Fire Prevention & Mitigation Plan Guidance – Waste Management

Guidance Note 16

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WORKING TOGETHER FOR A SAFER WALES –CYDWEITHIO TUAG AT GYMRU DIOGELACH

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What is this document about?

The guidance document has been compiled by Natural Resources Wales (NRW) in collaboration with the Fire & Rescue Services in Wales (South Wales Fire & Rescue Service, Mid & West Wales Fire & Rescue Service and North Wales Fire & Rescue Service).

It represents the minimum appropriate measures required to be put in place by waste operators within Wales to ensure that fires are prevented within their businesses.

Who is this document for?

This guidance has been produced using increased industry and Fire & Rescue Service experience when fighting real waste fires, and improved knowledge attained as a result of a series of burn tests carried out in 2015 and throughout 2016 by WISH (Waste Industry Safety and Health Forum) supported by CFOA (Chief Fire Officers Association).
In 2015 smaller-scale laboratory type testing was conducted at the FPA (Fire Protection Association) research premises. These 'phase 1' tests provided baseline data on parameters such as burn rates and thermal heat outputs.
In 2016 "phase 2" larger-scale waste burn trials were conducted at sites in Yorkshire and Essex. These tests involved much larger volumes of waste and aimed to replicate as closely as practical 'real life' waste fires. The results of these tests matched much more closely the experience of the FRS when fighting real waste fires, and revealed some of the different mechanisms at play during waste fires. Both phase 1 and phase 2 tests were conducted on a variety of wastes such as loose and baled wastes, plastics, paper and board, rubber, wood wastes, waste derived fuels such as RDF and SRF and others.

Natural Resources Wales and the Fire & Rescue Services in Wales will use this guidance to assess the suitability & appropriateness of fire prevention and mitigation measures at permitted waste facilities.

This guidance replaces "Natural Resources Wales Fire Prevention and Mitigation Plan Guidance – Waste Version 1, May 2016" and applies to all new waste permits (relevant standard rule and bespoke) & all relevant existing waste standard rule permits and bespoke, based on a phased implementation.

See section "Submitting your Fire Prevention & Mitigation Plan" for more detail.

*If you are using a printed version of this guidance document, please ensure that it is the most up-to-date version available.

Contact for queries and feedback

John Rock – Waste and Resources Team, EPP

Contents

1. Introduction and Scope

If you are applying for an environmental permit that authorises you to store combustible waste, or you have an existing permit with a permit condition requiring you to have a Fire Prevention and Mitigation Plan (FPMP), you must adhere to this guidance. It stipulates the fire prevention standards you must follow when formulating a site specific FPMP for your site.

These standards should be in your working plan or management system and implemented on your site.

You will need to follow this guidance if your permit conditions states that you must have a fire prevention plan, or if you need to submit one as part of your permit application.

If you do not follow this guidance or appropriate sector specific advice (e.g. Waste Industry Safety and Health Forum (WISH) - Reducing fire risk at waste management sites (latest version)) when compiling your FPMP **you should ensure that the measures you take are equivalent or superior to this standard**, and that they comply with regulatory requirements.

In order to achieve this you should include detailed assessments to satisfy Natural Resources Wales (NRW) that the

- likelihood of fire
- impact from emissions during or after a fire on the local community, critical infrastructure and the environment
- resources required by the NRW and other emergency responders during an incident
- post incident clean-up and remediation costs

are equivalent or less than would be incurred if the site followed the minimum standards in this regulatory guidance.

The permit determination process may be delayed and we may ask you to revise your FPMP if it does meet the guidance or the equivalent standards.

NRW and/or the Fire and Rescue Service (FRS) may also take enforcement action if it deems that your site does not comply with the required standard.

This guidance 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. It is your responsibility to check which statutory requirements apply to you.

While not a regulator, insurers have a major 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, assessments and plans. 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 risks.

2. Who this guidance applies to and does not apply to

This guidance applies to operators that store any amounts of combustible waste materials including (**but not limited to** [1]):

- paper or cardboard
- plastics
- rubber (natural or synthetic, including whole tyres, baled tyres, tyre shred, crumb and fibre)
- wood & wood composites (planks, boards, pallets, crates, sawdust, shavings & chips
- fragmentiser waste (from processing end of life vehicles (ELV's), plastics and metal wastes from materials recovery facilities)
- rags and textiles
- scrap metals including ELV's
- waste fuels – including residual combustible waste, RDF and SRF
- waste electrical and electronic equipment (WEEE) such as fridges, computers and televisions containing combustible materials such as plastic
- batteries within ELV's
- compost and plant material
- biomass facilities

It applies to operators from these sectors:

- waste metals (end of life vehicle (ELV) sites and scrap metal)
- non-hazardous waste

This guidance contains useful information that can apply to operators in any of these sectors, however you may not have to include all of your activities if you are required to produce a fire prevention plan:

- bio-waste treatment (open windrow, in-vessel composting and dry anaerobic digestion)
- agriculture (intensive farming only)
- incineration
- combustion
- paper and pulp
- cement lime and minerals

If you are in one of these sectors, please contact **Natural Resources Wales** for more information.

1 There may be other wastes that an operator will have to consider which may be mixtures of the above specified wastes or where specific properties of the waste stream present a combustible risk.

Who this guidance does not apply to

This guidance does not apply to landfill sites or to the storage of coal, materials or waste that are:

- flammable (flashpoint of 60°C or lower)
- combustible liquids or gases
- hazardous (excluding any hazardous waste to which this guidance applies, as set out above)
- dangerous substances stored under the COMAH (Control of Major Accident Hazards) Regulations

Gas cylinders, aerosols and combustible liquids are not covered by this guidance but they should still be considered in your fire prevention plan due to the potential they have to cause or increase the impact of fire on a site.

Advice is available in:

'Guidance for the storage and treatment of aerosol canisters and similar packaged wastes'

For advice about other materials and activities not listed above, contact the Health and Safety Executive (HSE), local Fire and Rescue Service or Natural Resources Wales.

3. Submitting your Fire Prevention & Mitigation Plan

This guidance applies to all new waste permits (relevant standard rule and bespoke) and all relevant existing waste standard rule permits and bespoke, based on a phased implementation.

Fire poses a significant risk during the storage of combustible waste materials. Therefore you must ensure that your FPMP is suitable in its measures to prevent the risk of fire at your site.

Standard Rules Permit (New & Existing Applications)

If you want to operate under a standard rule permit you do not need to submit a fire prevention and mitigation plan with your application, however, you must ensure that you have one in place before you start operating on site, and be able to demonstrate this to us.

Please note that the application form includes this and by signing the declaration in Part F of the application you are agreeing to this.

Bespoke Permit (New Application)

If you are applying to operate under a bespoke waste permit and you intend to accept, store and/or treat any of the materials to which this guidance applies, you must submit a fire prevention and mitigation plan with your application**.**

Your FPMP must be produced in accordance with this guidance. Your application may be refused/delayed if your FPMP does not meet the standards as set out in the guidance.

Bespoke Permit (Existing Application)

If you are an existing operator under a bespoke permit, you will also need to submit a fire prevention and mitigation plan with any application to add a new material or include a new activity or to increase the amount of materials stored at any one time, to which this guidance applies. If your application is to increase annual throughput **without** increasing the amount of materials stored at any one time you will not be required to submit a FPMP with your application.

Within your application, you will need to provide written confirmation of the following:-

- This is an increase to annual throughput only
- Storage of combustible materials covered/referenced in the guidance will not increase from current levels
- The methods/techniques used to manage current storage levels (at any one time limits) meet the standards set out in the guidance

Note – that you will not be able to duly make your application without written confirmation of the above.

The permit determination process may be delayed and we may ask you to revise your FPMP if it does meet the guidance or the equivalent standards.

4. Producing your Fire Prevention and Mitigation Plan

Your Fire Prevention & Mitigation Plan (FPMP) **must be a separate document** within your accident management plan which forms part of your written management system. Your management system should also **include a separate written assessment of fire risk** on your site and describe the measures in place to prevent, detect, suppress, mitigate and contain fires in accordance with the **Regulatory Reform (Fire Safety) Order 2005.** Many of the prevention measures will align with measures to ensure waste quantities are within the sites capacity and that wastes are stored and managed properly.

All staff and contractors working on-site should be aware and understand the contents of the FPMP and what they must do:-

- to prevent a fire occurring
- during a fire if one breaks out

It is ideal for your plan to be available both electronically and in hard copy**.** Employees will need to be aware of the plan contents & have access to it at all times; it is also essential that both NRW & FRS also have access to it during an emergency. Many sites place a copy of their plan in an “emergency services box" which can be located at the site entrance or suitable location so that the FRS can

access the plan out of hours in an emergency. In the end, it is of no use having a good plan in place if it is in the burning building and cannot be accessed.

You should ensure that you have regular exercises to test how well your plan works and make sure that staff understand their responsibilities and what actions need to be carried out.

5. Fire Prevention and Mitigation Plan Contents

Your FPMP must include:

- the amount & type of waste received daily and how it is managed
- the total amount of waste & the types and forms (e.g. unprocessed, shredded, chipped, fines or baled) that are stored on site at any one time and how it will be stored
- the maximum time each type of waste will be stored on site and how it will be managed
- the location within the site where each type of waste will be stored
- the maximum size of any waste pile, stipulating the maximum length, width and depth
- the minimum separation/fire break distance required between all waste/baled waste stacks, and between buildings and waste/baled waste stacks
- a clear area must be established around the perimeter of site, this can vary depending on the layout of your site and permitted stack sizes in accordance with the separation distances as illustrated in **Table 2** (this must be available at all times and identified on your site plan
- the fire prevention techniques used, including management of hotspots (signs of potential self-combustion), monitoring, reporting, recording and actions
- techniques used to minimise the risk of fire spreading within the site or from the site
- the steps and procedures to be followed if a fire occurs on your site
- all combustion products and emissions (to air, land and water) from the fire and the emergency response (including the impact on the community, critical infrastructure and the environment) and how they will be minimised
- contact details of sensitive receptors within 1km of your site –

    - **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

- how safe access to the site for fire and rescue services and other emergency responders is achieved

- **you must include a site plan(s) drawn to scale showing:**

- layout of buildings (including access points, fire exits & location of utilities)
- areas where hazardous materials are stored (location of gas cylinders, process areas, chemicals, piles of combustible materials, oil & fuel tanks)
- main access routes for fire engines (typical FRS vehicle access requirements are below) & any alternative access points around the site perimeter to assist fire fighting

Type of FRS appliance	Min width of road (metres)	Min width of gangway (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
Weight of vehicle may need to be confirmed with your local FRS as various types of vehicles are in use.				

- Location of hydrants and water supplies
- any watercourse, borehole or well located within or near the site
- areas of natural and unmade ground
- the location of plant, protective clothing and pollution control equipment and materials
- drainage systems, foul and surface water drains, and their direction of flow and outfall points
- the location of drain covers and any pollution control features such as drain closure valves and firewater containment systems
- location of “off- site” emergency information pack with site plan (as specified above)
- location of sensitive receptors within 1km of your site –

    - **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

- location of the **quarantine area**
- assembly point for staff and visitors to site
- compass rose showing north and the prevailing wind direction

You should also include actions to be taken should a fire occur such as:

- reducing the amount of firewater run-off generated - use sprays and fogs rather than jets
- recycling firewater if it is not hazardous and it is possible to re-use
- applying water to cool unburned material and other hazards, taking care to prevent this water causing or adding to water pollution and/or increasing air pollution
- separating unburned material from the fire using suitable heavy plant
- separating burning material from the fire to quench it with hoses or in pools or tanks of water (this will reduce the amount of firewater produced)
- using soil, sand, crushed brick and/or gravel (if smoke is threatening local communities) to help suppress the fire, although you can only do this when:

    - groundwater vulnerability is low
    - agreed as a part of a firefighting strategy by the FRS and supported by NRW
    - contaminated material is removed and legally disposed of as soon as it is safe to do so

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

- scale & nature of the environmental hazards and activities that take place
- risks posed to people, the environment and property
- type of materials you store on site, the form they are stored in & the length of time needed to extinguish a fire involving them
- availability of firewater containment facilities
- local topography, weather conditions and fire scenarios that could reasonably be expected on site

6. Common Causes of Fires and Preventative Measures

When producing your FPMP you should consider where applicable, the common causes of fire and the preventative measures you can take to reduce the risk at your site. Some of these risks may not apply to your site or there may be others you need to include in your fire prevention plan. It is your responsibility to identify all possible risks, depending on the activities you carry out on your site.

Some of the risks and measures can include:-

- **Arson or vandalism** - You need to have adequate security measures in place, such as security fencing, intruder alarms and CCTV. Arrangements for outside of working hours should also be considered.
- **Visitors & Contractors** – You should ensure all visitors follow the correct safety and fire prevention procedures. Fire prevention messages can be reinforced around the site using suitable signs.
- **Ignition sources** - You need to keep naked flames, space heaters, furnaces, incinerators and other sources of ignition 6 metres away from combustible and flammable waste.

- **Self-combustion** - (e.g. due to chemical oxidation in stored waste material) what measures you will put in place to monitor and control this issue and help prevent the risk of fire
- **Plant or equipment failure** - You need to ensure that you:-
    - have a maintenance and inspection programme for static and mobile plant and equipment
    - fit vehicles with fire extinguishers, dust filters, spark arrestors and where practicable all bucket loaders are to be fitted with rubber strips to prevent sparks when the bucket comes into contact with hard-standing etc.
    - keep mobile plant that is not being used away from combustible waste
- **Discarded smoking materials** - You should apply a no smoking policy or have designated smoking areas a safe distance from combustible wastes to prevent accidental ignition.
- **Hot works (e.g. welding or cutting)** - You need to ensure all staff and contractors follow safe working practices, such as a permit to work system, when carrying out hot works such as welding and cutting. A fire watch for a suitable period should be implemented once hot works have ceased and in particular at the end of a working day. For further information please refer to relevant **Health and Safety Executive (HSE) Guidance**
- **Industrial heaters** - You should have written procedures that set out the use and regular maintenance of industrial heaters.
- **Plant & Hot exhausts** - You need to ensure that a fire watch/visual check is carried out at regular intervals during the working day and at the end of the day to detect signs of a fire caused by dust settling on hot exhausts and engine parts. Set out in your plan how regular these intervals are, methods to record the inspection, actions taken and concerns. As part of your end of day procedures you should make sure separation distances are observed between plant and material when the site is not staffed
- **Damaged or exposed electrical cables** - Electrics on site should be fully certified by a qualified electrician and you must have written procedures in place that set out the regular maintenance.
- **Reactions between wastes** - You should ensure that you have written procedures within your management system for waste acceptance checks to prevent reactions between incompatible or unstable wastes, including lithium batteries. You must have a **quarantine area** available at all times and identified on your site plan.
- **Hot loads deposited at the site** – use a suitable **quarantine area** for hot loads.
- **Build-up of loose combustible waste, dust and fluff** - Your plan should state how regularly you will inspect and clean the site to prevent the build-up of loose combustible waste, dust and fluff within buildings & around the site

- **'Tramp' metal** that finds its way into moving machinery and causes localised 'hot spots'. Prevent metal getting into moving machinery by pre-sorting and/or extraction by a magnet/eddy current separator, especially when ignitable or explosive materials are present;
- **Batteries within waste deposits** - as part of your reception procedures, you must ensure that every effort is made to remove any form of battery unit from within the waste prior to processing. A number of recent fires within waste processing systems have been caused by batteries entering processing machinery.
- **Batteries in ELVs** - Batteries left connected in un-depolluted vehicles can short circuit and cause fires. You must disconnect or remove batteries from un-depolluted vehicles as soon as possible after reception
- **Cylinders stored at the site** – should be stored in the correct manner when either in/or not in use. Cylinder storage locations should be identified on the site plan
- **Leaks and spillages of oils and fuels** - You need to prevent fuels and combustible liquids leaking or trailing from site vehicles and ELVs. For example, this includes from vehicles:
    - being tracked around the site
    - before or after the de-pollution process

  You must ensure that any materials used to absorb combustible liquids are correctly disposed of to reduce the risk of a potential fire situation.

7. Storage Times and Self-combustion Factors

Many materials can self-combust under certain conditions, and the risk generally increases when materials are stored for prolonged periods, whether internally or externally, and in general the smaller the particle size the higher the risk.

Generally the storage time limits shown below are starting points for your considerations on storage and should be used to inform your stock management and rotation process.
For some wastes these storage times may be too long and you should consider your waste types carefully for self-combustion risk.

Table 1 – Maximum Storage Times

Combustible Waste Type	Maximum Storage Time on Site
Non-shredded or similarly treated wastes (that is wastes whose particle size has not been reduced)	6 Months
Baled and compacted wastes (if kept for longer periods you should consider breaking the bales & re-bale to help reduce risk) Please note that if you intend to do this, you must include this information in your FPMP.	6 Months
Shredded and similarly treated wastes (that is wastes whose particle size has been reduced)	3 Months
Combustible fines/dusts & very small particle size wastes	1 Month

You may have specific permit conditions that will restrict your maximum storage time. You must ensure that you comply with this limit.

It will be the responsibility of the operator to demonstrate a suitable management system prior to any combustible waste being stored for longer than the above periods. It is essential that you contact NRW to discuss the situation and methods to mitigate the risk of fire prior to exceeding the storage periods.

Materials that are at risk of self-combustion if stored for more than 3 months are:

- green material, compost, wood and wood products,
- paper and paper products,
- general/mixed waste including residual waste, RDF and ‘fines’
- tyres (whole or processed)
- smaller size or graded materials either stored or mixed
- material that has not had potential hazards removed before stacking e.g. exposed rust (which can generate heat)
- treated materials which are not cold before storage (treatment processes can generate heat)

If you are storing materials at risk of self-combustion for longer than 3 months you must demonstrate what additional measures you will take, including monitoring the piles to reduce this risk. **You must include this information in your FPMP.**

You must demonstrate a clear method to record and manage the storage of all waste on site and ensure you have robust waste acceptance procedures (that form part of your Management System) to prevent receipt of unauthorised waste, or waste that your site does not have the capacity to treat or store.

To help prevent self-combustion taking place you should consider adopting the following general fire prevention principles:

- reduce risk factors (e.g. exposed metal content, proportion of 'fines', mixing of materials and heat generated during treatment)
- minimise stacks sizes (small stacks with appropriate separation are safer than one larger one)
- control moisture levels
- demonstrate good stock rotation for all stored materials and show how this is monitored and implemented daily
- store material in its largest form prior to processing e.g. do not undertake preparatory treatments such as size reduction of green waste unless you are intending on submitting the waste to the treatment process immediately
- monitor and control sub-surface temperature and moisture content with a suitable thermal device (thermal probe/thermal camera) and ensure that this is capable of reaching all parts of a stack (if materials are stored in plastic wrapping you must demonstrate a sampling and testing protocol to ensure a representative number of bales (minimum 10%) are assessed during monitoring
- routinely turn stacks
- detect and control hotspots within stacks (**Note:** steam is a good indicator of self-heating)
- define the maximum storage time of all materials on site and show how this will be monitored and controlled
- minimise external heating during hot weather by shading from direct sunlight

Some of the storage periods within your plan may have to be reduced where there is another requirement to ensure compliance with the permit, e.g. Odour Management Plan or pest control measures.

It is important that alternative waste management options are available should your site reach its safe storage capacity (which should be incorporated as a limit within the site management system).

8. Managing Waste Material Stacks and Separation Distances

Please note that some of the detail & illustrations used within this section have been kindly supplied by WISH (Waste Industry Safety and Health) Forum

This section of the guidance has been produced using increased industry and fire & rescue service experience; and improved knowledge attained as a result of a series of burn tests carried out during 2015-2016 by WISH (Waste Industry Safety and Health Forum) supported by CFOA (Chief Fire Officers Association).
The results of these tests matched much more closely the experience of the FRS when fighting real waste fires, and revealed some of the different mechanisms at play during waste fires. Both phase 1 and 2 tests were conducted on a variety of wastes such as loose and baled wastes, plastics, paper and board, rubber, wood wastes, waste derived fuels such as RDF and SRF and others.

Information and use of the tables and graphs

Some of the standards for storage stacks are simple, such as stack height and width. However, the separation distances will vary dependent on the length of the stack on a sliding-scale. For ease of use, these separation distances are captured within two graphs that appear towards the end of this section.
When calculating your separation distances please refer to the graph that is applicable to the waste type that you are storing:-

- **Graph 1** – Must be used for stack lengths and separation distances for general wastes, such as RDF, SRF (Refuse derived fuel/solid recovered fuel - various types of fuel derived from wastes using various treatment processes), wood, paper etc. (950 °C typical maximum burn temperature).

- **Graph 2** - Must be used for stack lengths and separation distances for plastics and rubber wastes (1,200 °C typical maximum burn temperature).

Within each graph there are four lines shown that can be used:-

- *loose stack to loose stack distances,*
- *loose stack to buildings distances,*
- *baled stack to baled stack distances, and*
- *baled stack to buildings distances*

In order to determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line depending on the storage method used (stack to stack, to buildings etc.). Next draw a horizontal line across to the vertical axis and read-off separation distance.

If due to size constraints of your site you are restricted to separation distances, the graphs can be used in reverse. Therefore this distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis.
The terms stack length and width are used in the tables and graphs. However, when considering separation distances based on thermal heat transfer a burn-face could be on the long-side (length of a stack) or the short-side (width of a stack), or length and width could be equal. Both will need to be taken into account.

The aim of the tables and graphs is to give waste site operators practical and standard guidance that can be used without the need to employ a specialist fire engineer to calculate bespoke separation distances. As a result a number of assumptions have been made to avoid complicating the issue and a need to have ‘hundreds’ of graphs and scenarios.

The main assumptions made include:

- Graphs 1 and 2 assume a **stack height of 4 metres** (the maximum taking into account practical fire-fighting issues and stability). If your waste stacks are significantly lower than this you could employ a competent fire engineer to calculate bespoke separation distances for your site. However, small

differences in stack height are unlikely to have a significant effect, and you would need to be confident that your stacks are consistently lower

- To avoid over-complicating the tables and graphs given, a limited number of scenarios have been used (those most common at waste sites). There are other potential scenarios, such as a bale stack next to a loose stack. Further detail can be found in the non-technical summary of the waste burn trial results available on the **WISH web site.**

Finally, when using the graphs please take a practical and cautious approach. Separation distances obtained from the graphs should be rounded-up to the nearest whole number. Measuring stack length or width or height down to the last millimetre is unlikely to have any substantive effect, and would not replicate actual conditions on a waste site, which will vary from day-to-day and week-to-week depending on business activity – if in doubt err on the side of caution.

As part of your waste stack management protocol you should consider adopting the following general fire prevention and mitigation principles:

- manage all stacks to within the maximum sizes and minimum separation distances
- have availability to adequate water supplies or alternative firefighting methods at all times to fight a fire
- enable easy access for emergency vehicles around the whole site
- manage all stacks of materials that can self-combust and demonstrate suitable additional precautions if they are stored for more than 3 months

In summary:

- **Maximum stack height of 4 metres** (or maximum of four bales high whichever is lower) based on practical fire-fighting and stability considerations. The height of a pile should be taken as the longest measurement between the base of the pile and the top. If the ground is uneven this may not be the highest point.

- **Maximum stack width of 20 metres** (provided appropriate access for plant/machinery is available from both sides – **if not maximum of 10 metres**) based on practical fire-fighting considerations.

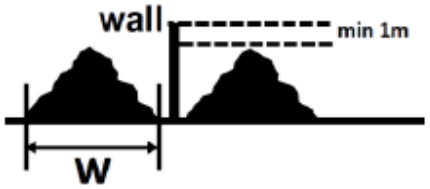
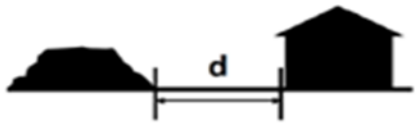
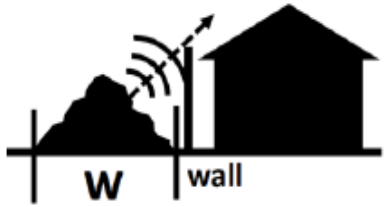
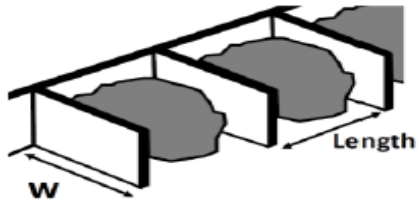
- Stack widths of more than 10 metres (with access from one side) start to degrade the effectiveness of standard fire hoses in applying water to the 'seat' of a fire. It will result in ‘spraying' water in the air and hoping it falls on the right spot.

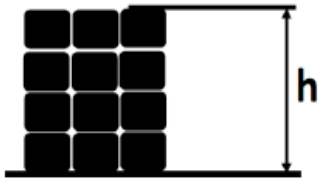
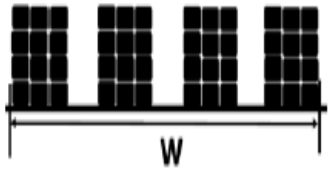
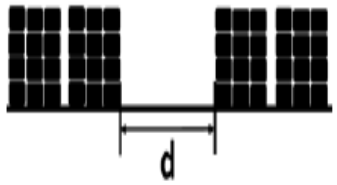
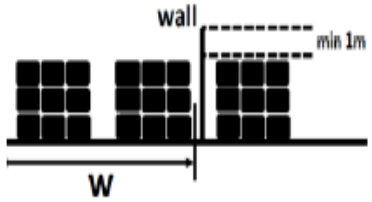
- **Depending on the waste type/s that you store at your site, please refer to the appropriate graph (either graph 1 or graph 2 in this section) to establish suitable stack lengths and**

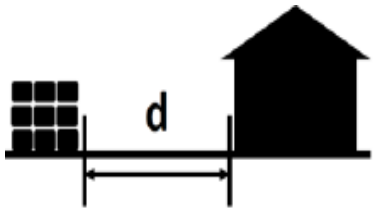
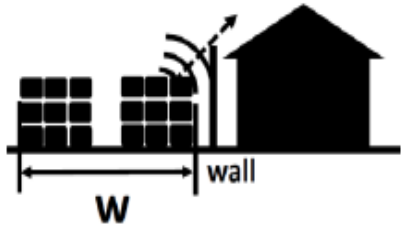
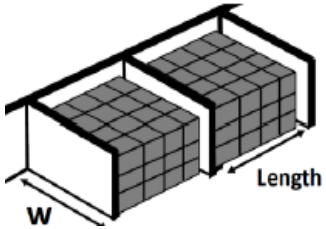
adequate separation distances. Stack length will be a variable based on the separation distance which is achievable at any specific site, so allowing flexibility to account for site dimensions and layout

Table 2 - Summary tables of standard stack separation distances and stack sizes

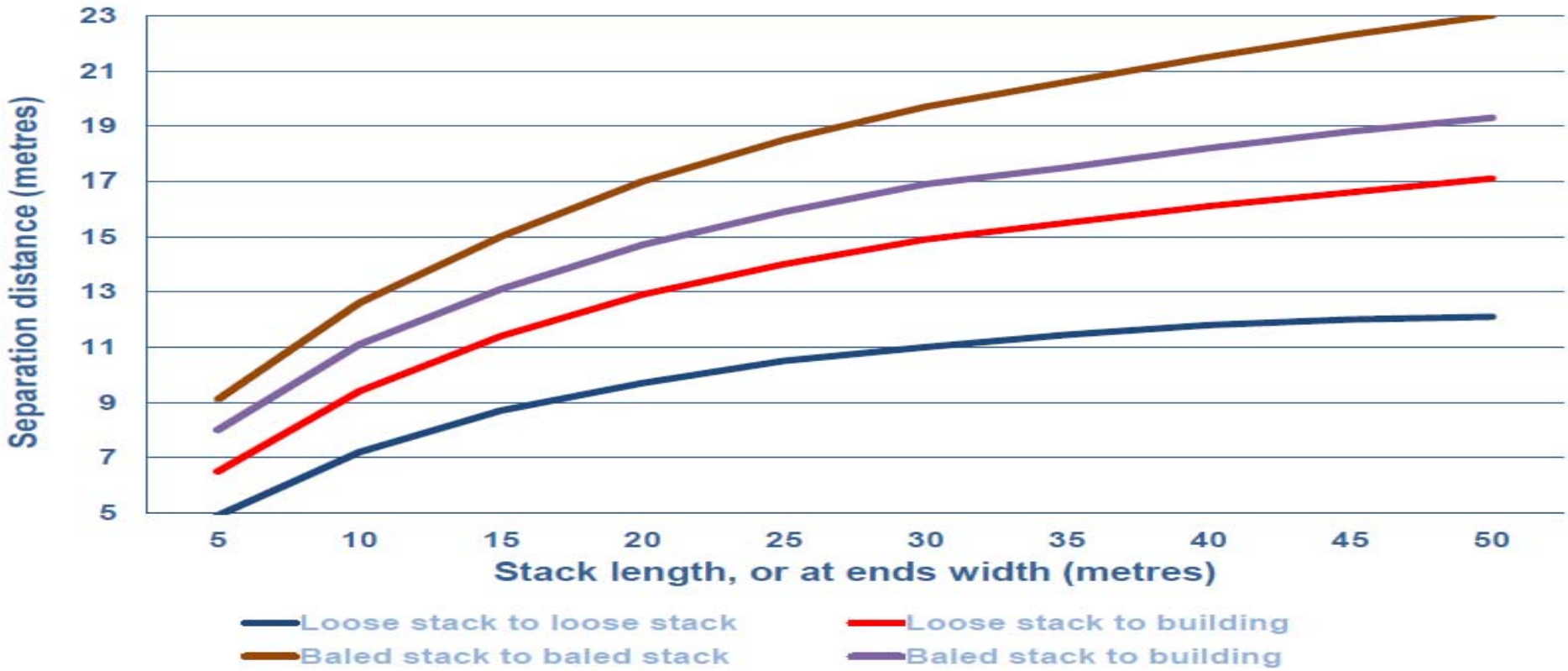
General combustible wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
Note: *The graphics used in all the following tables are indicative only and should not be considered as being to scale or a guide to stack layout or configuration, number of bales suggested in a stack etc. They are for illustrative purposes only and should be treated as such.*	
Parameter and standard	**Commentary**
1. Loose waste stacks: General wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
	**Maximum height (h) of 4 metres** is based on practical ability to fight fires using manual means such as standard hoses, and stability of stack to reduce the risk of fire spread from falling/rolling wastes.
	Maximum width (w) of 20 metres is based on practical ability to fight fires using manual means such as standard hoses. **NOTE – 20 metres** assumes good access for plant/machinery is available from both sides of the stack to fight fires. If this is not the case then maximum width = **10 metres**.
	Minimum free-air separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **blue** line to calculate separation distance for your stacks.

	Walls must be of suitable construction, and a minimum freeboard of **1 metre** left between waste and wall height to account for flame height. Stacks could be 'butt' against walls, but access to rear of stacks may be required for stock rotation and similar – this is a matter for site specific assessment. **NOTE** – access for fire-fighting will not be from both sides. This means maximum stack width = **10 metres**
Note: *When considering a fire wall between the length-sides of stacks the stack width is reduced to 10m, however, use of fire walls between the width-sides of stacks may have benefits.* **See examples of stack sizes & separation distances (page 25)**	
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **red** line to calculate separation distance for your stack to buildings.
	Heat does not only travel horizontally. A wall height which is too low may result in heat radiated upwards and outwards travelling to an exposed upper portion of a building. Wall height should be sufficient to avoid this. A gap between wall and building should be left for general access. Unless this gap is substantive, access for fire-fighting will be from one side only and max stack width = **10 metres**.
Note: Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries.	
	Maximum width (w) of bunkers = **10 metres** (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack then see graph 1 for separation distance.

Baled waste stacks: General wastes (typical max burn 950 °C), EXCLUDING plastics/rubber	
	Maximum height (h) of 4 metres, or four bales high whichever is the lowest, is based on practical ability to fight fires using manual means such as standard hoses, and stability of bale stack to reduce the risk of fire spread from falling/rolling waste bales.
	Maximum width (w) of 20 metres is based on practical ability to fight fires using manual means such as standard hoses. **NOTE** – 20 metres assumes good access from both sides of the stack to fight fires. If this is not the case then maximum width = **10 metres**. **NOTE** – within an individual bale stack adequate gaps for access for stock rotation should be left between rows of bales.
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See graph 1, **brown** line to calculate separation distance for your stacks.
	Walls must be of suitable construction, and a minimum freeboard of **1 metre** left between waste and wall height to account for flame height. Stacks could be 'butt' against walls, but access to rear of stacks may be required for stock rotation and similar – this is a matter for site specific assessment. **NOTE** – access for fire-fighting will not be from both sides. This means maximum stack width = **10 metres**
Note: *When considering a fire wall between the length-sides of stacks the stack width is reduced to 10m, however, use of fire walls between the width-sides of stacks may have benefits.* **See examples of stack sizes & separation distances (page 25)**	

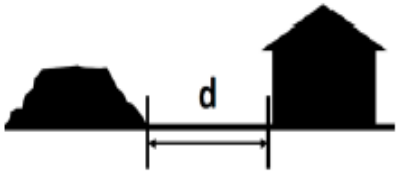
	Separation distance will depend on stack length – the longer the stack the wider the separation distance required. See **graph 1**, **purple** line to calculate separation distance for your bale stack to buildings.
	Heat does not only travel horizontally. A wall height which is too low may result in heat radiated upwards and outwards travelling to an exposed upper portion of a building. Wall height should be sufficient to avoid this. A gap between wall and building should be left for general access. Unless this gap is substantive, access for fire-fighting will be from one side only and max stack width = **10 metres**.
Note: Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).	
	Maximum width (w) of bunkers = 10 metres (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack then see **graph 1** for separation distance.

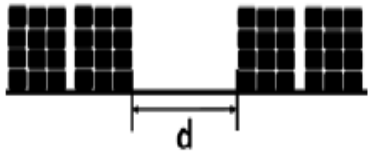
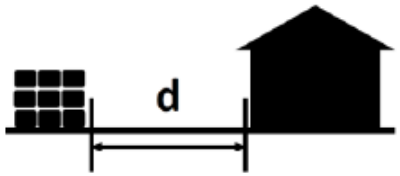
Graph 1. Stack lengths and separation distances general wastes (typical max burn 950 °C)



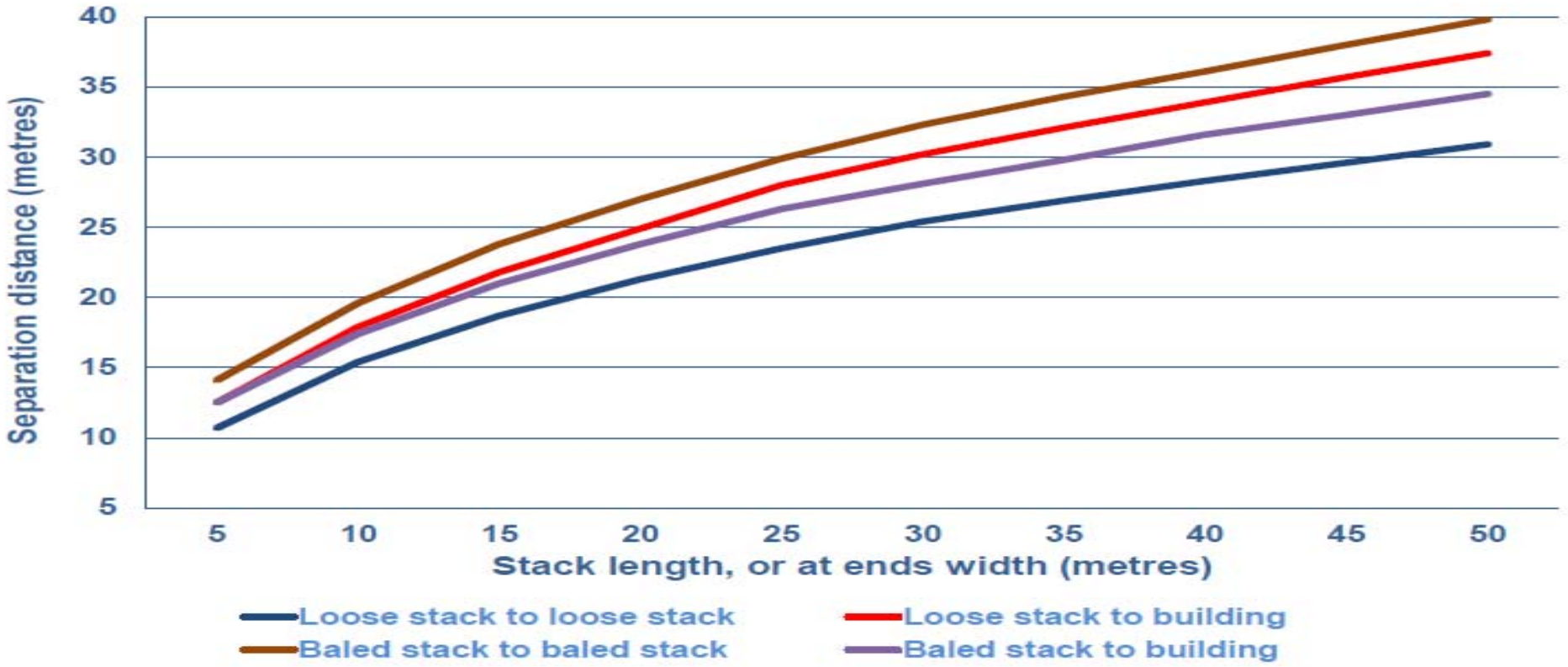
To determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line (stack to stack, to buildings etc.). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, at your site separation distance may be constrained by site size. Therefore this distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis

See examples of stack sizes & separation distances (page 26)

Plastics/rubber wastes (typical max burn 1,200 °C)	
The waste fire burn tests revealed that burning plastic and rubber wastes have higher burn temperatures and thermal emissions. As a result of this, separation distances are wider than for general wastes. Graph 2 reflects these wider distances. Other information, such as relating to fire walls/bunkers, stack width and height, as given for general combustible wastes, are the same and are not repeated below.	
Loose waste stacks: Plastics/rubber wastes (typical max burn 950 °C)	
Parameter and standard	**Commentary/rationale**
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See **graph 2**, **blue** line to calculate separation distance for your stacks.
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See **graph 2**, **red** line to calculate separation distance for your stack to buildings.

Baled waste stacks: Plastics/rubber wastes (typical max burn 950 °C)	
	Separation distance will depend on stack length (or at their ends width) – the longer the stack the wider the separation distance required. See **graph 2**, **brown** line to calculate separation distance for your stacks.
	Separation distance will depend on stack length – the longer the stack the wider the separation distance required. See **graph 2**, **purple** line to calculate separation distance for your bale stack to buildings.
Note: Buildings can be on-site (such as a recycling plant waste hall) or off-site (such as a nearby industrial unit). The separation distances and/or fire wall information given above applies in both cases, including at site boundaries (heat does not stop at a site boundary).	

Graph 2. Stack lengths and separation distances plastic/rubber wastes (typical max burn 1,200 °C)

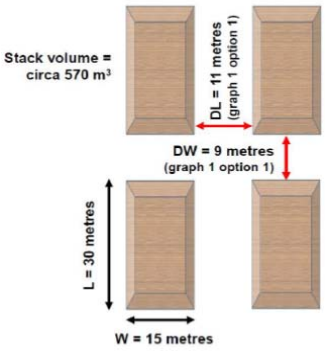


To determine your separation distance, mark your stack length on the horizontal axis of the graph and draw a line up to the relevant graph line (stack to stack, to buildings etc.). Then draw a horizontal line across to the vertical axis and read-off separation distance. This can also be done in reverse. For example, at your site separation distance may be constrained by site size. Therefore this distance can be marked on the vertical axis and maximum stack length read-off on the horizontal axis.

See examples of stack sizes & separation distances (page 26)

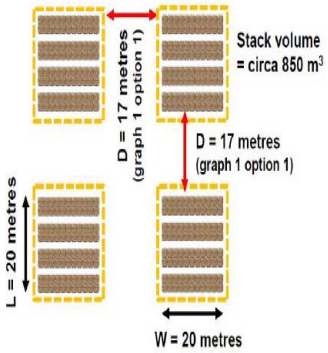
9. Example of Stack Sizes & Separation Distances

Simple loose stack layout, pre-crush wood using free-air separation distances



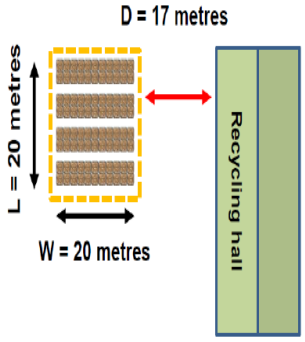
This example below is pre-crush wood stored in loose stacks with free-air separation distances used to mitigate fire spread. Each stack is 30 metres long and 15 metres wide. As wood is a general waste, using **graph 1** blue line (loose stack to loose stack distances) gives a separation distance on the length side of each stack of 11 metres (DL) and on the width side of 9 metres (DW). Each stack has a volume of circa 570 m^3, with total volume across all four stacks shown of circa 2,280 m^3 (equivalent to circa 450 – 500 tonnes density dependent).

Simple bale stack layout, baled paper/card using free-air separation distances



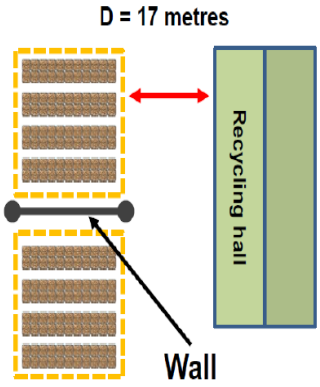
This is similar to above, but using paper/card bales (each individual stack of rows of bales demarked by amber dotted line). These are general wastes, so **graph 1** applies.
Stacks are 20 metres square, giving a separation distance from the brown line in **graph 1** of 17 metres each side. Excluding the gaps between bale lines for access, stack volume is circa 850 m^3, with a total volume across all four stacks of circa 3,400 m^3.

Example of restricted separation distance determining stack dimension



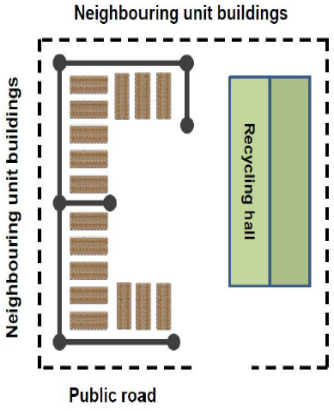
Limited space at this site means the maximum separation distance which can be achieved between recycling building and stack is 17 metres (D in graphic). Using paper/card bales as for example above, **graph 1** purple line gives a maximum stack length of 20 metres (mark 17 metres on the vertical axis of graph 1, draw a horizontal line across to the purple line, and then a vertical line down, giving stack length at 20 metres). This is an example of how the information can be used in reverse in **graph 1** and **graph 2**.

Use of a single fire wall to extend storage capacity



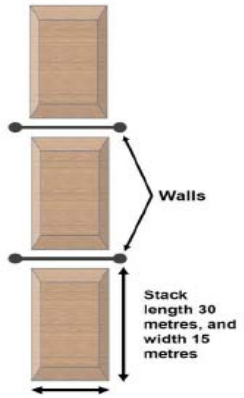
This is the same as above, but the operator wishes to increase overall storage capacity in a limited space. Adding an appropriate fire wall as shown removes the need for a free-air gap at the width ends of the bale stacks. Each stack still has a length of 20 metres, and is still in line with **graph 1**, because the separation distance is determined by the burn-face of each of the stacks. Obviously the integrity of the fire wall is critical – if it fails to prevent fire spread and both stacks ignite then overall burn face will be 40 metres, which would require a wider separation distance. Note – maintaining the 20 metre width of stacks in this example assumes good access for fire-fighting from both sides of stacks.

Use of a bunkers/fire walls to extend storage with buildings at site boundary



All of the above examples assume there is nothing at the site boundary. This example is the same site as example above, but assumes the waste site is on an industrial estate and has neighbouring industrial unit buildings close to its site boundary. Installation of additional walls to form bunkers around the storage stacks provides protection for these neighbouring units without free-air separation distances (a reasonable level of stand-off is still required). However, because access for fire-fighting is not available from both sides, stack width is decreased to 10 metres. In this example, extending the walls has allowed the operator to reduce the loss of overall site storage capacity to only circa 12% compared to the capacity of example above.

Use of fire walls with loose stacks



The use of fire walls is not restricted to bale stacks. This example shows a loose stack layout using fire walls to remove the need for free-air separation distances at the width ends of the stack. Assuming good access for fire-fighting is available from both sides stack width is not affected (shown at 15 metres, but could be the 20 metre maximum). If access is only available from one length face of the stack then width should be 10 metres. This type of layout may be suitable for 'long and thin' waste sites and allows for maximum use of space to be achieved.

Storage of Whole end of life vehicles (ELVs).

You must set out in your FPMP how you will store ELVs. Each vehicle should be accessible from at least one side

- to allow a fire to be fought
- so unburnt vehicles can be accessed and moved to prevent the fire spreading

These rules will limit any row to a depth of 2 vehicles.

Where you store vehicles one on top of another, or on racking, you should limit this to 3 vehicles high so the stack can remain stable during a fire. You should maintain a minimum separation distance between rows or blocks of vehicles in accordance with **Table 2** (depending on the length of the rows).

Batteries in ELVs - Batteries left connected in un-depolluted vehicles can short circuit and cause fires. You must disconnect or remove batteries from un-depolluted vehicles as soon as possible after reception.

Cylinders in ELVs – As part of your depollution process, you must ensure that any LPG tanks within vehicles have been safely removed.

Further advice is available on:-

Removal of LPG Tanks - Guidance

End of life vehicles (ELVs): guidance for waste sites

Depolluting end-of-life vehicles: guidance for treatment facilities

For stack pile sizes and separation distances of any other waste stored at your site (e.g. tyres) please refer to Table 2. You must include your proposed stack pile sizes and separation distances in your FPMP.

Compost Production

For composting activities, the maximum pile sizes do not apply when the waste is actively managed and monitored during the composting process. Waste stored before and after active composting must follow the maximum pile sizes in **Table 2**.

10. Baled Waste Storage

If you are storing waste in bales your FPMP must show how you are reducing the risk of a fire occurring within the bales. It is recommended your plan shows:

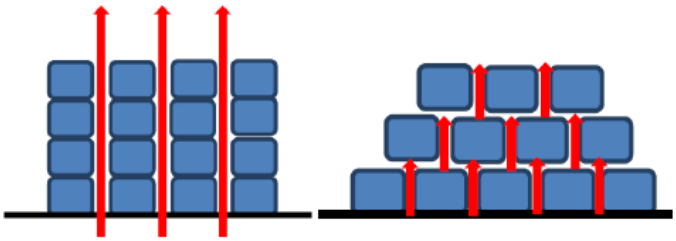
- what sampling and testing protocol you will use to make sure you assess a representative number of bales (minimum 10%) during monitoring
- that you get representative temperature readings from the centre of the bales; and from bales within the centre of each stack pile
- that you turn the bales to make sure the waste stays cold

If baled waste seems likely to exceed the time limits in **Table 1** you should consider breaking the bales and re-baling them to reduce fire risk. However, care should be taken when breaking bales or turning loose piles/stockpiles. Breaking bales and turning loose stacks may itself cause a fire. Self-heating may be occurring within a stack, but because of the lack of oxygen a fire has not occurred as yet.
When you open the bale/turn the stack you may introduce sufficient oxygen to the waste to result in a fire. When breaking bales and turning stacks you should have fire-fighting equipment, such as hoses, at the scene so that you can deal with a fire more quickly if one occurs (hand-held extinguishers are unlikely to be sufficient).

Bales that are stacked more than 4 high pose a serious risk of stack collapse, the stack will become unstable above 4 bales high and can result in the stack collapsing on a person in both a non-fire and fire situation. Stack collapse during a fire poses the risk of increased fire spread as well as the unnecessary risk posed to fire fighters and their ability to fight a fire.

Baled wastes when stored may pose a specific fire risk issue associated with the configuration of storage. Bales of waste are typically stacked directly on top of each other. This can result in continuous vertical air gaps between bales – in effect creating ‘chimneys’ between individual ‘towers’ of bales. If a fire occurs, these chimneys can result in energetic air-flows between bales so promoting a more rapid and energetic burn. Interlacing bales can help to break-up these chimneys – arranging bales in the same way as bricks in a wall rather than directly on top of each other. You should consider this for baled plastics/rubber

where burn temperatures are higher, interlacing bales may reduce burn temperature and how energetically a fire may burn.



Far left: Standard bale storage may result in chimneys between bales promoting air-flow during a fire. Left: Interlacing bales may disrupt this chimney effect reducing air-flow and fire intensity

The above assumes that your bales are 'square', as is typical for bales of paper, plastics etc. However, there are other types of baler, such as those used to bale and wrap RDF and similar waste derived fuels. Bales produced by such equipment may be cylindrical rather than square. Such cylindrical bales are stacked interlaced for stability reasons, and so any chimney effect may already be mitigated.

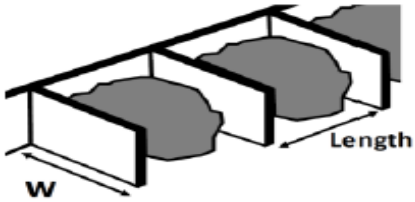
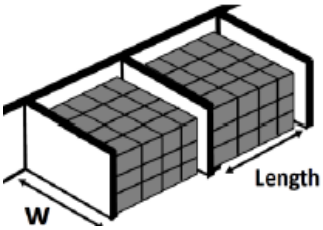
11. Enclosing Stacks Using Bays and Walls

If you use bays or walls between stacks to store waste materials they should be of sufficient height, thickness and construction that offer a **fire resistance period of at least 120 minutes** to allow waste to be isolated to stop fire spreading and minimise radiant heat.

Product specification will need to be established via approved stockists to ensure appropriate standard of fire resistance are met. It is essential that when installing such products that the installation method used is in line with the manufacturers recommended installation requirements.

You should be able to demonstrate:

- full and frequent stock rotation and how this will be monitored and recorded
- protection from wind
- how you intend to check temperature and moisture content of all the material within the bay so that the entire volume of the stack receives representative checks
- the construction of the walls in terms of how they offer a thermal barrier and enable cooling
- how stock capacity will be managed and controlled (using first in first out concept)
- how you will ensure segregation of materials
- how calculation of flame height and radiation has been taken into account in preventing the spread of fire between stacks
- prevention of brands or lighted material moving outside the bay walls
- prevention of bridging across or around walls
- how a 'freeboard' space of 1m at the top and sides of the walls will be physically retained at all times in accordance with the latest available guidance
- the frequency and method of turning stacks
- how the **quarantine area** will be used and how materials will be moved during an incident

	Maximum width (w) of bunkers = **10 metres** (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack **see graph 1** for separation distance.
	Maximum width (w) of bunkers = **10 metres** (for reasons of practical fire-fighting as access is unlikely to be from both sides). Length of bunker is for site specific assessment based on stock rotation etc. A minimum of 1 metre freeboard should be left between waste and bunker height. **NOTE** - if open (length) side of bunker/s faces a building/other waste stack **see graph 1** for separation distance.

12. Waste Stored Within a Building

If you are storing waste within a building; you should adopt the following general principles for fire prevention and mitigation of fires at all times:-

- Ensure waste stack sizes and separation distances are appropriate to the risk. **Table 2** can be used as a starting point but not absolute guidance for internal storage.
- Consider the use of fire walls/bunkers.
- Separation between internally stored wastes and building walls, plant & other equipment within buildings will need to be considered. In general fires in internally stored wastes are far more likely to spread to buildings and plant than for externally stored wastes. As a result, your insurer is likely to place more emphasis on internal storage than external storage fire management. You should seek advice from your insurer to ensure that you have met any requirements for fire detection and fire suppression.
- If you are storing wastes internally in large quantities, such as in warehousing, then you should 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. This is a specialised area, and the general standards applied to the warehousing of goods may not be appropriate to the internal storage of wastes.
- If the building is heated this could affect the potential for self-heating of the waste and should be taken into account when assessing self-heating risks.

- You must ensure that all escape routes, fire exits, alarm call points and fire extinguishers are kept clear and free from waste at all times
- Ensure electrical equipment and heaters are kept free from waste, including dust and packaging materials.
- Waste storage areas should be fire compartmented away from office areas.
- Waste storage areas should have some means of clearing smoke from the building, such as openable skylights or roller shutter doors, to aid fire-fighting.

Further guidance is given in the Gov. UK document:-
"Fire Safety Risk Assessment - Factories and Warehouses"

13. Waste Stored in Containers

If you store waste in containers that can hold more than 1,100 litres, each one must be accessible so any fire inside it can be extinguished. Examples of these types of containers include skips, roll-on roll-off skips, or shipping containers. Shipping containers should be stacked no more than 2 containers high and secured with a lock outside of operational hours.

If you have a fire, you should be able to move containers as soon as is reasonably practicable in a safe manner to prevent the fire spreading. You should set out in your FPMP the procedures you will put in place to allow this to happen.

For all other containers holding waste, the **appropriate stack sizes** apply as per **Table 2.**

14. Layout of Waste Stacks on your Site

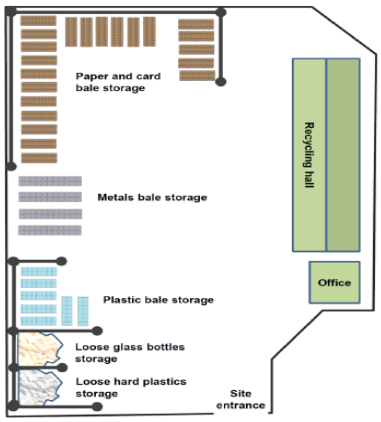
When you have identified the potential stack sizes, storage methods/types and appropriate separation distances required at your site, you can plan the storage arrangements. **See examples of stack sizes & separation distances**

In addition to the above, there are other factors that you may need to take into account when deciding on your site/stack layout. These include the below examples as well as specific site conditions):

- Location of potential ignition sources on your site
- Location/s of occupied buildings and high-asset value equipment and plant
- Escape and evacuation routes around your site and within buildings must not be compromised by stack layout
- Location of flammable and/or hazardous substances kept on site, such as gas cylinder cages, diesel tanks, quarantine areas which may contain non-conforming wastes etc.
- Locations of on or off-site fire hydrants, other water supplies and fire-fighting equipment – you do not want to block access to these with your stack layout

- Proximity and location/s of any infrastructure which may be affected by a fire, such as overhead power lines, major roads, rail lines etc.
- Proximity and location/s of any off-site, third party buildings which may be affected by a fire
- Permitted amounts of wastes, and types of waste, allowed on site
- Location of a ‘quarantine’ area, as appropriate to site specifics
- Operational practicalities such as movements of vehicles & designated routes
- Stock rotation requirements, seasonality of supply/off-take etc.

You should also consider the prevailing wind, **where fire water will flow** and the **firefighting strategy** that will be used.



This example shows a typical site layout using appropriate stack sizes and walled bunkers to achieve maximum available space.

15. Seasonality and Waste Stack Management

You should demonstrate that your waste stack management is viable and that you are able to prove the suitability of materials, the resilience of the supply chain and end user outlets. You should provide a technical assessment that shows you have confidence that your proposal will be viable in foreseeable market conditions.

If the materials on your site are subject to seasonal variation in demand and/or supply you should demonstrate how you intend to manage these variations. You should be able to demonstrate how you will follow the principle of “first in, first out” so that wastes are stored for no longer periods than indicated in **Table 1**.

All these issues and the contingencies you employ to manage them should be in your management system and implemented before operations commence on site.

16. Monitoring and Turning of Stacks [2]

Stacks should be monitored regularly to ensure that temperature increases & changes in moisture content are minimised. The equipment you use to detect temperature and

moisture content should be capable of operating at any depth throughout the pile. Therefore, if you are proposing to have a stack 4m deep, your thermal monitoring equipment should be capable of operating through the depth of the proposed stack.

You should explain what indicators you will use in relation to temperature and moisture content and the escalation of actions in relation to these indicators.

The turning of stacked waste may be carried out to prevent internal heating of the stack and self-combustion following the monitoring as highlighted above. However, waste storage times on site should be modified to prevent self-combustion as highlighted in the **'Storage Times and Self-combustion Factors'** section of this guidance. The turning of waste stacks if required following monitoring will ensure that the material remains cold and any localised warming is dissipated quickly. Your staff must be trained to detect and manage hotspots.

If you are storing waste in bales your FPMP should show how you are reducing the risk of a fire occurring within the bales. Please refer to Baled Waste Storage for appropriate control measures.

2 *This section does not apply to compost windrows during the composting process.*

17. Fire Detection

You should ensure that you have adequate procedures in place to detect a fire in its early stages so you can reduce its impact; you should seek competent advice on the potential installation of a fire detection system.

Your detection system should be proportionate to the nature and scale of waste management activities you carry out and the associated risks.

Appropriate automated systems may include:

- smoke and heat detectors including temperature probes
- CCTV visual flame detection systems
- spark, infrared and ultraviolet detection

The design, installation and maintenance must be covered by an appropriate **UKAS-accredited** third party certification scheme.

Many insurers have specific requirements for fire alarm, detection and suppression/extinguishing systems. If you fail to meet these specifications and requirements your insurance may be invalidated.

The basic rule here is:

TALK TO YOUR INSURER TO AGREE A WAY FORWARD AND ESTABLISH APPROVAL FOR ANY INSTALLATIONS.

18. Fire Suppression Systems

If you store waste in a building, you should seek competent advice on the potential installation of a fire suppression system. This system should be proportionate to the nature and scale of waste management activities you carry out and the associated risks. Materials must be kept a minimum of 3m below the level of the spray or sprinklers.

When deciding what type of system to install you need to take into account that:

- the fire and rescue service may not be able to enter the building during a fire
- a suppression system may not extinguish a fire, although it may prevent a fire spreading and then allow the fire to be fought effectively by the fire and rescue service
- the water supply to a fire system is reliable and adequate at all times

Appropriate fire suppression systems may include:

- sprinklers
- manual open deluge system
- deluge/water spray systems
- mobile foam trolley
- water monitors/cannons/curtains

You should ensure that the design, installation and maintenance of all your automated suppression equipment is covered by an appropriate **UKAS-accredited** third party certification scheme

Many insurers have specific requirements for fire alarm, detection and suppression/extinguishing systems. If you fail to meet these specifications and requirements your insurance may be invalidated.

The basic rule here is:

TALK TO YOUR INSURER TO AGREE A WAY FORWARD AND ESTABLISH APPROVAL FOR ANY INSTALLATIONS.

19. Firefighting Strategy

It is important that you design your site layout to allow for active firefighting. This will help allow a fire to be extinguished within the shortest time possible.

Active firefighting does not mean that you or your staff have to fight the fire; no one should put themselves at risk by trying to fight a fire.

Active firefighting means having the resources available on site at all times to fight a fire. The resources needed include:

- heavy mobile plant you have available that can be used to move waste around the site, for example loaders, excavators, material handlers

  Note – if you intend to use heavy mobile plant as a method of tackling a fire, you must ensure it is suitable for the task, such as by having completely enclosed cabs, fire and heat protected hydraulic systems, etc.

- the use of portable water carriers/bowsers can prove to be an essential mechanism to help extinguish fire effected waste
- adequately trained staff available
- available water supply
- finances available for additional resources if required

A variety of firefighting techniques can be used together or separately to extinguish a fire.

These include:

- applying water to cool unburned material and other hazards
- separating unburned material from the fire using appropriate heavy plant
- separating burning material from the fire to quench it with hoses or in pools or tanks of water

Firefighting techniques may also include suffocating the fire using soil, sand, crushed brick or gravel. However, you can only do this if:

- Natural Resources Wales has agreed you can do this in the first instance, and
- you remove and dispose of contaminated material as soon as it is safe to do so

All these techniques may be used by staff on site if they are suitably trained and are supervised at all times by the fire and rescue service. However, protecting the health and safety of people on site must be your priority.

20. Water Supplies

You must have sufficient water supplies available to your site for firefighting to take place and to manage a worst case scenario incident (e.g. one (your largest stack) or more stacks on site are on fire).

Depending on your site this could be water in storage tanks or lagoons on site, or access to hydrants or mains water supply.

On larger sites (and especially on sites where reprocessing or power generation takes place) you should consider providing a private fire hydrant system with the necessary supply of water.

Alternative water supplies such as a near-by river, canal, lake, lagoon etc. (in some rare cases wells can be used, but their capacity and recharge characteristics must be

adequate) can be considered within your plan to supplement tanked or mains supplies however these alternative supplies need to be capable of being accessed promptly.

Alternative water supplies also need to be reliable: Relying on a lagoon which is only half full or empty for part of the year may result in water shortage issues.

You must ensure that you have permission to use any water supplies that you have stated within your plan and necessary evidence of this solution is required.

You should contact your respective water supplier to establish water access, available water pressures to your site to ensure that water supplies are available without impacting on local supply.

If necessary, contact your respective Fire & Rescue Service and Natural Resources Wales for further advice.

Use this estimate as a rough guide to calculate the volume of water you will need:

A 300m^3 stack of combustible material will normally require an average water supply of at least 2,000 litres a minute for a minimum of 3 hours.

Note - the total amount of water needed can also vary depending on the waste type that you store within your site.

You may be able to reduce water volumes needed if you have a system that lets the fire and rescue service re-circulate the water they are using to fight the fire (fire water). However, you may need to filter this water and the fire and rescue service will also need suitable adapters to connect to your system. Depending on the waste that you store it may not always be appropriate or safe to re-circulate the water.

21. Managing Water Run-off

You should be able to contain the run-off from fire water to prevent pollution of the environment.

The containment facilities and pollution equipment you need will depend on the:

- size of your site
- amount of waste you store
- firefighting strategy

The CIRIA document '**Containment systems for the prevention of pollution (C736)**' may help you to identify what facilities and equipment you may need for your site.

You must take all the steps that are reasonably practicable to minimise pollution from fire water.

For example, preventing fire water entering:

- surface waters, for example rivers, streams, estuaries, lakes, canals or coastal waters
- into the ground

If you do not manage this issue, you may be committing an offence and Natural Resources Wales may take enforcement action.

Secondary and tertiary containment facilities for fire water run-off include:

- impermeable bunds
- storage lagoons
- shut-off valves
- isolation tanks
- modified areas of your site such as a car park
- pollution control equipment such as fire water booms and drain mats to block drains or divert fire water

You may also be able to divert fire water to your local sewers. You will need agreement in principle from the sewerage company before including this measure in your fire prevention plan (evidence of approval will need to be submitted in the plan)

Your environmental permit may let you store combustible wastes on hard standing rather than an impermeable surface with sealed drainage. If so, you must assess the potential effect of fire water on:

- the local groundwater and surface water bodies
- any well, spring or borehole within 50 metres used for the supply of water for human consumption, including private water supplies

Your FPMP must set out how you will prevent fire water affecting these receptors, if applicable.

22. Designated Quarantine Area

A quarantine area can be used as a designated area to place fire affected waste to ensure that it is fully extinguished. As an alternative approach unburnt wastes can be moved into the quarantine area for isolation and to help prevent it catching fire.

The quarantine area should be within the permitted boundary area of the site and should be large enough to both:

- hold at least 50% of the volume of the largest stack,
- have a separation distance of at least 6 metres around the quarantined waste (this can be decreased if concrete bunkers/walls will be used)

You should set out in your FPMP the location of this area and the volume of waste that it can hold.

For operational reasons you may want to keep the location of the quarantine area flexible. If so, you should identify on your site plan all the areas you could use.

You should keep at **least one** specified quarantine area clear at all times – unless it is being used in the event of a fire.

If you use your quarantine area to store material temporarily (for example, non-permitted wastes) you should make sure you can remove those wastes as soon as is practicable. In the event of a fire, you must remove those wastes immediately. Your FPMP should include details of the procedure you will use to do this.

You should set out how you will use your quarantine area in the event of a fire. You must have the ability to be able to move waste to it as soon as possible.

23. During and After an Incident

Your FPMP must have contingency measures in place for dealing with issues during and after a fire. For example, these could include:

- diverting incoming wastes to alternative sites during a fire
- having a plan for how you will notify those who may be affected by a fire, such as nearby residents and businesses
- contractors that might be used to assist with additional plant for firefighting techniques, removal of waste material, containment and removal of excess water run-off

You also need to set out in your FPMP:

- how you will clear and decontaminate the site
- the steps you must take before the site can become operational again

24. Reviewing and Monitoring your Fire Prevention & Mitigation Plan

It is essential that you ensure your FPMP is kept up to date to ensure that you maintain compliance. Your FPMP should be treated as a live working document and be reviewed regularly to reflect any changes that your business experiences.

Circumstances that would warrant a review of your FPMP can include:-

- Experiencing a fire incident. Following any fire it is essential that your FPMP (and overall fire management measures) should be reviewed and improved as required to address any issues/concerns
- Additional combustible waste streams accepted on site.
- Increase waste volumes accepted.
- Development of site infrastructure – new buildings.
- Installation of new equipment or plant – baler/loading shovel/sort-line/trommel etc.

Areas that could need to be updated can include:-

Staff training:

- Ensure your FPMP is available and that all staff know where it is kept.
- Ensure staff receive training to enable them to competently carry out the procedures and measures contained within your FP&MP-

    - New Starters – Induction Training.
    - At regular intervals - refresher courses, toolbox talks, on-site exercises/drills
    - Ensure training need is monitored and training records kept.

Site Monitoring:

As part of your site operations, areas can include:-

- Site inspections before, during and after shifts to ensure:

    - No identifiable ignition sources
    - All equipment is operating/turned off correctly.

- Waste stacks and separation distances are in accordance with your FPMP
- Monitor, control and record temperature of waste stacks
- Monitor and record residence times of wastes on site
- Plant and equipment are adequately serviced and maintained by qualified personnel. Daily, weekly, monthly checks undertaken and records kept.
- Ensure periodic testing of fire prevention and mitigation equipment is carried out

The methods and procedures you use to maintain compliance should be listed as a separate section within your Fire Prevention and Mitigation Plan.

25. Useful Links from Document

Applying for a permit

https://naturalresources.wales/apply-for-a-permit/?lang=en

Waste Industry Safety and Health Forum (WISH) – WASTE 28 Reducing fire risk at waste management sites issue 2 – April 2017

https://wishforum.org.uk/wp-content/uploads/2017/05/WASTE-28.pdf

WISH - https://wishforum.org.uk/

Regulatory Reform (Fire Safety) Order 2005

http://www.legislation.gov.uk/uksi/2005/1541/pdfs/uksi_20051541_en.pdf

"Fire Safety Risk Assessment - Factories and Warehouses".

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

'Guidance for the storage and treatment of aerosol canisters and similar packaged wastes'

https://www.gov.uk/government/publications/sector-guidance-note-s506-recovery-and-disposal-of-hazardous-and-non-hazardous-waste

Health and Safety Executive (HSE) Guidance

http://www.hse.gov.uk/search/search-results.htm?q=hot%20works%20guidance%20-%20gsc.tab=0&gsc.q=hot%20works%20guidance&gsc.page=1#gsc.tab=0&gsc.q=hot%20works%20guidance%20-%20gsc.tab&gsc.page=1

Removal of LPG Tanks - Guidance

https://www.gov.uk/government/publications/removal-of-lpg-tanks-guidance

End of life vehicles (ELVs): guidance for waste sites

https://www.gov.uk/guidance/end-of-life-vehicles-elvs-guidance-for-waste-sites

Depolluting end-of-life vehicles: guidance for treatment facilities

https://www.gov.uk/government/publications/depolluting-end-of-life-vehicles-guidance-for-treatment-facilities

UKAS-accredited

https://www.ukas.com/

Containment systems for the prevention of pollution (C736)

http://www.ciria.org/Resources/Free_publications/c736.aspx

Pollution prevention advice is available in the **'Guidance on Pollution Prevention' (GPP)** which apply in Wales, Scotland and Northern Ireland.

More information on how to protect groundwater is available on the **groundwater protection pages on Gov.UK**

26. Useful Contact Details

Natural Resources Wales
Cambria House
29 Newport Road,
Cardiff
CF24 0TP
Tel: 0300 065 3000
Email: enquiries@cyfoethnaturiolcymru.gov.uk
www.cyfoethnaturiolcymru.gov.uk

South Wales Fire & Rescue Service
Forest View Business Park
Llantrisant
CF72 8LX
Tel: 01443 232000
E-mail: firesafety@southwales-fire.gov.uk
www.southwales-fire.gov.uk

Mid & West Wales Fire & Rescue Service
Fire Service Headquarters
Lime Grove Avenue,
Carmarthen
SA31 1SP
Tel: 0370 6060699
Email: mail@mawwfire.gov.uk
www.mawwfire.gov.uk

North Wales Fire & Rescue Service
Ffordd Salesbury,
St Asaph Business Park
St Asaph,
Denbighshire
LL17 0JJ
Tel: 01745 535250
Email: business.education@nwales-fireservice.org.uk
www.nwales-fireservice.org.uk

Dŵr Cymru Welsh Water
www.dwrcymru.com

Severn Trent
www.stwater.co.uk

Dee Valley Water
www.deevalleywater.co.uk

Health & Safety Executive (Wales)
Tel: 0300 003 1747
www.hse.gov.uk/welsh

Public Health Wales
Tel: 029 2022 7744
www.publichealthwales.wales.nhs.uk