Waste batteries: appropriate measures for permitted facilities

Consultation draft

Date: June 2025

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We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

We can't do this alone. We work as part of the Defra group (Department for Environment, Food & Rural Affairs), with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

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1. Introduction

This guidance explains the standards (appropriate measures) that are relevant to operators of regulated facilities with an environmental permit to treat or transfer waste batteries, including battery packs, modules and cells, and similar wastes from battery manufacturers (for example, off-specification or unused batteries or cells), collectively referred to in this guidance as 'waste batteries'. The guidance will be of particular relevance to permitted waste facilities operated by Approved Battery Treatment Operators (ABTOs) but will also be relevant to other facilities that treat separate collections of waste batteries or store them for transfer.

The appropriate measures in this technical guidance have been grouped into the following sections:

- general management
- waste pre-acceptance, acceptance and tracking
- waste storage, segregation and handling
- waste treatment
- emissions control
- emissions monitoring and limits
- process efficiency (measures for using energy, raw materials and water apply to Industrial Emissions Directive (IED) installations only)

The guidance applies to the management of separate collections of waste batteries (including collections of mixed batteries) but not to other mixed wastes that may contain waste batteries (for example, mixed municipal wastes). Where regulated facilities produce separate collections of waste batteries from on-site activities (for example, from the treatment of mixed wastes or electrical equipment) they should be managed in line with the relevant measures set out in this guidance, or to equivalent standards.

The production of secondary metals from battery waste, including the further recovery of lead from lead acid batteries and other smelting and refining activities regulated as part of the non-ferrous metal sector, is not covered by this guidance. Such activities must meet the relevant requirements of the guidance that applies to the non-ferrous metal sector. However, where such sites store, handle or treat waste batteries or similar wastes, they should do so in line with the relevant measures set out in this guidance, or to equivalent standards.

This guidance includes measures for the handling and storage of wastes resulting from the treatment of waste batteries. However, it does not include specific measures for the further treatment of wastes resulting from battery recycling processes, for example, the further treatment of black mass (a material recovered from battery electrodes containing valuable metals, such as nickel, cobalt and lithium) using hydrometallurgical or pyrometallurgical processes to recover metals or treatment of electrolytes. Where such activities are undertaken, we would expect the storage and treatment of these wastes and waste-derived materials to meet relevant measures provided in this guidance, or equivalent standards, and other relevant

measures or standards provided elsewhere (for example, in our Chemical waste appropriate measures guidance, or the standards that apply to other relevant sectors and permitted activities, including the inorganic chemicals sector or the ferrous or non-ferrous metal sectors).

Separate collections of waste battery electrolyte and other chemical wastes (for example, acids, solvents, other liquids, slurries or sludges) must be managed in accordance with relevant requirements of our Chemical waste appropriate measures.

Additional technical permitting guidance applies to sites that treat or transfer other types of waste, including the transfer and treatment of waste electrical and electronic equipment (WEEE) and treating metal waste in shredders. If you treat or transfer waste batteries at a site that handles other types of waste, for example, at a metal or WEEE recycling site, you must still follow the relevant parts of this guidance that apply to your waste battery activities.

If you store or handle waste batteries under a waste exemption, you may find it useful to refer to this guidance and should follow it where relevant.

Combustion plant with a rated thermal input between 1 megawatt and 50 megawatts must comply with the relevant requirements of the Medium Combustion Plant Directive. Specified generator controls, unless excluded, apply to generators with a rated thermal input of up to 50 megawatts. See our guidance on medium combustion plant and specified generators.

This guidance should also be read alongside other relevant cross-sector permitting guidance, for example:

- Develop a management system: environmental permits - GOV.UK (www.gov.uk)
- Control and monitor emissions for your environmental permit - GOV.UK (www.gov.uk)
- Risk assessments for your environmental permit - GOV.UK (www.gov.uk)
- Risk assessments for specific activities: environmental permits - GOV.UK (www.gov.uk)
- Best available techniques: environmental permits - GOV.UK (www.gov.uk)
- Fire prevention plans: environmental permits - GOV.UK (www.gov.uk)
- Pollution prevention for businesses - GOV.UK (www.gov.uk)

1.1 When appropriate measures apply

There is a lot of overlap between:

- best available techniques (BAT) for waste installations facilities
- necessary measures for waste operation facilities

The Environment Agency uses the term ‘appropriate measures’ to cover all these requirements. Appropriate measures are the standards that operators should meet to comply with their environmental permit requirements. This guidance sets out what you must consider when you assess the appropriate measures for your site. It is not

definitive, and it does not replace your obligation to assess appropriate measures fully for your site, considering its location and other site-specific characteristics.

Where measures are specified for waste batteries, these measures are in addition to any applicable measures set out in the general waste storage or treatment sections of this guidance.

Some measures may not be suitable or relevant for your operation. Appropriate measures will depend on the:

- activities being carried out
- size and nature of the activities
- location of the site

For installations there are additional requirements for using energy and raw materials (including water) efficiently. These are called process efficiency measures.

Where a measure is not suitable, you can propose alternative measures that achieve the same level of environmental protection. Or you can provide an explanation of why the specific measure is not relevant to your operations.

In certain situations, you may need to provide a higher standard of environmental protection, for example:

- where there are local sensitive receptors
- if there is a risk that an operation may exceed an Environmental Quality Standard

This guidance also covers some activities where legislation applies directly to that activity. This guidance and any time scales for the appropriate measures does not remove the need to comply with that legislation. For example, legislation relating to persistent organic pollutants or hazardous waste.

1.2 Implementing appropriate measures at new and existing facilities

The appropriate measures in this guidance apply to both new and existing facilities that treat or transfer waste batteries.

For new facilities, the appropriate measures must be in place before operations start.

For existing facilities, if the cost of complying with the appropriate measures is disproportionate to the environmental benefit, immediate compliance may not be reasonable.

Through permit reviews, the Environment Agency will assess the current operating techniques of existing facilities against the relevant appropriate measures.

Where an operator is not using appropriate measures, we will expect them to provide improvement plans and timetables for implementing the relevant appropriate measures. We will review these proposals and set formal timescales for making the improvements needed. We will do this by varying the environmental permit to include improvement conditions.

Improvements at existing facilities are likely to fall into one of the following 2 categories.

Standard good practice requirements

For example, these could be:

- updated management systems
- waste, water and energy efficiency measures
- measures to prevent fugitive or accidental emissions
- waste acceptance and handling techniques
- appropriate monitoring equipment

Where these improvements are relatively low cost, operators must implement them as soon as possible and in any event within 12 months.

Larger, more capital-intensive improvements

For example, these could be:

- installing significant abatement equipment
- the significant redesign of facility layout, including the design and installation of new buildings or treatment plant

Operators should complete these improvements as soon as practicable and in any event within 3 years.

Local environmental impacts may mean you need to act more quickly than the timescales provided here. For example, if there are sensitive receptors or an air quality management area close by.

Relevant BAT associated emission levels (AELs) apply to existing installation facilities from August 2022, unless we approve a derogation. BAT AELs are set out in the published waste treatment BAT conclusions.

New installations (including new or replacement plant at existing facilities or a substantial change to existing plant) must comply with any relevant BAT AELs from when operations begin, unless a derogation is approved.

1.3 Waste Batteries and Accumulators Regulations (WBAR)

The management of waste batteries is also controlled under the Waste Batteries and Accumulators Regulations (2009, as amended), which categorises batteries as automotive, industrial and portable and places controls on their treatment, recycling and export.

In addition to holding an appropriate environmental permit, if an operator wishes to recycle automotive or industrial batteries or issue evidence on recycled portable batteries they must be registered as an Approved Battery Treatment Operator (ABTO). Similarly, if an operator wishes to export waste batteries they will need to be registered as an Approved Battery Exporter (ABE).

The requirements of the WBAR are not considered further in this guidance, which applies to relevant permitted facilities regulated under the Environmental Permitting Regulations.

1.4 Summary of common battery types, chemistries and classification

A battery is a device that stores chemical energy and converts it to electrical energy. A battery may be made up of one or more cells, which have a positive and negative terminal/electrode (cathode and anode, respectively) and a conductive material known as the electrolyte. Plastic separators are typically used to keep the anode and cathode apart. The battery casing will be made from metal or plastic.

Primary batteries are not rechargeable, whilst secondary batteries are. For example, lithium-ion (Li-ion) batteries are secondary batteries, which are rechargeable and typically used in electric vehicles (EVs), battery energy storage systems (BESS), phones, computers and other electronic equipment. Lithium metal batteries (at least the ones currently available on the market) are primary batteries, which are not rechargeable.

The main types of waste battery that may be received at permitted waste facilities include:

- alkaline (primary battery)
- zinc-carbon (primary battery)
- nickel-cadmium (Ni-Cd) (secondary battery)
- nickel-metal hydride (NiMH) (secondary battery)
- lead acid (secondary battery)
- Li-ion (secondary battery)
- lithium metal (primary battery)
- silver oxide (primary battery)
- mercury (primary battery)

Lead acid, Ni-Cd and mercury batteries are classified as hazardous wastes under the List of Waste (LoW) or European Waste Catalogue (EWC) codes. Unsorted collections of mixed batteries from households and businesses are also classified as hazardous wastes.

Separate collections of other batteries, including alkaline and lithium batteries, are currently classified under non-hazardous waste codes but are likely to contain substances or materials that have hazardous properties (for example, toxic or reactive metals and corrosive or flammable substances). Whilst within waste electrical equipment or end-of-life vehicles, lithium batteries are considered to be hazardous components. They are also dangerous goods for transportation.

Further information on the waste classification and coding of waste batteries can be found on the following webpage:

Classify different types of waste: Electronic and electrical equipment - GOV.UK (www.gov.uk)

A typical **alkaline battery** consists of a manganese dioxide cathode, a zinc anode and a potassium hydroxide electrolyte. Zinc-carbon batteries are similar but typically use an ammonium chloride or zinc chloride electrolyte.

In a typical **Ni-Cd battery**, the cathode is made of nickel hydroxide and the anode is made of cadmium hydroxide, with a potassium hydroxide electrolyte.

In a typical **NiMH battery**, the cathode is made of nickel hydroxide (similar to a Ni-Cd battery), the anode (metal hydride) is made from a hydrogen-absorbing alloy (containing metals such as nickel, cobalt, manganese and aluminium, and rare earth elements such as lanthanum, cerium, neodymium and praseodymium) and an alkaline electrolyte, usually potassium hydroxide (similar to Ni-Cd and other alkaline batteries).

In **lead-acid batteries**, the electrolyte is a diluted sulphuric acid solution (usually less than 50% acid by weight). The electrodes are called plates; typically, these are conductive metal grids made from a lead alloy with lead-dioxide (lead dioxide paste) on the cathode and metallic lead (sponge lead) on the anode. Waste batteries are also likely to contain lead sulphate, resulting from the reaction between the electrodes and the battery acid.

There are two types of battery than contain lithium, **Li-ion batteries and lithium metal batteries**. Where the term 'lithium battery' is used in this guidance it is referring to both types.

Li-ion batteries pose a well-known and significant fire risk and are likely to contain other hazardous materials (for example, toxic metals). The cathode is aluminium foil coated with a lithium-oxide material (often referred to as the cathode active material (CAM)), for example, lithium-Nickel-Manganese-Cobalt-Oxide (NMC). There are various other Li-ion battery chemistries, which vary by the metals contained in the CAM, including lithium iron phosphate (LFP), lithium cobalt oxide (LCO), lithium manganese oxide (LMO) and lithium nickel cobalt aluminium oxide (NCA). The anode typically consists of copper foil coated with a graphite or carbon-based material. Most batteries currently available contain a liquid electrolyte consisting of a lithium hexafluorophosphate salt ($LiPF_6$) dissolved in organic solvents. The electrolyte is likely to be hazardous and contain substances that are harmful, toxic, highly flammable and able to generate hydrofluoric acid when in contact with water. Advances in lithium-ion battery chemistry are typically focussed upon removing toxic metals (for example, Ni and Co) from the CAM and using a less hazardous electrolyte (including solid-state electrolytes).

Unlike Li-ion batteries, lithium metal batteries are usually non-rechargeable (primary batteries). The cathode of Li-metal batteries may be solid (for example, manganese oxide or iron disulphide) or liquid (for example, thionyl chloride). The anode is made from lithium metal foil. The lithium metal anode of the batteries can pose a significant fire risk due to the reactivity of lithium metal with water or moisture. The electrolyte is often a lithium salt dissolved in an organic solvent. Lithium thionyl chloride (LTC) batteries (commonly used in smart meters due to their long life) use a thionyl

chloride electrolyte and cathode, which is toxic, corrosive and can react violently with water to produce harmful gases (for example, hydrogen chloride).

Sodium ion batteries (Na^+-ion) are also being developed as a potential replacement or alternative to Li-ion batteries. These batteries are similar in function to Li-ion batteries and may pose similar risks depending upon their specific chemistry, for example, if they contain toxic metals in the cathode active material or a similar electrolyte (e.g. $LiPF_6$ and organic solvents).

Silver oxide batteries are small primary button batteries and contain a silver oxide cathode, zinc anode and an alkaline electrolyte (e.g., sodium or potassium hydroxides). **Mercury batteries** are similar to silver oxide and typically consist of a zinc anode, mercuric oxide cathode and a potassium hydroxide electrolyte. Selling battery button cells containing mercury was banned from 1st October 2015 by the EU Battery Directive (2006/66/EC).

Once sorted into their different types or chemistries, batteries are usually recycled using mechanical treatment processes that break or shred the batteries and then sort and separate the mixed shredded material into different fractions, for example, metals (ferrous or non-ferrous), plastics, paper and electrolyte, which can be sent on for further recovery. The treatment of batteries such as Li-ion and alkaline can produce a fraction known as black mass, which is subject to further treatment (either chemical or thermal) to recover the metals used in the electrodes (for example, lithium, nickel, cobalt, zinc). Lead plates and paste recovered from lead acid battery recycling processes are sent to lead smelters for refining and melting into ingots. Because of the chemicals and materials contained in batteries, they need to be stored and handled safely (for example, to prevent damage, leakage, short-circuiting or over-heating) and the mechanical treatment (recycling) of waste batteries has the potential to result in the generation of:

- hazardous materials and residues, which will require safe handling and storage prior to their treatment or transfer
- emissions of polluting substances, which will require appropriate controls to make sure their environmental impact is prevented or minimised (for example, through appropriate containment and abatement)

2. General management appropriate measures

These are the appropriate measures for the general management of a regulated facility with an environmental permit for the treatment or transfer of waste batteries.

2.1 Management system

1. You must have and follow an up-to-date, written management system. It must incorporate the following features.

You have:

- management commitment, including from senior managers
- an environmental policy that is approved by senior managers and includes the continuous improvement of the facility's environmental performance

You plan and establish the resources, procedures, objectives and targets needed for environmental performance alongside your financial planning and investment.

You implement your environmental performance procedures, paying particular attention to:

- staff structure and relevant responsibilities
- staff recruitment, training, awareness and competence
- communication (for example, of performance measures and targets)
- employee involvement
- documentation and records
- effective process control
- maintenance programmes
- the management of change (including legislative changes and waste classification changes)
- emergency preparedness and response
- making sure you comply with environmental legislation

You check environmental performance and take corrective action paying particular attention to:

- monitoring and measurement
- learning from incidents, near misses and mistakes, including those of other organisations
- records maintenance
- independent (where practicable) internal or external auditing of the management system and operations to confirm it has been properly implemented and maintained

Senior managers review the management system at least annually to check it is still suitable, adequate and effective.

You review the development of cleaner and more efficient technologies and their applicability to site operations.

When designing new plant, you make sure that you assess the environmental impacts from the plant's operating life and eventual decommissioning.

You consider the risks a changing climate poses to your operations. You have appropriate plans in place to assess and manage future risks.

You compare your site's performance against relevant sector guidance and standards on a regular basis, known as sectoral benchmarking.

You have and maintain the following documentation:

- inventory of emissions to air and water
- residues management plan (setting out measures to minimise the generation of residues and other wastes; optimise their reuse, recycling or recovery, or ensure appropriate disposal)
- accident management plan
- site infrastructure plan
- site condition report
- fire prevention plan (FPP)

If required, you have and maintain the following documentation:

- odour management plan
- noise and vibration management plan
- dust management plan
- pest management plan
- climate change risk assessment

2.2 Staff competence

1. Your site must be operated at all times by an adequate number of staff with appropriate qualifications and competence.

2. The design, installation and maintenance of infrastructure, plant and equipment must be carried out by competent people.

3. You must have appropriately qualified managers for your waste activity who are either:

- qualified under a technical competence scheme
- operating under a Competence Management System approved under a technical competence scheme

4. Non-supervisory staff must be reliable and technically skilled in the activities they are responsible for and in emergency response procedures. Their skills may be based on experience and relevant training.

2.3 Accident management plan

1. As part of your management system you must have a plan for dealing with any incidents or accidents that could result in pollution.

2. The accident management plan must identify and assess the risks the facility poses to human health and the environment. Particular areas to consider may include:

- waste types and the risks they pose
- robust waste acceptance procedures to avoid receiving unwanted waste types
- transferring substances, for example filling (including overfilling) or emptying of vessels and containers
- preventing incompatible substances coming into contact with each other
- failure of plant and equipment (for example, storage tanks and pipework, blocked drains, over-pressure of vessels)
- failure of containment (for example, bund failure, or drainage sumps overfilling)
- damaged batteries, for example, lithium-ion batteries and fire risk
- making the wrong connections in drains or other systems
- failure to contain firefighting water
- failure of abatement systems
- hazardous atmospheres in confined spaces
- failure of main services, for example, loss of power or water
- checking the composition of an effluents before their emission
- vandalism and arson
- operator error
- accessibility of control equipment in emergency situations
- extreme weather conditions, for example, flooding or very high winds

3. You must assess the risk of accidents and their possible consequences. Risk is the combination of the likelihood that a hazard will occur and the severity of the impact resulting from that hazard. Having identified the hazards, you can assess the risks by addressing 6 questions:

- how likely is it that the accident will happen?
- what may be emitted and how much?
- where will the emission go – what are the pathways and receptors?
- what are the consequences?
- what is the overall significance of the risk?
- what can you do to prevent or reduce the risk?

4. In particular, you must identify any fire risks that may be caused, for example by:

- arson or vandalism
- self-combustion, for example the finer fractions of shredder residue
- plant or equipment failure and electrical faults
- naked lights and discarded smoking materials
- hot works (for example welding or cutting), industrial heaters and hot exhausts
- neighbouring site activities
- sparks from metal machinery or equipment, for example, forklifts or loading buckets

- hot loads deposited at the site
- damage, over-heating or shorting of batteries

You must have a fire prevention plan (FPP) that identifies the risks at your site and meets the requirements of our fire prevention plan guidance.

5. The depth and type of accident risk assessment you carry out will depend on the characteristics of the activities undertaken, including their location and any plant or equipment involved. The main factors to consider include:

- scale and nature of the accident hazards presented by the activities
- risks to the environment, including human health (the receptors)
- nature and complexity of the activities undertaken, including plant and equipment involved
- the availability of appropriate risk control techniques and measures

6. Through your accident management plan, you must also identify the roles and responsibilities of the staff involved in managing accidents. You must provide them with clear guidance on how to manage each accident scenario, for example, whether to use containment or dispersion to extinguish fires, or let them burn.

7. Your facility must have an emergency co-ordinator who will take lead responsibility for implementing the plan. You must train your employees so they can perform their duties effectively and safely and know how to respond to an emergency.

8. You must also:

- establish how you will communicate with relevant authorities, emergency services and neighbours (as appropriate) both before, during and after an accident
- have appropriate emergency procedures, including for safe plant shutdown and site evacuation
- have post-accident procedures that include assessing the harm that may have been caused by an accident and the remediation actions you will take
- consider the impact of accidents on the function and integrity of plant and equipment
- have contingency plans to relocate or remove waste from the facility, and suspend incoming waste
- test the plan by carrying out emergency drills and exercises

9. Your accident management plan must identify and assess the risks the facility poses from the storage or treatment of waste batteries, including but not limited to:

- risks associated with the different types or chemistries of batteries that may be received
- storage and handling of any damaged batteries
- potential short-circuiting of batteries
- any charging or discharging of batteries undertaken at the site
- storage and handling of any wastes or residues resulting from the treatment of batteries (for example, battery electrolyte, black mass, plastics, metals)

2.4 Accident prevention measures

1. You must take the following measures, where appropriate, to prevent events that may lead to an accident.

Segregating waste

2. You must keep incompatible wastes apart. This includes, for example, keeping damaged batteries away from other batteries or wastes, storing batteries of different chemistries separately once sorted from mixed loads (for example, in separate containers), segregating batteries that have been tested or discharged from those awaiting testing or discharging.

Preventing accidental emissions

3. You must make sure you contain the following for off-site disposal or route to the sealed drainage system as appropriate:

- process waters
- site drainage waters from operational areas
- emergency firefighting water
- oil or chemical contaminated waters
- spillages, for example, of oils and chemicals

4. You must be able to contain surges and storm water flows. You must provide enough buffer storage capacity to make sure you can achieve this. You can define this capacity using a risk-based approach, for example, by considering the:

- nature of the pollutants
- effects of downstream waste water treatment
- sensitivity of the receiving environment

5. You can only discharge waste water from this buffer storage after you have taken appropriate measures, for example, to control, treat or reuse the water. Discharges to ground, surface water or sewer must be lawful and must comply with any consents or permissions that are required.

6. You must have spill contingency procedures to minimise the risk of an accidental emission of raw materials, products and waste materials, and to prevent their entry into water.

7. Your emergency firefighting water collection system must take account of additional firefighting water flows or firefighting foams. You may need emergency storage lagoons to prevent contaminated firefighting water reaching a receiving water body. This should be considered as part of your fire prevention plan.

8. You must consider and, if appropriate, plan for the possibility that you need to contain or abate accidental emissions from:

- overflows
- vents
- safety relief valves
- bursting discs

If this is not advisable on safety grounds, you must focus on reducing the probability of the emission.

Security measures

9. You must have security measures in place (including staff) to prevent:
- entry by vandals and intruders
- damage to plant and equipment
- theft
- fly-tipping
- arson

10. Facilities must use an appropriate combination of the following measures:
- security guards
- total enclosure (usually with fences)
- controlled entry points
- adequate lighting
- warning signs
- 24-hour surveillance, such as closed-circuit television (CCTV)

Fire prevention

11. There are 3 fire prevention objectives. You must:
- minimise the likelihood of a fire happening
- aim for a fire to be extinguished within 4 hours
- minimise the spread of fire within the site and to neighbouring sites

12. You must have a fire prevention plan that meets the requirements of our fire prevention plan guidance.

13. In accordance with our Fire Prevention Plan guidance, you must maintain appropriate separation distances between and within waste battery storage areas to prevent a fire from spreading. You must also maintain appropriate separation distances between combustible or flammable wastes (including waste batteries and other wastes in containers) and, where relevant:
- potential sources of ignition (for example, naked flames, space heaters, furnaces)
- the site perimeter, waste quarantine or isolation areas, any buildings, or other combustible or flammable materials

Separation distances will depend upon the nature and quantity of wastes stored and may be reduced by using fire walls, bays or other physical barriers if they provide sufficient fire resistance.

14. Areas where waste batteries are stored, handled or treated must be provided with appropriate fire detection and suppression systems. Selection and location of appropriate fire detection systems and fire-fighting materials, methods and equipment should be based upon a site-specific fire risk assessment and consultation with the local fire and rescue service.

Storage areas should have appropriate smoke or heat detectors, linked to automatic alarm systems, designed to provide early detection and alarm. Where lithium-ion batteries are stored in significant quantity, appropriate gas detection systems may help to provide an early warning of battery thermal runaway and release of associated off-gases. The gases released from Li-ion batteries can be heavier or lighter than air and therefore high- and low-level gas detection should be considered.

A wide range of potential firefighting substances and methods are available (for example, using water, foam, gas, sand, aqueous vermiculite, vermiculite fire blankets, sprinklers, deluge systems, water cannons, portable fire extinguishers, a water-filled container for the submersion of batteries). The most appropriate method of fire suppression is likely to depend on a range of factors, including the type and quantities of batteries or other combustible or flammable materials involved and the location and scale of the fire (for example, a lithium fire extinguisher may be sufficient if a single or small number of isolated Li-ion batteries are involved). One of the primary aims should be to prevent a fire from spreading and escalating to other waste batteries and combustible wastes or materials stored on-site, for example, by preventing heat transfer or through cooling.

15. Fire detection, suppression and fighting equipment must be subject to regular inspection, testing and maintenance in line with the recommendations of the equipment manufacturer and installer. You must keep records of their inspection, testing and maintenance.

Other accident prevention measures

16. You must maintain plant control in an emergency using one or a combination of:

- alarms
- process trips and interlocks
- automatic systems
- manual interventions

17. You must:

- make sure all the measurement and control devices you would need in an emergency are easy to access and operate in an emergency situation
- maintain the plant so it is in a good state through a preventive maintenance programme and a control and testing programme
- use techniques such as suitable barriers to prevent moving vehicles damaging equipment
- have procedures in place to avoid incidents due to poor communication between operating staff during shift changes and following maintenance or other engineering work
- where relevant, use equipment and protective systems designed for use in potentially explosive atmospheres

18. Areas of the site where explosive atmospheres could occur (for example, the treatment, storage or handling of waste containing organic solvents) must be assessed and, where appropriate, classified into hazardous zones in line with

the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR). Plant and equipment used in these zones must be ATEX compliant and operated by appropriately trained staff.

Record keeping and procedures

19. You must:

- keep an up-to-date record of all accidents, incidents, near misses, changes to procedures, abnormal events, and the findings of maintenance inspections
- carry out investigations into accidents, incidents, near misses and abnormal events and record the steps taken to prevent their reoccurrence
- maintain an inventory of substances, which are present (or likely to be) and which could have environmental consequences if they escape – many apparently innocuous substances can damage the environment if they escape
- have procedures for checking raw materials and wastes to make sure they are compatible with other substances they may accidentally come into contact with
- make sure that any documents that may be needed in the event of an incident are accessible

2.5 Contingency plan and procedures

1. You must have and implement a contingency plan and management procedures to make certain you comply with all your permit conditions and operating procedures during maintenance or shutdown at your site.

2. Your contingency plan must also contain provisions and procedures to make sure that you:

- do not exceed storage limits in your permit and you continue to apply appropriate measures for storing and handling waste
- stop accepting waste unless you have a clearly defined method of recovery or disposal and enough permitted storage capacity
- as far as possible, know in advance about any planned shutdowns at waste management facilities where you send waste

Your contingency plan must include plans and procedures for circumstances where you cannot send your wastes to other sites (including exports to sites outside of the UK) due to their planned or unplanned shutdown.

3. If you produce an end-of-waste material at your facility, your contingency planning must consider issues with storage capacity for end-of-waste products and materials that fail end-of-waste specification.

4. You must make your customers aware of your contingency plan, and of the circumstances in which you would stop accepting waste from them.

5. You must consider whether the sites or companies you rely on in your contingency plan:

- can take the waste at short notice

- are authorised to do so in the quantities and types likely to be needed – in addition to carrying out their existing activities

6. Where circumstances mean you could exceed your permitted storage limits or compromise your storage procedures, you must look for alternative disposal or recovery options. You must not discount alternative disposal or recovery options based on extra cost or geographical distance.

7. You must not include unauthorised capacity in your contingency plan. If your contingency plan includes using temporary storage for additional waste on your site, then you must make sure your site is authorised for this storage, and you have the appropriate infrastructure in place.

8. Your management procedures and contingency plan must:

- identify known or predictable malfunctions associated with your technology and the procedures, spare parts, tools and expertise needed to deal with them
- include a record of spare parts held, especially critical spares – or state where you can get them from and how long it would take
- have a defined procedure to identify, review and prioritise items of plant which need a preventative regime
- include all equipment or plant whose failure could directly or indirectly lead to an impact on the environment or human health
- identify 'non-productive' or redundant items such as tanks, pipework, retaining walls, bunds, reusable waste containers (for example wheeled carts), ducts, filters and security systems
- make sure you have the spare parts, tools, and competent staff needed before you start maintenance

9. Your management system must include procedures for auditing your performance against all these contingency measures and for reporting the audit results to the site manager.

2.6 Plant decommissioning

1. You must consider the decommissioning of the plant at the design stage and make suitable plans to minimise risks during later decommissioning.

2. For existing plant, identify potential decommissioning risks and take steps to address these. Make changes and design improvements as and when plant is upgraded, or when construction and development works are carried out at your site. Examples of design improvements could include avoiding using underground tanks and pipework. If it is not economically possible to replace them, you must protect them by secondary containment or a suitable monitoring programme.

3. You must have and maintain a decommissioning plan to demonstrate that:

- plant will be decommissioned without causing pollution
- the site will be returned to a satisfactory condition

4. Your decommissioning plan should include details on:

- whether you will remove or flush out pipelines and vessels (where appropriate) and how you will empty them of any potentially harmful contents
- site plans showing the location of all underground pipes and vessels
- how asbestos or other potentially harmful materials will be removed, unless we have agreed it is reasonable to leave such liabilities to future owners
- methods for dismantling buildings and other structures, and for protecting surface water and groundwater during construction or demolition at your site
- any soil testing needed to check for any pollution caused by the site activities, and information on any remediation needed to return the site to a satisfactory state when you cease activities, as defined by the initial site condition report
- the measures proposed, once activities have definitively stopped, to avoid any pollution risk and to return the site of operation to a satisfactory state (including, where appropriate, measures relating to the design and construction of the plant)
- the clearing of deposited residues, waste and any contamination resulting from the waste treatment activities

5. You should make sure that equipment taken out of use is decontaminated and removed from the site.

3. Waste pre-acceptance, acceptance and tracking appropriate measures

These are the appropriate measures for waste pre-acceptance, acceptance and tracking at regulated facilities with an environmental permit for the treatment or transfer of waste batteries.

3.1 Waste pre-acceptance

1. You must implement waste pre-acceptance procedures so that you know enough about a waste before it arrives at your facility. You need to do this to assess and confirm the waste is technically and legally suitable for your facility. Your procedures must follow a risk-based approach, considering:

- the source and nature of the waste, including:
    - the types of waste battery present (for example, chemistry, classification [for example, portable, automotive, industrial], or size)
    - the condition of the batteries and, if known, information regarding their age and residual charge (for example, for high voltage electric vehicle batteries)
    - how the batteries are, or will be, packaged (for example, including type of container, packaging material, measures taken to prevent physical damage, electrical shorting, exposure to liquids and high temperatures)
- any hazardous properties and persistent organic pollutant (POPs) content
- potential risks to process safety, occupational safety and the environment (for example, from the presence of hazardous substances that could be dispersed during treatment)
- knowledge about the waste producer and previous waste holder

2. You must get the following information (in writing or electronic form) when you receive a customer query and before the waste arrives at your facility:

- details of the waste producer (who you are receiving the waste from) including organisation name, address and contact details
- where the waste is coming from
- full description of the waste and its composition, including type and chemistry of waste batteries and their quantity if known
- the List of Waste codes (European Waste Classification (EWC) code)
- any hazardous properties and presence of any regulated chemicals, for example, POPs
- the type of containers and packaging used for the waste
- where available, information regarding the age and condition of the waste and, where relevant, potential for self-heating, self-reactivity or reactivity to moisture or air

You can verify the pre-acceptance information by contacting or visiting the waste producer. Dealing with staff directly involved in waste production can help to fully characterise a waste.

3. You must assess the information obtained at the waste pre-acceptance stage to make sure you:

- only accept wastes that are suitable for treatment or storage
- avoid unnecessarily accumulating waste
- have enough storage and treatment capacity
- prevent waste arriving at the site in inappropriate containers or packaging
- identify waste that may require additional safety measures or precautions to be taken
- meet any relevant Control of Major Accident Hazards (COMAH) requirements, because wastes, raw materials and end-of-waste materials all contribute to COMAH limits

4. Where relevant, you should consider with your customer whether waste batteries are suitable for preparing for reuse (for example, re-using electric vehicle batteries for other energy storage applications). Where that remains a possibility, you should ensure the waste batteries are handled and transported with care to avoid any damage or loss that could affect reuse.

5. If there is a risk of radioactive contamination or presence of a radioactive source you must obtain confirmation that the waste is not radioactive unless your facility is permitted to accept such waste.

6. You must consider whether specific wastes, from among those you are permitted to receive, have properties that can pose unacceptable risks to the site or process. For example, due to risk of:

- fire or explosion
- corrosion
- uncontrolled reactions, for example, involving self-heating or gas evolution

You should establish a list of such wastes and procedures for managing the risks from them.

7. You must keep pre-acceptance records for at least 3 years in a computerised waste tracking system following receipt of the waste. If an enquiry from a waste producer does not lead to the receipt of waste, you do not need to keep records.

8. You must reassess the information required at pre-acceptance if the:

- waste changes
- process giving rise to the waste changes
- waste received does not conform to the pre-acceptance information

9. In all cases you must reassess the information required at pre-acceptance on an annual basis.

3.2 Waste acceptance

1. You must implement waste acceptance procedures to check that the characteristics of the waste received matches the information you obtained during waste pre-acceptance. This is to confirm that the waste is as expected, and you can accept it. If it is not, you must confirm that you can accept it as a non-conforming

waste, or you must reject it. If you are rejecting hazardous waste you must follow the guidance on the procedure for rejecting hazardous waste. Procedures should be documented and auditable.

2. Your procedures must follow a risk-based approach, considering:

- the source, nature (including type and chemistry of batteries), condition and age of the waste
- any hazardous properties of the waste
- any persistent organic pollutant content in the waste
- potential risks to process safety, occupational safety and the environment (for example, the presence of lithium-ion batteries)
- knowledge about the previous waste holders

3. Other than in an emergency (for example, taking waste from an emergency incident clean-up), you must only receive pre-booked wastes onto site that have been adequately pre-accepted and are consistent with the pre-acceptance information.

4. You must weigh each load of waste on arrival to confirm the quantities against the accompanying paperwork, unless alternative reliable systems are available (for example, based upon volume). You must record the weight in the waste tracking system.

5. You must visually check wastes and verify them against pre-acceptance information and transfer documentation before you accept them on site. The extent of the initial visual check should be determined by the waste type and how it is packaged.

6. You must check and validate all transfer documentation and resolve discrepancies before you accept the waste. If you believe the incoming waste classification and description is incorrect or incomplete, then you must address this with the customer during waste acceptance. You must record any non-conformances. If you have assessed the waste as acceptable for on-site storage or treatment, you must document this.

7. You must have clear criteria that you use to reject non-conforming wastes. You must also have a written procedure for recording, reporting and tracking non-conforming wastes, including notifying the relevant customer or waste producer to prevent reoccurrence.

8. The person carrying out waste acceptance checks must be trained to effectively identify and manage any non-conformances in the loads received, complying with this guidance and your permit conditions (for example, including the different types, properties and chemistries of waste batteries or similar wastes that may be received at the facility).

9. If there is a known risk of radioactive contamination, you must check the waste to determine that it does not include radioactive material, unless you are permitted to accept these materials.

10. Upon arrival, wastes must be inspected to check that they are as expected and match accompanying paperwork (for example, regarding battery type(s), quantity and packaging). As far as practicable, loads must be visually checked for any non-conforming wastes (including batteries that are of a non-conforming type or chemistry, or that show signs of damage) prior to being accepted and moved to a dedicated storage area. For example, damaged batteries could be identified by signs of physical damage (dents, puncture, cracks), swelling, smoking, leaking or overheating. Any non-conforming batteries (for example, a lithium-ion battery received in a load that should only contain lead acid batteries) must be removed at the earliest opportunity and stored appropriately.

11. If you receive wastes that you are not permitted to accept, you should either:

- reject the load immediately; or
- if non-conforming types of waste are found within a load that could otherwise be accepted on to site, they must be segregated and placed in the designated battery quarantine area.

12. Waste batteries must be received and handled in appropriate containers or packages that are secure, prevent damage and leakage of materials, for example, liquid battery electrolyte, and are resistant to any corrosive chemicals contained in them. This must be a requirement of your waste pre-acceptance and acceptance procedures.

13. You must check all waste containers and packages to make sure they are fit for purpose, including, where appropriate, that they are:

- in sound condition
- undamaged
- not corroded
- suitable for the contents (for example, its mass and other physical or chemical properties)
- with well-fitting lids, where relevant
- with caps, valves and bungs in place and secure, where relevant

You must risk assess containers, particularly those made of plastic, if they have exceeded the manufacturer’s use by date.

You must quarantine non-conforming containers and deal with them immediately and appropriately. You must record all non-conformances.

14. If waste batteries are not received in appropriate containers, they must be risk assessed and, if safe to do so, repackaged as soon as it is practicable and before being moved to the waste storage area.

15. The site must have written procedures for safely managing non-conforming or quarantined wastes, including damaged batteries. Where relevant and supported by an appropriate risk assessment, this could include the prioritisation of damaged batteries for treatment.

16. If identified during acceptance or storage, damaged batteries must be risk assessed (for example, considering the risk of potential emissions, fire and electrical

hazards) and, where necessary and safe to do so, placed in appropriate rigid, closed, leak-proof and chemically-resistant containers and segregated from other batteries or wastes.

17. Following assessment, and where safe to do so, damaged batteries that pose an increased fire risk (for example, lithium-ion batteries) should be:

- placed in an appropriate fireproof container, for example, a UN approved steel drum or container, filled with an inert packing material, such as vermiculite or sand
- moved to a dedicated location or quarantine area that is a safe distance from combustible or flammable materials, possible sources of ignition, buildings, equipment and sensitive site perimeters (for example, those close to public rights of way)
- kept under cover in a cool, dry and well-ventilated location

Where possible, pressure relief valves or vents should be provided on containers if there is potential for the release and accumulation of gases from the batteries. Spark arrestors should be fitted where necessary to reduce the risk of ignition of flammable gases. Storage of containers in enclosed steel cages, or similar, may help minimise the risk of battery ejection and propagation in the event of a fire, particularly if the damaged batteries are not already in fire-resistant containers or packaging and it is not safe to repackage them.

Large Li-ion battery packs or modules (for example, from EVs or BESS) that are damaged and assessed as posing a risk of thermal runaway or fire should be isolated within an appropriate exclusion zone or in a dedicated, fully enclosed (ventilated) and contained fire-resistant container or enclosure provided with appropriate fire (for example, gas or heat) detection and suppression systems.

Storage areas

18. All relevant waste storage areas (quarantine, reception and general) and treatment processes in your facility must have the physical capacity needed for the waste you receive. You must not receive wastes if this capacity is not available. The amount of waste you receive must also comply with storage limits in your permit.

19. The waste offloading, reception and quarantine areas must have impermeable surfaces with a sealed drainage system. This system must collect all surface water run-off from these areas and channel it to a blind sump unless you can lawfully discharge it.

20. You must clearly designate a waste reception area (or areas). Staff controlling the inspection, reception and validation of waste at the facility, must be trained in their respective roles

Quarantine storage

21. Your facility must have a dedicated waste quarantine area or areas, which you use to temporarily store waste being rejected, or non-conforming waste whilst it is being inspected or assessed.

22. Quarantine storage must be for a maximum of fourteen days. Records must be maintained of the removal of quarantined waste from site. For some limited and specific cases (for example the detection of radioactivity), you can extend quarantine storage time if the Environment Agency agrees.

23. You must have written procedures in place for dealing with wastes held in quarantine, and a maximum storage volume.

24. Quarantine storage must be separate from all other storage and clearly marked as a quarantine area.

25. You must store the waste in quarantine in appropriate closed containers or under weatherproof covering. You must segregate or isolate incompatible wastes.

3.3 Waste tracking

1. You must use an electronic or computerised waste tracking system to hold up-to-date information about the available capacity of the waste quarantine, reception, general and bulk storage areas of your facility including treatment residues and end of waste product materials.

2. Your waste tracking system must hold all the information generated during:

- pre-acceptance
- acceptance
- non-conformance or rejection
- storage
- treatment
- removal off site

This information must be readily accessible.

3. You must create records and update them to reflect deliveries, on-site treatment and dispatches. This can be done on a ‘loads received’ basis. Your tracking system will also operate as a waste inventory and stock control system. It must include this information as a minimum:

- the date the waste arrived on-site
- the producer’s details (or unique identifier)
- a unique reference number
- waste pre-acceptance and acceptance information
- the quantity delivered
- the intended treatment route
- accurate records of the nature and quantity of wastes held on site, including all hazards – and identifying the primary hazards and presence of any regulated chemicals such as POPs
- where the waste is physically located on site

4. The tracking system must be able to report:

- the total quantity of waste present on site at any one time

- a breakdown by type of the waste quantities you are storing pending treatment or transfer
- the quantity of waste on site compared with the limits authorised by your permit
- the length of time the waste has been on site
- the quantity of end-of-waste product materials on site at any one time, and, where applicable details of any non-conformances and rejections

5. You must store back-up copies of electronic records off site. Records must be readily accessible in an emergency.

6. You must hold pre-acceptance and acceptance records for a minimum of 2 years after you have treated the waste or removed it off site. You may have to keep some records for longer if they are required for other purposes, for example, hazardous waste consignment notes.

4. Waste storage and handling appropriate measures

These are the appropriate measures for waste storage and handling at regulated facilities with an environmental permit for the treatment or transfer of waste batteries.

4.1 General waste storage and handling *(applicable to waste batteries and other wastes, including wastes resulting from battery treatment activities)*

1. You must have waste storage and handling procedures. You must store and handle waste in a way that makes sure you prevent and minimise pollution risks by using appropriate measures. Waste handling must be carried out by competent staff using appropriate equipment.

2. You should design and operate your facility in a way that minimises the handling of waste, for example, by storing waste in locations that minimise waste handling and using mechanical loading and unloading technologies and conveyors where it is safe and practicable to do so.

3. Where possible, you should locate storage areas away from watercourses and sensitive perimeters (for example, those close to public rights of way, housing or schools).

4. You must store all waste within the secure area of your facility to prevent unauthorised access and vandalism.

5. Where relevant, you must conform to Health and Safety Executive (HSE) guidance and standards, for example:

- HSG51 The storage of flammable liquids in containers
- HSG71 Chemical warehousing: The storage of packaged dangerous substances
- HSG76 Warehousing and storage
- HSG140 Safe use and handling of flammable liquids
- HSG176 The storage of flammable liquids in tanks
- HSG85 Electricity at work: Safe working practices
- HSG258 Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV)
- INDG139 Using electric storage batteries safely
- L138 DSEAR Approved Code of Practice

6. You must clearly document the maximum storage capacity of your site and designated storage areas. You must not exceed these maximum capacities. You should define capacity in terms of, for example, maximum tank or vessel capacities, tonnage, numbers of skips, pallets or containers. You must regularly monitor the quantities of stored waste on site and designated areas and check against the allowed maximum capacities. You must also monitor the quantities of relevant wastes against limits set out in your management plans, for example, fire prevention plan.

7. You must clearly mark waste storage areas and provide signs showing the maximum quantity and types of waste (including any hazardous properties) that can be stored there.

8. The design and arrangement of storage areas must provide and maintain appropriate separation distances to prevent fire spreading and access for fire-fighting measures, considering the use of other measures such as fire walls and bays, in accordance with an agreed FPP.

9. You must maintain adequate access and separation distances between and within storage areas to allow for easy inspection. You must maintain safe access, with a gap of at least 0.7m between rows of bulk containers or palletised wastes.

10. You must not accumulate waste unnecessarily. You must treat wastes, or remove them from the site, as soon as possible and in compliance with the timescales provided below. If you have a shorter time period as a permit condition or one is specified in your fire prevention plan you must comply with that condition or the fire prevention plan.

Waste type	**Maximum storage duration**
Alkaline and zinc carbon batteries	12 months
Lead acid batteries	6 months
Other batteries (including NiCd, NiMH, lithium and mixed or unsorted batteries)	6 months
Other wastes (including battery components or fractions, scrap or off-spec products from manufacturers, electrolytes)	6 months

The repackaging, bulking or sorting of waste should not change (extend or restart) the maximum duration that a waste is stored on-site.

11. Up-to-date records must be kept of the on-site storage duration and inventory of waste. Storage duration and inventory should be minimised, for example, by ensuring that they are transferred or treated once a viable load has been established and managed on a first-in first-out basis to prevent the accumulation of aged stock.

12. You must not handle waste or its packaging in a way that might damage its integrity. You must not, for example, walk on, throw or drop waste or waste packages or cause damage from the use of mobile machinery or vehicles.

13. You must train forklift drivers in the handling of palletised goods, to minimise forklift truck damage to the integrity of containers and infrastructure.

14. Storage area drainage infrastructure must:

- contain all possible contaminated run-off
- prevent incompatible wastes coming into contact with each other
- make sure that fire cannot spread

15. You must:

- contain wash waters within an impermeable area and either discharge them to foul sewer under a trade effluent consent or dispose of them appropriately off site.
- prevent run-off into external areas or to surface water drains

16. Any liquids removed from waste must be collected and stored in lidded, leakproof containers or dedicated tanks provided with appropriate secondary and tertiary containment. Containers must be kept closed when not being filled and must be stored within a dedicated area that will contain any leakage or spillage. Containers and tanks must be chemically resistant to the liquids stored in them.

17. Secondary and tertiary containment systems of waste storage areas must conform to CIRIA guidance C736 Containment systems for the prevention of pollution.

18. You must store wastes that are sensitive to air, light, heat, moisture or extreme ambient temperatures under appropriate weatherproof covering protected from such ambient conditions (for example, waste lithium metal must be protected from exposure to water, including the moisture in air or other substances) The type of covering will depend on the types and quantities of waste. It could be as simple as a lid or cover over a container for small items but in other cases may require the construction of a roofed building. Covered areas must have good ventilation. This includes containers:

- held in general storage, reception storage (pending acceptance) or quarantine
- being emptied, repackaged or otherwise managed

For example, waste held in fibre or cardboard primary or secondary packaging must be stored in a cool, dry and well-ventilated area of a building and not exposed to rain or moisture and must be kept off the floor to prevent damage caused by damp.

19. Wherever practicable you should store all other wastes under cover. Covered areas must have good ventilation. Under cover storage provides better protection for containers than open air storage and minimises the generation of contaminated water. Covered storage also:

- lowers temperature fluctuations that wastes are subjected to
- reduces the degradation of containers through weathering

20. You must not store hazardous chemical wastes (for example, produced from battery treatment activities) in open-topped containers. Empty open-topped containers should be kept in a building or under cover to prevent rainwater ingress. Wastes that have the potential for self-heating or self-reactivity must be stored in sealed metal containers under cover and monitored for heat build-up.

21. All waste storage containers and packages must remain fit for purpose and:

- in sound condition
- undamaged
- not corroded

- suitable for the contents (for example, its mass and other physical or chemical properties)
- have well-fitting lids, where relevant
- with caps, valves and bungs in place and secure, where relevant

22. You must check the condition of containers and the pallets they may be stored on as part of routine site inspections and record non-conformances. Non-compliant containers and pallets must be made safe. You must immediately and appropriately manage any unsound, poorly labelled or unlabelled containers (for example, by relabelling, over drumming and transferring the container's contents). You must risk assess, approve and record the use of storage containers, tanks or vessels:

- beyond their specified design life
- where you use them for a purpose, or substances, other than the ones they were designed for

23. All containers must be clearly labelled with relevant information, including their contents, date of filling or receipt and relevant hazards. They should keep the labelling they had at acceptance unless they have repackaged and relabelled. If the label is damaged or no longer legible you should replace the label with the same information. You must handle and store containers of waste so that the label is easily visible and continues to be legible.

24. Containers must be held in designated areas of the site marked with maximum stack footprint and minimum separation distances. The containers should be stored in rows and must be arranged in a way that ensures they can be safely and easily accessed for inspection or retrieval at all times without having to move others that may be blocking access, other than those in the same row.

25. Containers of waste must only be stacked if they are specifically designed for stacking, and no more than 2.2m high and on a pallet.

26. You must store all other containers (including bags and boxes) on pallets (unless they have an integral pallet at the base) and stacked no more than 1m high. Pallets must not be stacked more than 2 high, except for empty containers which can be stacked 3 high.

27. Stacked containers must be stable. They should be secured if required, for example, with banding or shrink-wrap. The containers must not extend beyond (over-hang) the sides of the pallet. If shrink-wrap is used, it must be clear or transparent so that you can identify waste types, damaged containers, leaks or spillages and incorrectly stacked containers. You must be careful not to damage any packages during stacking.

28. Flexible IBCs (FIBCs) must not be handled or stored in way that could cause damage to the container or its contents (for example, from being dropped, lifted or lowered too quickly, or impacted by machinery or sharp edges) or that would exceed its safe working load or carrying capacity. They must only be lifted and handled using equipment designed to handle FIBCs and which do not have any sharp edges or protrusions that could damage the container. They must be stored inside a building

(if containing batteries) or under cover, and in a cool, dry location away from direct sunlight. All FIBCs must be stored in a way that means they can be accessed safely and easily for inspection or retrieval. They must be inspected regularly to identify and address any signs of damage (for example, including loss of containment, fraying, splits, leaks, or signs of chemical contamination).

29. FIBCs must not be stacked on top of each other unless designed and approved for stacked and they are stacked and in a manner that is secure and stable and in accordance with the manufacturer's recommendations and other relevant industry guidance (for example, from the FIBCA and the HSE). FIBCs must not be stacked more than 2 high or if it could cause damage to their contents, for example, including waste at the bottom of the containers or stack.

30. You must keep incompatible chemical wastes segregated so that they cannot come into contact with one another. You must store flammable wastes apart from other wastes to prevent fire spreading between them and other materials. You must use sealed drainage systems to prevent leaks and spillages contaminating other wastes.

31. You should, where applicable and based on a recorded risk assessment, make inert the atmosphere of tanks containing liquid waste with a flashpoint less than 21°C (for example, tanks containing flammable waste electrolytes or solvents). This can be done, for example, by using nitrogen gas.

32. You should pay particular attention to avoid the build-up of static electricity when you are storing or handling flammable wastes and materials. You should use leak detection systems and alarms (for example VOC alarms) and automatic fire suppression equipment based on a recorded risk assessment.

33. You must not store or hold wastes on site in vehicles or vehicle trailers unless you are receiving them or preparing them for imminent transfer (meaning that you will remove them from site within 24 hours, or 72 hours if over a weekend).

34. Waste storage areas, containers and infrastructure must be subject to daily inspection to make sure that any leaks, spillages of liquids, dust or loose material are identified and managed appropriately, and fire breaks are maintained. You must keep written records of the inspections. You must rectify and log any spillages of waste.

35. Any spillage or leakage resulting from the storage of waste must be collected without delay using equipment and procedures appropriate to the type of spillage. The collected residues must be stored in a lidded, leakproof container. Any containers or surfaces affected by the spillage must be cleaned. Sand or neutralising granules, or other equivalent materials, must be available to deal with any leaks or spills.

36. You must not carry out activities that represent a clear fire risk within waste storage areas. Examples include:

- hot works, including grinding, welding, or brazing of metalwork, unless risk assessed and approved, for example, under a permit to work scheme

- smoking
- parking normal road vehicles, except while unloading or loading
- pressure washing
- recharging forklift truck or power tool batteries
- recharging or discharging batteries

37. All waste storage areas must have an impermeable surface which is resistant to the materials being stored. Outdoor waste storage areas must have a sealed drainage system to collect all surface water run-off and channel it to a blind sump unless it may be lawfully discharged. Indoor waste storage areas must be provided with appropriate spillage collection facilities.

38. You must keep clean water (for example, uncontaminated rainwater) separate from wastes and waste waters.

39. You must use weatherproof covering in areas used for the storage of waste containing hazardous material or fluids where this is necessary to avoid contamination of surface water, including fractions that may be persistent organic pollutant (POPs) waste. The type of covering will depend on the types and quantities of waste but must ensure the waste is protected from the weather. It could be as simple as a lid or cover over a container for small items but in other cases may require the construction of a roofed building.

40. If racking systems are used to store waste, their design and construction must be in accordance with HSG76 Warehousing and storage and consider the need for:

- waste separation and segregation (including separation distances for fire prevention)
- the inspection and retrieval of waste
- fire prevention and suppression measures

Where racking systems are used for the storage of combustible or flammable wastes (for example, Li-ion batteries or wastes resulting from the treatment of Li-ion batteries), they should be made of non-combustible materials, with solid fire-resistant barriers in place to prevent the spread of fire (horizontally and vertically). The use of in-rack sprinkler systems and anti-static measures should also be considered, where appropriate.

41. Bulk storage systems (for example, used for liquids and powders), including tanks and silos, must meet the relevant requirements for Bulk storage provided in Section 4 of Chemical waste: appropriate measures for permitted facilities.

42. You must manage waste in a way that prevents pests or vermin. You must have specific measures and procedures in place to deal with wastes that are identified as causing pests or vermin.

4.2 Additional measures for the storage and handling of waste batteries

1. Where relevant to their role, all personnel must be trained in the different types, properties and chemistries of batteries that may be received at the facility, including how they can be identified and the measures that must be taken to ensure they are stored, handled and treated safely.

2. Other than mixed loads of waste batteries that are yet to be sorted (for example, received from household collections), batteries of different chemistry must be stored separately from each other, for example, in separate dedicated storage areas or containers. Once sorted and separated, you must not mix batteries of different chemistries or types. This includes, for example, storing traction batteries and other large automotive or industrial batteries separately from smaller portable batteries of the same chemistry. Batteries that are known to contain POPs or made of a polymer that may contain POPs should be segregated from those that do not.

3. To make sure waste batteries are protected and contained during storage and handling, they must be stored and handled in appropriate containers (for example, battery boxes, drums or other suitable packages) that are:

- non-conductive or provided with a non-conductive liner
- protected from static where necessary (for example, if containing, or stored or handled near, lithium-ion batteries or other potentially flammable wastes or substances)
- waterproof and weather resistant (unless stored within an enclosed building)
- resistant to chemicals contained in the waste batteries (for example, acids or other corrosive substances)
- leak-proof or provided with a strong, chemically resistant leak-proof liner
- kept closed and sealed when not being filled or emptied

4. Containers of waste batteries must be stored in well-ventilated designated areas of a building or under weatherproof covering, which provide a dry and cool environment, prevents exposure to extreme temperatures and sources of heat (including direct sunlight) and away from other relevant hazards, for example, including high voltage cables, transformer cabins, flammable or corrosive gas or liquid tanks, or other storage areas for potentially dangerous materials.

5. If waste batteries are stored under weatherproof covering (including in storage tents or similar temporary structures) instead of in an enclosed building, its design and construction must:

- be appropriate to the waste batteries being stored, considering their type, chemistry, quantity and potential hazards (for example, hazardous chemicals or fire)
- be on level ground with an impermeable surface and sealed drainage
- be secured with appropriate anchoring methods and resistant to weather conditions, for example, including direct sunlight and ultraviolet radiation, strong winds, wind-driven rain, snowfall

- provide protection needed for any sensitive or reactive wastes, for example, providing sufficient shade and thermal insulation for Li-ion batteries
- provide appropriate ventilation, for example, to minimise formation of condensation and aid dispersion of any hazardous gases that may be released from the waste batteries
- keep the storage area dry and prevent the accumulation of water, for example, from rainfall, condensation or surface water
- be subject to regular inspection and maintenance

6. Lead acid batteries must be stored upright with terminals capped or insulated. Other batteries should have terminals and any wired connections insulated where practicable, particularly lithium batteries and larger batteries and battery packs from WEEE and EVs, and must be packed in a way that prevents shorting or damage, for example, using a suitable packing material, such as vermiculite.

7. Waste batteries must not be stored on-site in cut-off IBCs (Intermediate bulk containers) or loose in skips, vehicle trailers or similar large bulk containers. If lead acid batteries are loaded in to large bulk containers or trailers in preparation for imminent off-site transfer to a battery treatment facility, they must meet the relevant ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road) requirements for bulk carriage and be kept closed or sheeted (other than during loading or unloading). Transfer of the batteries to the large bulk container must be done in a careful and controlled manner that prevents and minimises damage or breakage (for example, they are not tipped or dropped from a height that could cause damage) and ensure, as far as practicable, that the batteries remain upright with terminals protected. Unless this can be reliably achieved and demonstrated, the batteries must remain in their original smaller containers (for example, rigid lidded battery boxes) for loading and loading.

8. Rigid lidded containers must be used for the storage and handling of lithium batteries, lead acid batteries, other vehicle batteries (for example, NiMH batteries from hybrid vehicles) and unsorted or mixed loads of batteries that may contain these batteries. Such containers should also be used for the storage of other waste batteries where possible to ensure they are stored securely and protected from damage. Flexible (non-rigid) containers (for example, flexible IBCs (FIBCs)) must not be used for the storage of waste batteries that contain flammable substances, corrosive substances (unless chemically resistant to them) or free liquids. If other separate or sorted types of battery are received and stored in flexible containers (for example, FIBCs) they should meet the requirements of appropriate measure 3. above and must be:

- stored inside a building
- stored and handled safely and carefully to protect their integrity and prevent any damage to the container or its contents, for example, from drops, falls or crushing (see appropriate measures 28 and 29 in Section 4.2)
- designed to keep their shape and prevent sagging and bulging when filled (for example, FIBCs that use four-panel or baffle design bags)

9. Separate collections of lithium batteries must be stored in rigid containers that are non-conductive or provided with a non-conductive liner (for example, a UN approved steel drum with an internal plastic liner). The containers must be kept closed and stored in a dedicated area of a building or under weatherproof covering, in a cool, dry and well-ventilated location, away from sources of heating or ignition and other combustible or flammable materials (for example, including other combustible wastes or packaging materials). The batteries must have terminals or connections insulated to prevent short-circuiting or be separated by layers of vermiculite or other suitable non-conductive and non-combustible packing material. Li-ion batteries should be stored and handled in lined UN approved steel drums or other fire-resistant containers to minimise the risk of fire propagation, particularly where they are stored in significant quantities. Pressure relief valves should be provided on the containers if there is the potential for the accumulation of flammable gases and spark arrestors should be fitted where necessary to reduce the risk of ignition.

10. Batteries that are too large to be stored in appropriate containers (for example, large battery packs and battery modules from EV or BESS), must be stored raised off the floor in a dedicated area of a building (constructed of non-combustible materials) that is cool, dry and well-ventilated, away from flammable or combustible materials and sources of heat or ignition, and with measures in place to protect the batteries from damage (for example, secure on pallets or in a racking system), short-circuiting (including insulation of terminals) and overheating. Where available, they should be stored following manufacturer's instructions and remain in the packaging provided for their transportation. They must not be stacked directly on top of each other unless they are designed to be stored in this way. Where possible, prior to storage, large battery packs should be tested and, where necessary, safely discharged to minimise electrical safety and fire risks.

11. Waste batteries must always be handled carefully to prevent damage, for example, from being dropped or other physical impact, particularly during loading and unloading activities and movement around site.

12. Waste batteries must not be tipped during storage or handling activities unless it is risk assessed (for example, considering the type, chemistry and quantity of batteries) and carried out under cover or inside a building and in a careful and controlled manner (for example, minimising tipping height and angle) that will prevent damage to the batteries and minimise associated risks, such as short-circuiting, fire or leakage or loss of materials.

13. Where tipping of waste batteries is necessary for the loading of a treatment process (including sorting) and could cause damage, leakage or loss of battery materials, it must be risk assessed (for example, considering the type, chemistry and quantity of batteries) and carried out inside a building and using enclosed plant or equipment (for example, enclosed and abated feed hopper) with appropriate measures in place to ensure that:

- any materials and liquids released are appropriately collected and contained (for example, battery electrolyte),

- diffuse emissions to air are prevented or controlled (for example, contained, extracted and abated),
- other operational risks (for example, fire, electrical hazards, chemical reactions and corrosion) are prevented or minimised

14. If lead acid batteries are removed from containers (including large bulk containers or tailers) in preparation for on-site treatment, they must be:

- handled and stored with care to prevent and minimise damage or breakage (for example, not dropped from height, crushed or impacted)
- kept inside an enclosed building, in dedicated storage bays or areas that are provided with acid-resistant surfacing and self-contained drainage

Any electrolyte lost from damaged batteries must be collected by the drainage system, or alternative spillage collection measures, and sent for appropriate treatment. If other materials leak or are lost from the batteries (for example, lead sulphate paste) they must be collected without delay using appropriate equipment and procedures. The collected residues must be stored in appropriate lidded, leakproof and chemically resistant containers. Any containers or surfaces affected by the spillage must be cleaned to prevent contamination leaving the storage area (for example, on the wheels of vehicles).

Where necessary to prevent and control diffuse emissions to air (subject to a risk assessment of emissions (including sulphuric acid fumes, lead and other particulates) that considers the likelihood and extent to which damaged or broken batteries may be received or stored in the building and the measures taken to prevent, minimise and manage them):

- the building must be kept under adequate negative pressure and provided with appropriate air extraction and abatement systems
- other than when access is required, building doors and windows must remain shut to provide containment

Procedures must be in place to minimise the time that waste batteries are stored in the dedicated bays or areas, prioritising the treatment of the oldest waste and ensuring that bays are regularly cleared to allow the inspection, cleaning and maintenance of surfacing and drainage systems and prevent the accumulation of waste (for example, at the back or bottom of a storage bay or area), including liquids and other residues.

15. Where lithium batteries (Li-ion or Li metal) are stored, these must be recognised as a fire hazard, marked, and stored accordingly, for example, with adequate fire breaks and away from potential ignition sources and other combustible material.

16. Lithium batteries must always be stored and handled with caution and in a way that prevents them from:

- coming into contact with any liquids
- being damaged (e.g. dropped, impacted, punctured)
- short-circuiting
- overheating or being exposed to high temperatures

17. You must have procedures and training in place for identifying and managing damaged waste batteries in storage. Damaged waste batteries should be managed in accordance with Waste Acceptance appropriate measures 15, 16 and 17.

18. The site must have storage procedures and measures in place to promptly identify, manage and, where possible, isolate any overheating Li-ion batteries in a quick and safe manner. Infrared cameras or detectors (fixed or hand-held) should be used to regularly monitor the temperature of separate collections of Li-ion batteries during storage and identify deviation from the normally expected temperature. Gas detection systems can also provide an early warning of battery thermal runaway and release of associated off-gases. The method and frequency of monitoring should be informed by risk assessment, for example, considering the type and quantity of waste stored and potential for heating. The completion of these checks must be recorded. Other waste batteries should also be monitored and managed appropriately where there is a risk of self-heating or overheating.

5. Waste treatment appropriate measures

These are the appropriate measures for waste treatment at regulated facilities with an environmental permit for the treatment of waste batteries.

5.1 Preparing batteries for reuse or further treatment *(including sorting, testing, charging, discharging and dismantling)*

1. The sorting of mixed batteries into their different types or chemistries must take place in a dedicated area of a building. Sorting may be undertaken manually or using automated mechanical systems (for example, using infrared, X-ray, laser or optical devices). Where sorting is done manually, site operatives must receive regular training on the identification of relevant battery types and chemistries and what to do if any non-conforming batteries or other wastes are identified in a load. If batteries are sorted mechanically then you must have measures in place to monitor and assess the performance and reliability of the sorting process. Once sorted, the batteries must be repackaged in appropriate containers that are clearly labelled to identify their contents and date of sorting and stored in accordance with the relevant requirements of Section 4.2.

2. Staff involved in testing, charging and discharging batteries must be appropriately trained in how to do it safely and the equipment used must be tested and inspected regularly by a qualified electrician. Activities involving high voltage equipment and batteries (for example, the testing, charging, discharging or dismantling of EV batteries or similar) must be undertaken by appropriately trained and qualified technicians, for example, holding an IMI Level 4 certificate for diagnosis, testing and repair of electric/hybrid vehicles and components, or equivalent qualification.

3. Activities involving the testing, charging, discharging and dismantling of batteries must be undertaken in dedicated and marked, well-ventilated areas of a building, away from waste storage areas and flammable or combustible materials. Areas where such activities are carried out on large Li-ion battery packs or modules should be provided with thermal imaging equipment to monitor and identify increases in battery temperature. You must have procedures and measures in place for the safe management of damaged or self-heating batteries identified during these activities, for example, involving their safe removal and insolation.

4. To minimise potential risks such as electric shock, short circuiting and thermal runaway, large battery packs and modules (for example, from EV or BESS) should be tested and safely discharged to an appropriate level before being subject to further treatment (including dismantling, where possible).

5. Large Li-ion battery packs, for example, from EVs or BESS, may contain liquid coolants, including ethylene glycol water solutions. Where relevant, these liquids must be fully drained from the batteries prior to mechanical treatment (for example, shredding). Liquids removed from batteries must be collected and stored in appropriate sealed containers in an appropriately contained or bunded storage area and sent for appropriate recovery or disposal. Other components that should be removed from large Li-ion battery packs prior to mechanical treatment include

insulation materials (for example, components containing ceramic refractory fibres) and other electronic components such as external electric cables, battery management systems and central processing units and printed circuit boards.

6. The selection and design of the battery discharging process must consider and have measures in place to mitigate and minimise relevant hazards, including, for example, electrical hazards, gas formation, battery corrosion, electrolyte leakage and temperature rise. Where possible, and practicable to do so, you should look to recover energy from battery discharging activities.

7. Where solutions and liquids are used to discharge batteries (for example, through immersion), they must be contained in an appropriate tank or container resistant to the chemicals and processes involved and provided with appropriate secondary containment. The liquid used must be subject to regular sampling and testing to inform its reuse or safe disposal, including the need for any treatment.

8. You should give priority to testing and preparing waste batteries where they could be reused. If they cannot be reused, you must make sure they are recycled or recovered at a suitable permitted facility.

9. You should identify and segregate all waste batteries that could be reused as soon as possible to prevent damage to them and to maximise the opportunities for reuse.

10. You must store batteries designated for reuse in appropriate containers and packaging, in a building and separate from other waste batteries.

11. Waste batteries that are subject to the POPs Regulations are not eligible for reuse. Where relevant, you should follow our guidance on how to identify and destroy waste that contains POPs and the management of waste lead acid batteries containing POPs.

12. Any batteries that are being prepared for reuse must be fully functional and electrically safe, in accordance with all relevant product safety standards and regulations.

13. If you are preparing batteries for reuse you must take precautions to make sure there is no pollution of the environment. The standards specified elsewhere in this guidance for storage of components, liquids and other materials apply equally when batteries are being tested and prepared for reuse.

14. Following preparation for reuse, an end of waste assessment must be undertaken and recorded, to make sure the batteries meet all of the conditions to be considered a non-waste product, taking into account Environment Agency guidance on the definition of waste and end of waste tests.

5.2 General waste treatment

1. Where wastes cannot be prepared for re-use, they must be treated to maximise the recycling and recovery of materials whether that is at the same facility or by further downstream processing.

2. You must fully understand, monitor and optimise your waste treatment process to make sure you treat waste effectively and efficiently. You must not treat waste to deliberately dilute it or mix any hazardous outputs with any non-hazardous outputs.

3. The treated output material must meet your expectations, and you must fully classify and characterise them to ensure they are suitable for their intended disposal or recovery route.

4. You must identify and characterise emissions from treatment processes and take appropriate measures to control them at source.

5. You must have up-to-date written details of your treatment activities, and the abatement and control equipment you are using. This should include information about the characteristics of the waste you will treat, and the waste treatment processes, including:

- simplified process flowsheets that show the origin of any emissions
- details of emission control and abatement techniques for emissions to air and water, including details of their performance
- diagrams of the main plant items where they have environmental relevance – for example, storage tanks, treatment and abatement plant design
- details of physical treatment processes, for example shredding, separation, compaction, filtration, heating, cooling or washing
- details of any treatment processes (chemical, thermal or biological)
- details of any effluent treatment, including a description of any flocculants or coagulants used
- an equipment inventory, detailing plant type and design parameters – for example, time, temperature, pressure
- waste types to be subjected to the process
- the control system philosophy and how the control system incorporates environmental monitoring information
- process flow diagrams (schematics)
- venting and emergency relief provisions
- a summary of operating and maintenance procedures
- process instrumentation diagrams

6. You must have up to date written details of the measures you will take during abnormal operating conditions to make sure you continue to comply with permit conditions. Abnormal operating conditions may include:

- unexpected releases
- start up
- momentary stoppages
- shut down

7. You should use material flow analysis for relevant contaminants in the waste to help identify their flow and fate. You should use the analysis to determine the appropriate treatment for the waste either directly at the site or at any subsequent treatment site. Material flow analysis considers the contaminant quantity in the:

- waste input
- different waste treatment outputs
- waste treatment emissions

8. You should use the analysis and your knowledge of the fate of the contaminants to make sure you correctly treat and either destroy or remove them.

9. The use of material flow analysis should be risk-based considering:
- the hazardous properties of the waste
- the restricted chemicals in the waste
- the risks posed by the waste in terms of process safety
- occupational safety and environmental impact
- knowledge of the previous waste holders

10. A treatment process may destroy certain substances in the waste. It could also put substances into the air, water or the ground, or produce residues which are sent for disposal. You should minimise the weight of these outputs. The treatment process may produce residues for recovery or reuse, and you should maximise the weight of these outputs.

11. You must not proceed with the treatment if your risk assessment or material flow analysis indicates that losses from a process will cause:
- the breach of an environmental quality standard
- the breach of a benchmark
- a significant environmental impact

12. The treatment plant must be specifically designed, commissioned and operated to be fit for purpose. The designs need to consider chemical process hazards and a hazard assessment of any potential chemical reactions. They also need to consider prevention and protective measures and process management, such as:
- working instructions
- staff training
- appropriate process control measures
- monitoring systems, alarms and interlocks
- plant maintenance
- checks
- audits
- emergency procedures

13. To track and control the process of change, you must have a written procedure for proposing, considering and approving changes to technical developments, or to procedural or quality changes.

14. Where an emission is expected, all treatment plant or vessels must be enclosed and vented to the atmosphere via an appropriate scrubbing and abatement system (subject to explosion relief).

15. You must minimise the release of diffuse emissions to air from activities which may give rise to them (for example, shredding or granulating) by:

- carrying out the activity using enclosed equipment or in an enclosed building
- maintaining the enclosed equipment or buildings under an appropriate pressure
- collecting and directing the emissions to an appropriate abatement system

16. You must make sure that any substances, mixtures and components removed as part of your treatment process are subsequently recovered or disposed of at an appropriately permitted facility.

17. Treatment activities must take place under weatherproof covering such as a roofed building, in a dedicated area provided with impermeable surfacing and sealed drainage and with spillage collection facilities appropriate to the materials being handled. Associated equipment, including hoppers, conveyors, storage skips or bays, must also be provided with appropriate covering to prevent emissions and exposure to rain, wind, extreme temperatures and direct sunlight.

18. Where wastes are shredded, you may use a range of separation technologies to further segregate and purify the fractions produced. For example, eddy-current separators, electrostatic separators, and density separation. Such treatment processes must be contained, extracted and abated to prevent and control emissions (including, for example, dust, metals, volatile organic compounds (VOCs) and other relevant gases, such as hydrogen fluoride (HF) and hydrogen chloride (HCl)).

19. You must fully characterise and classify fractions produced by your waste treatment processes.

20. You must make sure that any required sample is representative of the waste and has been taken by someone technically competent to do so. A representative sample is one that takes account of the full variation and any partitioning of the material.

21. Wherever possible you should sample waste fractions and residues in line with relevant guidance, for example:

- WM3 Waste classification – Guidance on the classification and assessment of waste – Appendix D
- EN 14899 Characterization of waste – Sampling of waste materials – Framework for the preparation and application of a Sampling Plan
- CEN/TR 15310 1 Characterization of waste – Waste Collection – Part 1: Guide on the selection and application of criteria for sampling under various conditions
- CEN/TR 15310 2 Characterization of waste – Waste Collection – Part 2: Guide on sampling techniques
- CEN/TR 15310 3 Characterization of waste – Waste Collection – Part 3: Guide on procedures for sub sampling in the field
- CEN/TR 15310 4 Characterization of waste – Waste Collection – Part 4: Guide to the packaging procedures for storage, conservation, transportation and delivery of samples

- CEN/TR 15310 5 Characterization of waste – Sampling of waste – Part 5: Guide on the process of developing a sampling plan.

22. You must fully characterise and classify process solutions and effluents before determining suitable disposal options.

23. Chemical analysis carried out on waste fractions and residues produced by your treatment process must be carried out by an independent accredited laboratory, using recognised accredited methods where they are available.

24. You must only use waste codes for single material outputs, for example plastic or metal, where the treatment involved is aimed at producing a pure material fraction. Contamination by other materials must be negligible.

5.3 Additional measures for the treatment of waste batteries

1. Your treatment process must be specifically designed, built, operated and maintained for the type and chemistry of waste batteries that it will treat, taking into account, for example, the materials and chemicals contained in the waste, the effect of any residual charge they may contain, and the potential emissions and other risks associated with their treatment, such as chemical reactions, corrosion, fire and explosion and electrical hazards.

2. Other than initial sorting and dismantling activities (see Section 5.1), batteries should not be treated manually by hand, for example, using manual hand tools.

3. Mechanical treatment of waste batteries must take place in dedicated, enclosed treatment plant that makes sure:

- all substances released during treatment are collected and contained
- emissions are prevented and minimised through the provision of appropriate extraction and abatement systems, including gases (for example, steam, other vapours, mists and fumes), dusts and particulates

4. Operators must have and maintain an emissions inventory that includes information on the potential emissions to air and water from the battery treatment processes undertaken, including their source, nature, composition and fate. The emissions released from a treatment process will vary, depending upon the type and chemistry of the batteries treated and the nature of the treatment processes undertaken. Examples of potentially polluting substances, which should be considered where relevant (based upon the chemistry of the batteries being treated), may include dusts and particulates, metals (for example, lead (Pb), nickel (Ni), cobalt (Co), copper (Cu), cadmium (Cd), manganese (Mn), lithium (Li), mercury (Hg), zinc (Zn)) and VOCs, as well as other substances such as sulphuric acid, ammonium chloride, ammonia, HF, HCl, potassium hydroxide, sulphur dioxide and per-and poly fluoroalkyl substances (PFAS). See Emissions Monitoring and Limits appropriate measures for more information.

5. Where possible, the battery treatment process and associated plant and equipment should be designed and operated to minimise manual handling of waste (for example, using enclosed conveyors and hoppers, forklift trucks).

6. Any liquids released from the treatment process, including wash waters, must be collected and contained in appropriate chemically resistant and bunded containers or tanks. Containers or tanks containing potentially volatile liquids, or liquids that may produce fugitive emissions (including odour, fumes or mists), must be held in fully enclosed containers or tanks. Tank vents must be provided with appropriate abatement where necessary to prevent emissions of volatile substances.

7. Solid waste materials and residues generated and collected from waste battery treatment processes must be collected and held in appropriate containers that are resistant to the materials contained and designed to prevent or contain potential emissions (for example, including emissions of dust, volatile gases/fumes, mists, odour, liquids).

8. Where the battery electrolyte is removed as part of the treatment process (for example, during the treatment of lead acid or lithium-ion batteries), the process must be designed and operated to ensure that it is safely collected and contained, and emissions to the environment are prevented (including potential emissions of volatile gases, other gases or fumes, acid mists and odour). The treatment process must also be designed and operated to optimise the removal and collection of the electrolyte and prevent or minimise the contamination of other output factions and materials.

9. The materials and fractions resulting from the shredding of batteries may need to be treated further to remove electrolyte (for example, vacuum drying of shredded Li-ion battery material or washing of the shredded plastic casings of lead acid batteries). Where this is done, the treatment process must be fully enclosed and contained, with emissions directed to an appropriate abatement or collection system.

10. The breaking of lead acid batteries must be undertaken using specialised battery breaking equipment and not using manual tools or other machinery, and in a way that prevents, or where that is not possible, minimises human contact and exposure. Batteries must not be dropped from or crushed by vehicles or mobile equipment. If mechanical saws are used to open batteries, this should be done in a contained enclosure with necessary measures in place to provide sufficient ventilation, extraction and abatement of emissions, safe collection of acid, and protection measures for site operatives (example of a ventilated battery saw). Battery acid must be directly collected and contained from battery breaking operations and held in enclosed acid-resistant tanks or containers provided with appropriate secondary and tertiary containment, and not allowed to collect, drain or accumulate on open surfaces.

11. Dust and acid mist emissions from lead acid battery treatment processes must be collected and passed to an appropriate abatement system (for example, a bag filter or wet scrubber). If gas containing acid mist is sent to a bag filter, mist filters should be installed. Scrubbing water must be sent to an adequately designed waste water treatment plant to treat the pollutants contained (for example, acids and metals).

12. Lead acid battery storage and treatment areas must be provided with acid resistant surfaces and sealed drainage systems to collect any spillages, which are connected to dedicated waste acid storage tanks or an on-site effluent treatment plant. All equipment used must be acid-resistant.

13. Any mechanical treatment of lithium batteries, or other batteries or wastes containing flammable substances (for example, electrolytes or solvents), must be done using specialised processes and plant that are designed and operated to prevent and minimise the risk of fire or explosion. The shredding of such wastes must be done safely under controlled conditions (for example, using an inert gas, under vacuum or in water) to prevent explosions or ignition of the flammable electrolyte and other combustible or flammable substances or materials. Where forced ventilation is used to prevent the risk of explosions, gas concentrations must be kept below 25 % of the lower explosive limit.

14. Your plant must be fitted with appropriate process monitoring and control systems, for example, to:

- detect any build-up of explosive or other hazardous gases
- detect changes in operation conditions, for example, temperature, pressure, oxygen concentration, air flow
- trigger appropriate automatic measures being taken (including, where necessary, safe plant shutdown) when relevant safe operating conditions and limits are approached or exceeded, for example, exceedance of oxygen concentration or lower explosive limit

15. You must take measures to prevent the corrosion of plant, equipment or other site infrastructure (including pipework, conveyors, vessels, flanges and fittings) that could come into contact with corrosive substances. Examples of corrosive substances include battery electrolytes (for example, sulphuric acid from lead acid batteries and potassium hydroxide from alkaline batteries) and associated substances or breakdown products (for example, hydrogen fluoride from the reaction between Li-ion battery electrolyte lithium hexafluorophosphate and water). Measures should include:

- use of corrosion resistant materials
- preventing or minimising the formation or deposit of corrosive substances
- regular inspection and maintenance

16. Shredded lithium-ion battery material that contains the electrolyte and associated organic solvents should be considered flammable unless tested and demonstrated otherwise. The battery treatment process should be designed and operated as a contained and abated system whereby electrolyte is promptly removed and collected from the shredded material as an integral part of the treatment process and prior to its storage. Treatment to remove the battery electrolyte typically involves drying and evaporation (usually under vacuum) or washing of the shredded material. Treatment processes carried out on shredded battery material must be carried out in a controlled or inert atmosphere unless it has been treated to remove the electrolyte and organic solvents.

17. Any organic solvents or other flammable liquids or gases collected from battery treatment processes must be stored in appropriate vessels that are approved for the safe storage of the chemicals in question and in accordance with all other relevant guidance, for example, HSG 51 The storage of flammable liquids in containers, HSG 176 The storage of flammable liquids in tanks and HSG 140 Safe use and handling of flammable liquids.

18. Certain wastes (for example, Li-ion batteries and associated waste liquids, fractions and residues) may contain substances (for example, organic solvents) that have the potential to form explosive atmospheres. Areas of the site where flammable or explosive atmospheres may occur (for example, waste storage, handling and processing areas) should be assessed and, where appropriate, classified into hazardous zones, in accordance with the requirements of DSEAR. Further guidance on DSEAR and hazardous area classification can be found on the HSE's website and in the Approved Code of Practice and guidance (L138).

19. Output fractions from lithium battery treatment processes may pose a fire risk if they contain substances such as residual electrolyte, organic solvents, or lithium and aluminium metal. Some fractions may also contain reactive chemicals that can generate harmful compounds if they come into contact with water (for example, thionyl chloride can react to produce hydrogen chloride and sulphur dioxide; lithium hexafluorophosphate can react to produce hydrogen fluoride). Such materials, including black mass, must be held in appropriate sealed containers, for example, UN approved steel drums, and stored under cover in a dry, well-ventilated location and away from potential sources of heat or ignition (including direct sunlight) and other flammable or combustible wastes. Pressure relief valves should be provided on containers if there is the potential for the accumulation of gases and spark arrestors should be fitted where necessary to reduce the risk of ignition of flammable gases.

20. Treatment processes must be designed and operated to maximise the recovery of output fractions and materials. Recovered materials include battery electrolytes, which can be recovered for re-use, for example, in the manufacture of new batteries or, in the case of sulphuric acid, used to produce gypsum. The metals used in battery electrodes, for example, the lead plate in lead acid batteries and the copper and aluminium foils in Li-ion batteries, can be recycled. The black mass recovered from the mechanical battery treatment processes can be treated further to recover metals (for example, cobalt, nickel, lithium, manganese and zinc) and graphite, typically involving the use of thermal or hydrometallurgical processes. Battery casing materials (for example, polypropylene from lead battery casings and metal casings from other types of batteries) should also be separated and recycled where possible.

21. Washing and rinsing processes (for example, for cleaning plastics or other recovered fractions or residues) must be undertaken in dedicated and contained plant and equipment, designed, monitored and maintained to provide effective washing to suitable a specification, and enclosed to contain potential fugitive emissions (for example, including VOCs, fumes, mists, spray and steam). Emissions must be collected and directed to appropriate abatement. Where possible, wash water should be reused and treated on-site using an appropriately designed waste

water treatment plant or sent for further treatment at an appropriately permitted facility.

5.4 Treatment of waste containing Brominated Flame Retardants (BFRs) and other POPs

1. You must identify, separate and remove any plastic containing BFRs for further treatment. Some BFRs are POPs.

2. You must not mix batteries containing POPs with other batteries during treatment. They must be treated separately. You may only treat batteries containing POPs if the treatment process separates the components or materials containing POPs for further treatment. Lead acid batteries with cases made of polymers other than polypropylene, particularly ABS, are likely to contain brominated flame retardants including POPs. Further information is available on the management of waste lead acid batteries containing POPs.

3. You must make sure that any components or materials derived from the treatment of waste batteries that are POPs waste (as defined by Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants) are treated as required by that regulation. This means the treatment must make sure the POP content is destroyed or irreversibly transformed. The only known cost effective way of doing this is by incineration or similar thermal treatment. You must not recycle these materials containing POPs.

4. The treatment of batteries that are not POPs waste, but which may contain POPs in some components or materials, may result in fractions where the POPs threshold is exceeded. You must assess such fractions to establish whether the threshold is exceeded and, where it is, manage those fractions as POPs waste.

5. You may treat materials (for example, plastic) that is POPs waste to separate the POPs containing fractions from the non-POPs containing fractions. For example, density separation can be used to separate plastic containing POPs from that which does not. The non-POPs fraction may then be recycled. You must demonstrate that your process reliably achieves a satisfactory separation.

6. You must fully characterise and classify (including for POPs) process solutions and washings from treatment processes, for example, density separation, before determining suitable disposal options. Where these originate from the treatment of POPs waste, any POPs must be destroyed.

7. If you separate POPs containing fractions (for example, containing BFRs) from non-POPs containing fractions, you must monitor at least once every 3 months how much POPs material is present in any fraction destined for recycling.

8. Other hazardous chemicals may be used as flame retardants. For example, antimony trioxide has been widely used as a synergist with a range of BFRs, not just those that are POPs. It is present in some plastics at concentrations exceeding the hazardous waste threshold. You must consider antimony trioxide when you are classifying plastic containing fractions from the treatment of waste batteries.

6. Emissions control appropriate measures

These are the appropriate measures for emissions control at regulated facilities with an environmental permit for the treatment or transfer of waste batteries.

You must identify, characterise and control emissions from your activities that may cause pollution. See our guidance on controlling emissions.

6.1 Point source emissions to air

1. You must contain waste treatment processes to make sure that you collect, extract and direct all process emissions to an appropriate abatement system for treatment before release.

2. You must identify the main chemical constituents of the site's point source emissions as part of the site's inventory of emissions to air. You must include the speciation of volatile organic compounds (VOCs) if you have identified them in the emissions inventory.

3. You must assess the fate and impact of the substances emitted to air, following the Environment Agency's air emissions risk assessment methodology.

4. To reduce point source emissions to air (for example, dust, metals (particulates and vapours), volatile organic compounds and odour) from the treatment of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems:

- adsorption
- fabric filter
- wet scrubbing
- HEPA filter
- condensation and cryogenic condensation
- cyclone
- electrostatic precipitator (ESP)
- thermal oxidation

This applies to all point source releases to air from waste treatment plant, including releases that are made inside a building, to help make sure that emissions are controlled at source and diffuse emissions are prevented.

5. You must ensure that waste gas treatment systems are appropriately designed (e.g. considering the maximum flow rate and pollutant concentrations), operated within their design ranges, and maintained (through preventive, corrective, regular and unplanned maintenance) to ensure optimal availability, effectiveness and efficiency of the equipment.

6. You must assess and design vent and stack locations and heights to make sure dispersion capability is adequate.

7. Where monitoring is required, including for odour, you must install a suitable monitoring point. Monitoring points will be required to meet MCERTS standards.

8. Your procedures must make sure you correctly install, operate, monitor and maintain abatement equipment. For example, this includes monitoring and maintaining:

- appropriate flow and chemical concentration of scrubber liquor
- the handling and disposal or regeneration of spent scrubber or filter medium

6.2 Fugitive emissions to air (including odour)

1. You must use appropriate measures to prevent emissions of dust, mud, litter and odour. See our guidance on suggested appropriate measures to control dust, mud and litter, and to control odour.

2. You must design, operate and maintain storage and treatment plant in a way that prevents fugitive emissions to air, including dust, volatile organic compounds, mists and odour. Where that is not possible, you must minimise these emissions.

Storage and treatment plant includes associated equipment and infrastructure such as:

- shredders
- sorting equipment
- conveyors
- skips or containers
- building fabric, including doors and windows
- pipework and ducting

3. You must make sure fugitive emissions are collected and directed to appropriate abatement and your treatment plant must use high integrity components (for example, seals or gaskets).

4. You must use your waste pre-acceptance, waste acceptance and site inspection checks and procedures to identify and manage wastes that could cause, or are causing, fugitive emissions to air. When you identify any of these wastes you must:

- take appropriate, risk assessed measures to prevent and control emissions
- prioritise their treatment or transfer

5. To prevent fugitive emissions to air from the storage and handling of odorous or dusty wastes, you should use a combination of the following measures:

- store and handle such wastes within a building or enclosed equipment
- keep buildings and equipment under adequate negative pressure with an appropriate abated air circulation or extraction system
- where possible, locate air extraction points close to potential emissions sources
- use fully enclosed material transfer and storage systems and equipment, for example, conveyors, hoppers, containers, tanks and skips
- keep building doors and windows shut to provide containment, other than when access is required for loading or unloading
- minimising drop heights

- use misting systems and wind barriers

6. Where a dust management plan is required, you must develop and implement it following our guidance on emissions management plans for dust.

Maintenance and cleaning

7. You must set up a leak detection and repair programme. You must use it to promptly identify and mitigate any fugitive emissions from treatment plant and associated infrastructure (such as pipework, conveyors, tanks).

8. You must regularly inspect and clean all waste storage and treatment areas, equipment (including conveyor belts) and containers. You must contain any residues collected during cleaning.

9. Your maintenance and cleaning schedules must make sure that your plant is regularly cleaned to avoid large-scale decontamination activities.

10. You must take measures to prevent the corrosion of plant and equipment (for example, including treatment plant, conveyors or pipes that may come into contact with corrosive battery electrolyte or associated substances, such as hydrogen fluoride). This includes:

- designing treatment processes to prevent or minimise the formation or deposition of corrosive substances
- selecting and using appropriate construction materials
- lining or coating equipment with corrosion inhibitors
- regularly inspecting, cleaning and maintaining plant

11. You must have an appropriate regular maintenance programme covering all buildings, plant and equipment. This must also include protective equipment such as air ventilation and extraction systems, curtains and fast-action doors used to prevent and contain fugitive releases.

Odorous wastes

12. You must have procedures to minimise the amount of time odorous wastes spend in your storage and handling systems (for example, pipes, conveyors, hoppers, tanks). In particular, you must have provisions to manage waste during periods of peak volume.

13. You must have measures to contain, collect and treat odorous emissions, including using contained buildings and plant or equipment with appropriate air extraction and abatement. We do not consider masking agents to be appropriate measures for the treatment of odorous emissions.

14. You must monitor and maintain odour abatement systems to ensure optimum performance. For example, you should make sure that scrubber liquors are maintained at the correct pH and replenished or replaced at an appropriate frequency.

15. Contaminated waters have potential for odours. You must store them in containers or enclosed tanks that are vented to an abatement system.

16. Where you expect odour pollution at sensitive receptors, or it has been substantiated, you must periodically monitor odour emissions using European (EN) standards. For example, either:

- dynamic olfactometry according to EN 13725 to determine the odour concentration
- EN 16841-1 or -2 to determine the odour exposure

17. If you are using alternative methods for which no EN standards are available (for example, estimating odour impact), you should use ISO, national or other international standards to make sure you use data of an equivalent scientific quality. You must set out the monitoring frequency in the odour management plan.

18. Where you expect odour pollution at sensitive receptors, or it has been substantiated, you must also set up, implement and regularly review an odour management plan. It must be part of your management system and include all of the following elements:

- actions and timelines to address any issues identified
- a procedure for conducting odour monitoring
- a procedure for responding to identified odour incidents, for example, complaints
- an odour prevention and reduction programme designed to identify the source(s), to characterise the contributions of the sources and to implement prevention and reduction measures

19. Where an odour management plan is required, you must develop and implement it following our guidance on odour management plans.

6.3 Emissions of noise and vibration

1. You should design the layout of the facility to locate potential sources of noise (including building exits and entrances) away from sensitive receptors and boundaries. You should locate buildings, walls, and embankments so they act as noise screens.

2. You must use appropriate measures to control noise, for example, including, but not limited to:

- adequately maintaining plant or equipment parts that may become noisier as they deteriorate – such as bearings, air handling plant, building fabric, and specific noise attenuation kit associated with plant or machinery
- closing doors and windows of enclosed areas and buildings
- avoiding noisy activities at night or early in the morning
- minimising drop heights and the movement of waste and containers
- using broadband (white noise) reversing alarms and enforcing the on-site speed limit
- using low-noise equipment, for example, drive motors, fans, compressors and pumps
- adequately training and supervising staff

- where possible, providing additional noise and vibration control equipment for specific noise sources – such as noise reducers or attenuators, insulation, or sound-proof enclosures

3. Where you expect noise or vibration pollution at sensitive receptors, or it has been substantiated, you must create, use and regularly review a noise and vibration management plan. This must be part of the environmental management system and must include:

- actions and timelines to address any issues identified
- a procedure for conducting noise and vibration monitoring
- a procedure for responding to identified noise and vibration events, for example, complaints

4. The noise and vibration management plan should also include a noise and vibration reduction programme designed to:

- identify the sources of noise and vibration
- measure or estimate noise and vibration exposure
- characterise the contributions of the sources
- implement prevention and reduction measures

5. Where a noise and vibration management plan is required, you must develop and implement it following our guidance on noise and vibration management plans.

6.4 Point source emissions to water and sewer

1. You must identify the main chemical constituents of the site's point source emissions to water and sewer as part of the site's inventory of emissions.

2. You must assess the fate and impact of the substances emitted to water and sewer following the Environment Agency's risk assessment guidance.

3. Except for uncontaminated surface water (for example, roof drainage), discharges to water must comply with the conditions of an environmental permit, and trade effluent consent if to sewer. Relevant sources of waste water include (but are not limited to):

- waste waters collected from treatment processes
- waste compactor runoff
- vehicle washing
- vehicle oil and fuel leaks
- washing of containers
- spills and leaks in waste storage areas
- loading and unloading areas
- uncovered storage areas

4. POPs may leach or wash out in particulates from some wastes, such as shredded plastic, if exposed to the weather. You must prevent the release of POPs to water or sewer by storing these wastes and any other shredded POPs waste under weatherproof covering. Waste waters from processes that treat POPs waste, which may contain POPs, must not be discharged to water or sewer.

5. To reduce emissions to water and sewer, if you need to treat waste water before discharge or disposal, you must use an appropriate combination of treatment techniques, including one or more of the following:

- preliminary or primary treatment – for example, equalisation, neutralisation or physical separation
- physico-chemical treatment – for example, adsorption, distillation or rectification, precipitation, chemical oxidation or reduction, evaporation, ion exchange, or stripping
- biological treatment – for example, activated sludge process or membrane bioreactor
- nitrogen removal – for example, nitrification and denitrification
- solids removal – for example, coagulation and flocculation, sedimentation, filtration or flotation

6.5 Fugitive emissions to land and water

1. You must use appropriate measures to control potential fugitive emissions and make sure that they do not cause pollution. See the guidance on emissions to water and leaks from containers.

2. You must have these in all operational areas of the facility:

- an impermeable surface
- sealed construction joints
- spill containment kerbs
- sealed drainage system

3. Your sealed drainage system must collect all surface water run-off and channel it to a blind sump unless it may be lawfully discharged to water or sewer.

4. You must collect and treat separately each water stream generated at the facility, for example, surface runoff water or process water. Separation must be based on pollutant content and treatment required. You must make sure you segregate uncontaminated water streams from those that require treatment.

5. You must use suitable drainage infrastructure to collect surface drainage from areas of the facility where you store, handle and treat waste. You must also collect washing water and spillages.

6. Depending on the pollutant content, you must either:

- recirculate what you have collected
- discharge it in accordance with an environmental permit or trade discharge consent
- send it for further treatment

7. You should provide appropriate buffer storage capacity at your facility to store waste waters, considering:

- potential abnormal operating scenarios and incidents
- the nature of any polluting substances and their impact on the downstream waste water treatment plant and receiving environment

8. You must have appropriate measures in place to monitor, treat and reuse the water held in the buffer storage before discharging.

9. You must have measures in place to prevent overflows and failures from tanks and vessels, including where relevant:

- overflow detectors and alarms
- directing over-flow pipes to a contained drainage system
- locating tanks and packaged liquids in suitable secondary containment (bunds)
- providing isolation mechanisms (for example, closing valves) for tanks, vessels and secondary containment

10. You must have design and maintenance provisions in place to detect and repair leaks. These must include regularly monitoring, inspecting and repairing equipment and minimising underground equipment and infrastructure.

11. You must take measures to prevent emissions from washing and cleaning activities, including:

- directing liquid effluent and wash-waters to foul sewer or collecting them in a sealed system for off-site disposal – you must not discharge them to surface or storm drains
- where possible, using biodegradable and non-corrosive washing and cleaning products
- storing all detergents, emulsifiers and other cleaning agents in suitable bunded or containment facilities, within a locked storage area, or in a building away from any surface water drains
- preparing cleaning or disinfection solutions in contained areas of the site and never in areas that drain to the surface water system

12. Where relevant, you must have measures to prevent pollution from the on-site storage, handling and use of oils and fuels. Follow the guidance on oil storage regulations for businesses.

Spill response plan

13. You must produce and implement a spillage response plan and train staff to follow it and test it.

14. Your procedures and associated training must make sure you deal with spillages immediately.

15. You must keep spill kits at locations close to areas where a spillage could occur and make sure relevant staff know how to use them. Make sure kits are replenished after use.

16. You must take measures to stop spillages from entering drains, channels, gullies, watercourses and unmade ground. You must make available proprietary sorbent materials, sand or drain mats for use when required.

17. You must make sure your spillage response plan includes information about how to recover, handle and correctly dispose of waste produced from a spillage.

Designing and maintaining surfacing and subsurface structures

18. For subsurface structures, you must:

- establish and record the routing of all site drains and subsurface pipework
- identify all sub-surface sumps and storage vessels
- engineer systems to minimise leakages from pipes and make sure they are detected quickly if they do occur, particularly where hazardous substances are involved
- provide secondary containment or leakage detection for sub-surface pipework, sumps and storage vessels
- establish an inspection and maintenance programme for all subsurface structures, for example, pressure tests, leak tests, material thickness checks or CCTV

19. For surfacing, you must design appropriate surfacing and containment or drainage facilities for all operational areas, considering:

- collection capacities
- surface thicknesses
- strength and reinforcement
- falls
- materials of construction
- permeability
- resistance to chemical attack and corrosion
- inspection and maintenance procedures

20. You must have an inspection and maintenance programme for impermeable surfaces and containment facilities.

Tanks and bunding

21. You must bund all above-ground tanks containing liquids whose spillage could be harmful to the environment. Bunds must:

- be impermeable and resistant to the stored materials
- have no outlet (that is, no drains or taps) and drain to a blind collection point
- have pipework routed within bunded areas with no penetration of contained surfaces
- be designed to catch leaks from tanks or fittings
- have a capacity greater than 110 percent of the largest tank or 25 percent of the total tankage, whichever is the larger
- have regular visual inspections – any contents must be pumped out or otherwise removed under manual control after checking for contamination
- be fitted with a high-level probe and an alarm (as appropriate) if not frequently inspected
- have tanker connection points within the bund (where possible), otherwise provide adequate containment
- have programmed engineering inspections – normally visual, but extending to water testing if structural integrity is in doubt
- be emptied of rainwater regularly to maintain their containment capacity

7. Emissions monitoring and limits appropriate measures

These are the emissions limits and appropriate measures for monitoring emissions to air and water at regulated facilities with an environmental permit for the treatment or transfer of waste batteries.

We may set emission limits and monitoring requirements in your permit, based on your emissions inventory and environmental risk assessment. We may mean we need to set emission limits lower than those provided in this guidance to protect the environment.

Where you are required to monitor emissions to comply with the requirements of your environmental permit you must follow our monitoring guidance when carrying this out.

You must create and maintain an inventory (emissions inventory) of point source emissions to air and water (including emissions to sewer) for your facility.

7.1 Point source emissions to air

1. Your facility's emissions inventory must include information about the relevant characteristics of point source emissions to air, such as the:

- average values and variability of flow and temperature
- average concentration and load values of relevant substances and their variability
- flammability, lower and higher explosive limits and reactivity
- presence of other substances that may affect the waste gas treatment system or plant safety – for example, oxygen, nitrogen, water vapour, dust

2. Monitoring locations must meet MCERTS standards. Monitoring must be carried out using MCERTS qualified accredited methods and MCERTs certified staff. Further guidance can be found in our guidance M1 sampling requirements for stack emissions monitoring.

3. You must carry out emissions monitoring when the plant is operating at or near to full treatment capacity. Information regarding the plant treatment processing rate and air flow rate at the time of monitoring must be recorded and submitted with the monitoring results.

4. You must monitor point source emissions to air from your treatment plant for the following substances using the monitoring standards stated. You must monitor at the frequencies stated and meet the specified emission limits unless your permit states alternative requirements.

Channelled emissions to air from the mechanical treatment of waste batteries

Dust
Monitoring standard – EN 13284-1
Frequency – every 6 months

Emission limit – 5 mg/m³

In addition, you should monitor for the following substances and meet the specified emission limits where the substance concerned is identified as relevant based on your facility's emissions inventory unless your permit states alternative requirements.

TVOC (Total Volatile Organic Compounds)
Monitoring standard – EN 12619
Frequency – every 6 months
Emission limit – 30 mg/m³

Dioxin-like Polychlorinated biphenyls (PCBs)
Monitoring standard – EN 1948-1, -2 and -4
Frequency – every 12 months

Dioxins and Furans (PCDD/F)
Monitoring standard – EN 1948-1, -2 and -3
Frequency – every 12 months

Brominated flame retardants (BFRs)
Monitoring standard - BS EN 1948-1
Frequency – every 12 months

Metals and metalloids excluding mercury
(including As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V)
Monitoring standard – EN 14385
Frequency – every 12 months

Total mercury
Monitoring standard – EN 13211.
Frequency – every 3 months
Emission limit – 7 µg/m³

Sulphuric acid
Monitoring standard – US EPA method 8
Frequency – every 6 months
Emission limit – 10mg/m^3

Hydrogen Chloride
Monitoring standard – EN 1911
Frequency – every 6 months
Emission limit – 10mg/m^3

Hydrogen Fluoride
Monitoring standard – EN TS 17340
Frequency – every 6 months
Emission limit – 1mg/m^3

Sulphur Dioxide
Monitoring standard – EN 14791 or CEN TS 17021
Frequency – every 6 months
Emission limit – 150mg/m^3

Ammonia
Monitoring standard – EN ISO 21877
Frequency – every 6 months
Emission limit – 10mg/m^3

Periodic monitoring results should consist of the average value of 3 consecutive measurements of at least 30 minutes each. For some parameters, due to analytical limitations, a longer sampling period may be required (for example, dioxins and furans and dioxin-like PCBs should be monitored over a single period of at least 6 hours).

Monitoring frequencies may be reduced if emission levels are proven to be sufficiently stable over time.

Other monitoring requirements and limits may also apply to other relevant substances that are identified through you emissions inventory, depending upon the type and composition of the waste batteries treated and nature of your treatment process.

7.2 Point source emissions to water or sewer

1. Your facility's emissions inventory must include information about the relevant characteristics of point source emissions to sewer or water, such as:

- average values and variability of flow, pH, temperature, and conductivity
- average concentration and load values of relevant substances and their variability – for example, COD (chemical oxygen demand) and TOC (total organic carbon), nitrogen species, phosphorus, metals, priority substances or micropollutants
- data on bio-eliminability – for example, BOD (biological oxygen demand), BOD to COD ratio, Zahn-Wellens test, biological inhibition potential, for example, inhibition of activated sludge

2. For relevant emissions to water or sewer identified by the emissions inventory, you must carry out monitoring of key process parameters (for example, waste water flow, pH, temperature, conductivity, or BOD) at key locations. For example, these could either be at the:

- inlet or outlet (or both) of the pre-treatment
- inlet to the final treatment
- point where the emission leaves the facility boundary

3. For the following types of discharges, you must monitor point source emissions to water or sewer for the substances listed using the monitoring standards stated. You must meet the specified emission limits unless your permit states otherwise.

Direct discharges to water from the mechanical treatment of waste batteries

TOC
Monitoring standard – EN 1484
Frequency – every month
Emission limit – 60 mg/l

COD
Frequency – every month
Emission limit – 180 mg/l
The requirement is to monitor for either total organic carbon or chemical oxygen demand

Total suspended solids
Monitoring standard – EN 872
Frequency – every month
Emission limit – 60 mg/l

Direct or indirect discharges to water from the mechanical treatment of waste batteries

Hydrocarbon oil index
Monitoring standard – EN ISO 9377-2
Frequency – every month
Emission limit – 10 mg/l

Direct or indirect discharges to water from the mechanical treatment of waste batteries, when the substance concerned is identified as relevant based on your facility's emissions inventory

Metals and metalloids
Monitoring standard – various EN standards available
Frequency – every month
Emission limits:

- arsenic, 0.05 mg/l
- cadmium, 0.05 mg/l
- chromium, 0.15 mg/l
- copper, 0.5 mg/l
- lead, 0.1 mg/l
- nickel, 0.5 mg/l
- mercury, 0.005 mg/l
- zinc, 1.0 mg/l
- manganese (limit set based upon environment risk assessment)
- cobalt (limit set based upon environment risk assessment)

Perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS) and Decabromodiphenyl (deca-BDE)
Monitoring standard – BS ISO 25101 (for PFOA and PFOS)
Frequency – every 6 months

Monitoring frequencies may be reduced if the emission levels are proven to be sufficiently stable over time.

Monitoring frequencies for discharges to sewer may be reduced if the downstream waste water treatment plant abates the pollutants concerned.

8. Process efficiency appropriate measures

These are the appropriate measures for process efficiency at regulated facilities with an environmental permit for the treatment or transfer of waste batteries.

For your facility, you must monitor and review the annual quantity of:

- water, energy and raw materials used
- residues and waste water produced

You must do this at least once every year.

8.1 Energy efficiency (installations only)

1. You must create and implement an energy efficiency plan at your facility. This must:
    - define and calculate the specific energy consumption of the activity (or activities) you carry out and waste stream(s) you treat
    - set annual key performance indicators – for example, specific energy consumption (expressed in kWh/tonne of waste processed)
    - plan periodic improvement targets and related actions

2. You must regularly review and update your energy efficiency plan as part of your facility's management system.

3. You must have and maintain an energy balance record for your facility. This must provide a breakdown of your energy consumption and generation (including any energy or heat exported) by the type of source (electricity, gas, conventional liquid fuels, conventional solid fuels, and waste). You should provide Sankey diagrams or energy balances to show how energy is used in your waste treatment processes.

4. You must regularly review and update your energy balance record as part of your facility's management system, alongside the energy efficiency plan.

5. You must have operating, maintenance and housekeeping measures in place in relevant areas, for example, for:
    - air conditioning, process refrigeration and temperature exchange systems (leaks, seals, temperature control, evaporator or condenser maintenance)
    - the operation of motors and drives
    - compressed gas systems (leaks, procedures for use)
    - steam distribution systems (leaks, traps, insulation)
    - space heating and hot water systems
    - lubrication to avoid high friction losses
    - boiler operation and maintenance, for example, optimising excess air
    - other maintenance relevant to the activities within the facility

6. You must have measures in place to avoid gross energy inefficiencies. These should include, for example:
    - insulation
    - containment methods (such as seals and self-closing doors)

- avoiding unnecessary discharge of heated water or air (for example, by fitting simple control systems such as timers and sensors)

7. You should implement additional energy efficiency measures at the facility as appropriate, following our guidance on energy efficiency standards for industrial plants.

8.2 Raw materials (installations only)

1. You must maintain a list of the raw materials used at your facility and their properties. This includes auxiliary materials and other substances that could have an environmental impact.

2. You must regularly review the availability of alternative raw materials and use any suitable ones that are less hazardous or polluting. This should include, where possible, substituting raw materials with waste or waste-derived products.

3. You must justify the continued use of any substance for which there is a less hazardous alternative.

4. You must have quality assurance procedures in place to control the content of raw materials.

8.3 Water use (installations only)

1. You must take measures to make sure you optimise water consumption to:

- reduce the volume of waste water generated
- prevent or, where that is not practicable, reduce emissions to soil and water

2. Measures you must take include:

- implementing a water saving plan (involving establishing water efficiency objectives, flow diagrams and water mass balances)
- optimising the use of washing water (for example, dry cleaning instead of hosing down, using trigger control on all washing equipment)
- recirculating and reusing water streams within the plant or facility, if necessary, after treatment
- the use of water for vacuum generation (for example, using liquid ring pumps with high boiling point liquids), where relevant

3. You must carry out a regular review of water use (a water efficiency audit) at least every 4 years.

4. You must also:

- produce flow diagrams and water mass balances for your activities
- establish water efficiency objectives and identify constraints on reducing water use beyond a certain level (usually this will be site specific)
- identify the opportunities for maximising reuse and minimising use of water
- have a timetabled improvement plan for implementing additional water reduction measures

5. To reduce water use and associated emissions to water, you should apply these general principles in sequence:

- use water efficient techniques at source where possible
- reuse water within the process, by treating it first if necessary – if not practicable, use it in another part of the process or facility that has a lower water quality requirement

6. If you cannot use uncontaminated roof and surface water in the process, you should keep it separate from other discharge streams – at least until after you have treated the contaminated streams in an effluent treatment system and have carried out final monitoring

7. You should establish the water quality requirements associated with each activity and identify whether you can substitute water from recycled sources. Where you can, include it in your improvement plan.

8. Where there is scope for reuse (for example, after treatment) you should keep less contaminated water streams, such as cooling waters, separate from more contaminated streams.

9. You must minimise the volume of water you use for cleaning and washing down by:

- vacuuming, scraping or mopping in preference to hosing down
- reusing wash-water (or recycled water) where practicable
- using trigger controls on all hoses, hand lances and washing equipment

10. You must directly measure fresh water consumption and record it regularly at every significant usage point, ideally on a daily basis.

8.4 Waste minimisation, recovery and disposal

1. You must have and implement a residues management plan that:

- minimises the generation of residues arising from waste treatment
- optimises the reuse, regeneration, recycling or energy recovery of residues, including packaging
- makes sure you properly dispose of residues where recovery is technically or economically impractical

2. Where you must dispose of waste, you must carry out a detailed assessment identifying the best environmental options for waste disposal.

3. You must review options for recovering and disposing of waste produced at the facility on a regular basis. You must do this as part of the management system to make sure you are:

- still using the best environmental options
- promoting the recovery of waste where technically and economically viable

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