire engines and any alternative accesses? 4. Access points around the site perimeter to assist fire fighting? 5. Location of hydrants (on and off site) and water supplies, including lakes, lagoons, water tanks etc? 6. Location of fire extinguishers, hoses and other fire fighting equipment on site? 7. Any watercourse, borehole, or well located within or near the site? 8. Areas of natural and unmade ground? 9. Location of plant, protective clothing and pollution control equipment and materials?		

10. Drainage systems, including foul and surface water drains, and their direction of flow and outfall points? 11. Location of drain covers and any pollution control features such as drain closure valves/penstocks and firewater containment systems?		
Is a copy of your accident/emergency plan, including site map/s, kept in an obvious location where the FRS can find it out of hours (such as a secure clearly marked box at the site entrance)?		
Have you lodged a copy of your accident/emergency plan with your local FRS?		
Have you consulted with your local FRS on your accident/emergency plan?		
Do you test your accident/emergency plan (such as fire drills) routinely?		

Appendix 4: Useful links and further reading

Useful links and web sites

Health and Safety Executive web site, fire and explosion pages:
http://www.hse.gov.uk/fireandexplosion/index.htm

Environment Agency web site, how to comply with your environmental permit: http://publications.environment-agency.gov.uk/pdf/GEHO0812BUST-E-E.pdf

Contact details for your local fire and rescue service: http://www.fireservice.co.uk/information/ukfrs

Advice on fire risk assessment for factories and warehouses: https://www.gov.uk/government/publications/fire-safety-risk-assessment-factories-and-warehouses

Other guidance on fire risk assessment: https://www.gov.uk/government/collections/fire-safety-law-and-guidance-documents-for-business

WISH (Waste Industry Safety and Health) Forum guidance: http://www.hse.gov.uk/waste/information.htm

Environmental Services Association DSEAR/waste management guidance:
http://www.esauk.org/esa_reports/index.html

For the full Regulatory Reform (Fire Safety) Order 2005: http://www.opsi.gov.uk/si/si2005/20051541.htm

Links to other documents mentioned in this guidance

Spontaneous heating of piled tyre shred and rubber crumb – HSE:
http://www.hse.gov.uk/rubber/spontaneous.htm. FM (Factory Mutual) technical note 8-3 also includes information on tyre storage fire hazards.

SFPE Handbook 3rd Edition - Ch 2 Conduction of heat in solids - National Fire Protection Association – SBN: 0877654514

CIRIA Report 164, 1997, P A Mason, H J Amies, P R Edwards, G Rose, G Sangarapillai, Design of containment systems for the prevention of water pollution from industrial incidents ISBN 0 86017 476 X:
http://www.ciria.org/SERVICE/Home/core/orders/product.aspx?catid=2&prodid=301

Fire and Rescue Service Manual Volume 2 Fire Service Operations – Environmental Protection, The Stationery Office – ISBN 978 0 11 341316 4:
http://www.communities.gov.uk/publications/fire/environmentprotectvol2

Also from the Environment Agency other guidance which may be useful:

- Managing Fire Water and Major Spillages: PPG18
- Incident Response Planning: PPG 21

Appendix 5: Glossary

Accident/emergency Plan	Part of a written management system that includes an assessment of fire risk on the site and what measures are in place to prevent, detect, suppress, mitigate and contain fire. Note – this is a term used in environmental permits/waste management licences. Other terms, such as emergency plan, fire plan etc, may be used in other regulator aspects. While outside of this guidance, you may also want to consider disaster recovery and business continuity planning
Bund	A type of secondary containment. Usually an impermeable construction designed to hold polluting substances that leak, are spilt or run-off from a storage area
Combustible materials	In the context of this document, solid materials that can ignite and burn, such as textiles, wood and paper
Competent advice	Competent advice on fire safety and its technical aspects is critical to good fire control management. Competent advice sources may include: • In-house health and safety specialists – provided that they have sufficient knowledge and experience of fire management and the standards applied • Your local Fire and Rescue Services (FRS). Please note that your local FRS may be best being consulted after you have produced draft management processes, design of site etc • Regulators such as the Environment Agency, Scottish Environment Protection Agency and the Health and Safety Executive. Please note that while such regulators can provide advice this is not their primary role • Insurers – your insurance company may have internal fire management specialists who you can call on at no or lower cost than going to an external consultant • External consultants – suitably competent external consultants. Please ensure that these are experienced and knowledgeable about fire management and standards Note – different stakeholders, such as insurers and regulators, may have different priorities and you may need to consult with more than one type competent advice to gain a full picture
Controlled burn	An operational fire fighting strategy where the application of fire fighting media such as water or foam is restricted or avoided, to minimise damage to public health and the environment
Exemption	Low risk waste handling operations that don't require a permit or licence. Most exemptions need to be registered with the EA/SEPA
Protected habitat	Examples include: Site of Special Scientific Interest (SSSI), Area of Special Scientific Interest (ASSI), Special Area of Conservation (SAC), Special Protected Area (SPA), National Nature Reserve, Sites of international conservation importance – Ramsar site, Area of Outstanding Natural Beauty (AONB), National Scenic Area

Hazardous substances	Materials that can harm human health and/or damage the environment
Hazardous/Special Waste	Wastes, specified in the European Waste Catalogue, that may be harmful to human health or the environment
Permit/waste management licence	A document issued by your environmental regulator that controls the environmental impact of your business activities. It has conditions which you must follow to prevent your business harming the environment or human health
Firewater run-off	Water that has been used to fight a fire, likely to be contaminated with the products of combustion and un-burnt materials that are washed off the site
Flammable material	Materials that ignite easily and burn rapidly with a flame. Liquids and articles are usually defined as flammable if they possess a flash point of 60°C or lower
Flashpoint	The lowest temperature at which a liquid produces enough vapour to form an ignitable mixture in air
Foul sewer	Sewers or pipes that collect foul water (sewage and trade effluent) and convey it to a sewage treatment facility. They can be owned privately or by the local sewage treatment provider
Groundwater	Water that is below the surface of the ground in the saturation zone, and in direct contact with the ground or subsoil. The saturation zone is where all the cracks in the rock and all the spaces between the grains of rock and within the soil are filled with water
Penstock/shut-off valve	A sluice or gate valve fitted in a sewer or drain that can be closed automatically or manually to contain spillages or firewater
RDF/SRF	Refuse derived fuel/solid recovered fuel (various types of fuel derived from wastes using various treatment processes)
Secondary containment	A structure such as a bund that surrounds a storage area, designed to contain pollutants in the event of a fire or spillage
Sensitive receptor	Human receptors include hospitals, nursing homes, schools, residential areas, places of work, transport networks. Environmental receptors include source protection zones, surface waters, potable abstractions, groundwater, protected habitats, fisheries
Stack	A pile of solid combustible materials. Any spaces within it will not allow free passage, or exceed one metre in width at their narrowest point
Surface water drain/sewer	Sewer or pipes that collect uncontaminated surface water only, from buildings, roads and yards, which usually discharges directly into rivers, the sea or groundwater
Spontaneous combustion	Combustion which occurs without an external heat or ignition source being applied
Tertiary Containment	A device or structure such as a firewater lagoon, that provides additional containment should secondary containment fail

Appendix 6: Cover letter

The below is the text from the cover letter issued during consultation on this guidance (italic text). This provides background and context for the guidance:

WISH

NOTE – THIS IS A COVER LETTER AND DOES NOT FORM PART OF THE DRAFT GUIDANCE

27 June 2014.

Dear consultee,

Re: Fire prevention and mitigation guidance for the waste management industry

Attached is draft fire guidance for the waste management industry. This has been produced by a cross-industry group including input from the Environment Agency (EA), The Health and Safety Executive (HSE), the Health and Safety Laboratories, the Chief Fire Officers Association (CFOA) and other bodies. It is endorsed by the EA, HSE, CFOA, ESA and WISH (Waste Industry Safety and Health) Forum. In addition, the main insurance companies involved in waste management have been consulted for their views on some aspects.

All comments on this draft should be directed to Stephen Freeland of ESA (Environmental Services Association) at s-freeland@esauk.org. If you wish to discuss any aspect of this draft please also contact Stephen who will put you in touch with the appropriate person.

The deadline for comments is Friday 25 July 2014.

When reading and commenting on this draft please keep in mind the below:

- ✓ *There is an urgent need to issue guidance – our industry keeps suffering serious fires*
- ✓ *The attached draft guidance is good practice based on legal requirements and the experience of regulators, insurers and the industry - your comment is welcome*
- ✓ *We expect most comment to be on stored waste stack sizes and separation distances, in particular for the external storage of wastes (see appendix 1 of the draft). Please note that the data in table 1 of appendix 1 assumes only the most basic fire precautions are in place – sites with more than basic fire precautions may be able to exceed these limits. Please also note the three options included in appendix 1, which give operators flexibility, and that other separation measures, such as storing wastes in three-sided bunkers, are also available to operators – table 1 provides a starting point only*
- ✓ *When writing this guidance we have been aware that there is a range of technical standards and other documents currently available which include various stack sizes and separation distances for stored wastes. However, none of these documents is complete and we have therefore used the best of available information from different sources to arrive at the figures in this draft guidance*

- ✓ *Key to the sizes and distances included in this draft guidance is that the days of extremely large piles of stored waste with little or no separation between stacks ('mega-stacks') must come to an end – fires in such stacks can burn for unacceptably long periods, are the most difficult to control and pose the greatest risk to the environment, human health and business. Our industry must change, or be condemned to continue to suffer major fires on a frequent basis - this is not acceptable or sustainable and ultimately could result in calls for more, and more rigid, control regulation*

- ✓ *There is little available fire testing or science specific to wastes to provide a firm under-pinning for the available information on stack sizes and separation distances – most of the current information is based on operational and fire fighting experience. There is data on raw materials. Much of this indicates that the separation distances in table 1 in appendix 1 are conservative and separation distances in excess of those currently available for wastes may be required at sites with no fire prevention measures. For example, data on virgin, raw paper and plastics suggests separation distances between 10 - 11 metres and 18 - 27 metres respectively – that is well in excess of those distances quoted in table 1 of appendix 1. Whether this data for raw materials can be applied direct to wastes is not known - real testing on wastes is required*

- ✓ *The contributors to this guidance intend to undertake such testing, but this will take time. Industry input into this testing would be welcome. If you wish to be involved, please indicate this in your reply to this consultation. But, we cannot wait for what is likely to be complex and time-consuming testing and science before issuing guidance - the need is too urgent. Therefore, we have decided to issue this guidance for consultation based on the best current information on stack sizes, separation distances and similar*

- ✓ *Over time as waste specific testing data becomes available we will revise this guidance to keep it up-to-date and to ensure that it remains consistent with the best information available*

We welcome your comments on this draft guidance and our approach.

The cross-industry fire work group