

DESIGNING AND OPERATING MATERIAL RECOVERY FACILITIES (MRFs) SAFELY

This guidance has been developed by the Waste Industry Health and Safety (WISH) Forum to help control safety and health risks in the waste management industry associated with designing and operating material recovery facilities (MRFs) safely. The Health and Safety Executive (HSE) was consulted in the production of this publication. It endorses the sensible, proportionate, reasonable and balanced advice to owners on managing the risk from this guidance during the waste-related activities as set out in the guidance.

This guidance gives advice on the main health, safety and welfare issues at material recovery facilities (MRFs). The guidance is primarily aimed at designers/manufacturers, installers and users involved in developing and operating MRFs, also sometimes called material recycling or reclamation facilities. It explains how to remove or reduce key general health and safety risks associated with designing and operating an MRF. It includes advice about how to assess hazards and provides solutions that will help eliminate or reduce the risk of serious injury or ill health.



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1. Introduction

This guidance was produced by Waste Industry Safety and Health Forum (WISH) in consultation with the Health and Safety Executive. There has been an increase in the use of MRFs in the UK because of changes in waste management operations. This guidance highlights the main health and safety issues to consider when designing, installing, making alterations to, or operating an MRF. It also provides guidance on welfare issues in MRFs. The guidance cannot cover every risk and is not comprehensive. It does however identify other sources of information, but in some cases you may need to refer to a health and safety professional. Although it is primarily aimed at designers, managers, supervisors and users of MRFs, it may also interest safety professionals who may advise waste management companies and those working at such sites. General text, such as explanation of what the section is about and which does not require a sub-section number or similar.

2. Assessing the risks

The Management of Health and Safety at Work Regulations 1999 require employers and self-employed people to carry out a suitable and sufficient risk assessment of their activities.

Your risk assessment will help you to:

- Identify the hazards that can cause harm;
- Identify who is at risk, eg workers, contractors, subcontractors, agency and temporary workers, members of the public or visitors;
- Assess the risks from those hazards;
- Eliminate or reduce risks (by using appropriate control measures), so far as is reasonably practicable;
- Record any significant findings.

Your risk assessment should be regularly reviewed to ensure that any control measures put in place remain effective. When reviewing, you should consider the following:

- Are there safe systems of work in place that reflect the risks associated with the activities
- Do your employees follow those systems of work? If not, why not?
- Are your systems adequate to control the risk? Do they need revising?
- Are the procedures and checks you have put in place sufficient?
- Do you need to do certain tasks more (or less) frequently?
- Are there any changes to the working environment that might have an impact?

This guidance gives information that will help you comply with the law, and may be used to help with the risk assessment process. It is not, however, a substitute for a suitable and sufficient site or task-specific risk assessment based upon individual site conditions, layout, structure, the exact nature of the activities, the types of waste material involved and other factors. For further information about risk assessment, visit www.hse.gov.uk/risk.

3. Workplace transport

Transport operations associated with vehicle movements in MRFs represent a risk of serious or fatal accidents to workers and others. Traffic routes for MRFs (for both the site and its buildings) should be properly designed to permit safe traffic movement. A risk assessment should be carried out for all workplace transport activities. Consider each of the following:

Safe site:

- Is it organised so that pedestrians and vehicles are kept apart?
- Are vehicle and pedestrian traffic routes clearly marked and are signs clearly visible?
- Are there site rules and are they enforced?
- Are reversing operations kept to a minimum?

Safe driver:

- Are they qualified and competent?
- Is their training up to date?
- Are they aware of their health and safety responsibilities?
- Do they have the correct personal protective equipment (PPE)?

Safe vehicle:

- Is it right for the job?
- Is it maintained, inspected and repaired regularly?
- Can it be accessed safely to minimise the need for work at height?
- Has it been fitted with any safety devices, eg mirror, CCTV, reversing alarms, radar, flashing beacons?

You can find more information on HSE's workplace transport website at www.hse.gov.uk/workplacetransport. Guidance specifically for the waste industry can be found in *Safe transport in waste management and recycling facilities* and *Hand sorting of recyclables ('totting') with vehicle assistance*.

4. Machinery

The designer should ensure work equipment is suitable for its intended purpose. Where different machines are put together to form a process or line, the supplier and user should consider their interactions. You may need to consult someone with sufficient expertise in safety matters (see *Buying new machinery* for guidance on this).

Carry out an assessment of the machinery in an MRF to ensure it is safe to use. When choosing the appropriate safeguards, consider the following:

- What guarding is appropriate:
 - Use **fixed guards** to enclose the dangerous parts, whenever practical. They should be secured in place so they cannot be easily removed without a tool (eg screws or nuts and bolts, Allen bolts etc);
 - Use **perimeter guarding**/fencing to enclose a number of machines. (If perimeter fencing is fitted, the gap between the fence and the machine should normally be sufficiently small to prevent anybody remaining in it without being detected);
 - If regular access to dangerous parts is essential (eg to clear blockages, lubricate or clean), use moveable guards/gates fitted with **interlocking devices** so that the machine cannot start before the guard is closed and cannot be opened while the machine is still moving. These devices must be designed and installed so that they are difficult or impossible to bypass or defeat
- Providing adequate emergency stop arrangements for moving machinery, eg conveyor belts;
- Whether permit-to-work systems and effective isolation are required for cleaning, blockage clearing or maintenance and repair operations (see HSE's safe maintenance website www.hse.gov.uk/safemaintenance/permits.htm for guidance on this);
- Machinery siting (especially access, lighting and maintenance arrangements) and in particular:
 - Whether there is adequate access to maintenance points, eg lubrication points so they can be reached from the ground or a secure working platform rather than a ladder. Note that working platforms should have adequate side protection and no open edges at platform level (eg the benchmark should be at least that of guardrails and toe boards to the standards found at scaffolding);
 - Adequate access to machinery that requires cleaning.

Further guidance can be found on HSE's work equipment and machinery website at www.hse.gov.uk/work-equipment-machinery and in *Recover paper safely: Guidance for the recovered paper industry*.

5. Ergonomics

MRFs have specific ergonomic demands when workers are hand sorting materials and you should consider these fully at the design stage.

- Design picking conveyors so that the belt height and width do not require excessive reaching or bending.
- The line speed should not be too fast. Musculoskeletal risks from repetitive arm movements and stress can result from excessive pick rates. Throughput volume, types of items being picked and pick targets may also lead to excessive pick rates.
- Line speeds that are too fast (>10 m/min) can also cause motion sickness.
- Transfer points should not require operators to bend or twist excessively when taking items from the belt and placing them in the transfer chute.
- What types of materials operators are expected to throw – very light materials require a lot of effort, very heavy materials can be tiring.
- Avoid people having to stand on cold/hard floors with no facility to rest or change position. Where it is advantageous, and reasonably practicable, consider providing seats, foot bars and anti-fatigue insulated matting.
- Provide adequate lighting of picking lines.
- Do not expose operators to excessive vibration.

Further guidance is available in *Upper limb disorders in the workplace*, *Conveyor belt workstation design* and *Ergonomics and human factors at work*.

6. Working environment for 'pickers'

It is preferable to provide proper isolated 'picking cabins', rather than to operate from picking belts exposed to hazards from other parts of the process, such as:

- Noise;
- Moving vehicles;
- Tipping and loading operations;
- Excessive dust;
- Vibration.

Picking cabins provide a degree of isolation from these hazards and enable you to provide economical heating for staff.

7. Dust

Segregating pickers from the general environment by providing picking cabins also makes it easier to provide any necessary effective local exhaust ventilation to deal with dust and bioaerosols. Some picking cabins have a separate ventilation system of fresh air exchange or positive pressure to effectively prevent the entry of dust and bioaerosols from any nearby tipping, screening or similar operations that liberate dust into the atmosphere. Options you can consider include:

- Providing a suitably ventilated picking cabin;
- Providing local exhaust ventilation (lev) where required and good design of general building ventilation to prevent any liberated dust accumulating in the working atmosphere. Further guidance on the legal requirements and practical methods for buying and using lev to control airborne contaminants at work can be found on HSE's lev webpages at www.hse.gov.uk/lev ;
- Making sure the machinery design and location does not compromise ventilation or expose operators to excessive noise;
- Providing suitable ventilation/air filtration fitted vehicles (particularly in the tipping area);
- Providing facilities to enable rejection of heavily contaminated loads;
- Providing suitable cleaning equipment (ie using vacuum cleaners rather than compressed air or manual sweeping which can create dust clouds).

You can find more guidance on the legal requirements and practical methods for reducing exposure to dusts and bioaerosols on HSE's waste management and recycling website at www.hse.gov.uk/waste and on HSE's Control of Substances Hazardous to Health (COSHH) website www.hse.gov.uk/coshh.

8. Noise

Noise is also a concern in MRFs. Items of machinery and operations which produce noise should, so far as is reasonably practicable, be located and operated away from where people are routinely required to work. Examples include:

- Overband magnets;
- Eddy-current devices;
- Changes in conveyor direction/level (where one conveyor drops waste onto another);
- Screens (vibrating, trommel etc).

Further guidance on the legal requirements and practical methods for reducing noise exposure can be found on HSE's noise at work website at www.hse.gov.uk/noise .

9. Space and access

Consider the following when assessing space and access in an MRF:

- Provide sufficient space for, and suitable access to, storage areas.
- Provide suitable access to high-level operating areas. For example try to avoid access steps to working stations that are excessively steep, or elevated working platforms that need to be accessed by vertical ladders, or having insufficient headroom above the working station.
- Provide storage that can accommodate periods when materials cannot be moved from site, or as capacity increases.
- Design pick-up and drop points to make sorting materials easy.
- Provide adequate fixed access and space for cleaning, blockage clearing, materials observation, repair and maintenance operations.
- Provide adequate space for fire escapes.
- Avoid blind bends where possible; where you cannot avoid them, consider measures such as mirrors to help drivers and pedestrians see what is round the corner.
- Provide separate vehicle and pedestrian access points to buildings and operational areas to ensure pedestrian/vehicle separation.
- Provide suitable storage space for staff to keep their PPE and other essential items (respirators, gloves, vacuum cleaners etc) clean.

10. Welfare

In MRFs there are important environmental and welfare considerations.

- Provide a 'reasonable' working temperature at workstations. Where the work involves severe physical effort, the temperature should be at least 13°C, and at least 16°C otherwise.
- Provide adequate lighting. Good lighting is less fatiguing for staff and also makes tasks easier to perform (eg better waste segregation, faster blockage clearance etc).
- Floor materials should be suitable and fit for purpose. In MRFs, they should be durable enough for the work carried out, and minimise slip/trip risks. Also, remember that open steel gridwork is not always the preferred option, as it can make the consequences of any fall more severe. Consider anti-fatigue flooring materials where a substantial part of the work is done standing.
- Consider the quality and location of toilet/washing facilities. They should also be designed to be easily cleaned.
- Good personal hygiene is vital for waste and recycling workers, to prevent infections and other ill health that may be caused by working with waste.
- Provide suitable personal protective equipment, when skin is likely to become contaminated.
- Advise workers who handle waste to wash their hands before eating and drinking, and before wearing gloves.

- Provide adequate education and training to ensure workers understand the importance of hygiene and use the facilities that are available.
- Consider having a reporting system for ill health complaints to help analyse sickness absence.

Further guidance is available in the HSE leaflets *Workplace health, safety and welfare: A short guide for managers*, *Stay clean – stay healthy: Looking after your health in the waste/recycling industry* and HSE's skin at work website at www.hse.gov.uk/skin .

11. Fire

There is a risk of fire in MRFs, and this risk can increase depending on the type of materials processed and how they are processed. For example:

- Paper and timber can ignite readily;
- Plastics and rubber give off toxic smoke;
- Some materials can become explosive if in a fine condition (eg certain dusts).

Sources of ignition can include:

- Poorly installed and/or maintained electrical equipment that can spark or overheat;
- Poorly installed and/or maintained mechanical equipment, such as bearings, that can overheat;
- Smoking;
- Batteries and accumulators;
- 'Tramp' metal that finds its way into moving machinery and causes localised 'hot spots'. Prevent metal getting into moving machinery by pre-sorting and/ or extraction by a magnet/eddy current separator, especially when ignitable or explosive materials are present;
- Poorly controlled hot work (welding, burning etc). Where there are flammable materials, risk assess hot work and put effective measures into place to reduce the risk of fire. You may need to carry out hot work under a rigorous permit-to-work system;
- Some materials, such as rubber crumb, have been reported to have ignited spontaneously (see *spontaneous heating of piled tyre shred and rubber crumb – briefing note* at www.hse.gov.uk/rubber/spontaneous.htm). Paper and other cellulose-based materials have reportedly been known to self-heat, and have even ignited where stocks are so large that the heat cannot radiate safely. The product trade associations for these materials may be able to provide you with further guidance on precautions.

References and further reading

Safe transport in waste management and recycling facilities Waste09 HSE Books 2004

www.hse.gov.uk/pubns/waste09.htm

Hand sorting of recyclables ('toting') with vehicle assistance Waste18(rev1) HSE Books 2012

www.hse.gov.uk/pubns/waste18.htm

Buying new machinery: A short guide to the law and your responsibilities when buying new machinery for use at work Leaflet INDG271(rev1) HSE Books 2011 www.hse.gov.uk/pubns/indg271.htm

BS EN 1088:1995+A2:2008 *Safety of machinery. Interlocking devices associated with guards. Principles for design and selection* British Standards Institution

Recover paper safely: Guidance for the recovered paper industry Leaflet INDG392 HSE Books 2004

www.hse.gov.uk/pubns/indg392.htm

Upper limb disorders in the workplace HSG60 (Second edition) HSE Books 2002 ISBN 978 0 7176 1978 8

www.hse.gov.uk/pubns/books/hsg60.htm

Conveyor belt workstation design General Information Sheet GEIS4 HSE Books 2012

www.hse.gov.uk/pubns/geis4.htm

Ergonomics and human factors at work: A brief guide Leaflet INDG90(rev3) HSE Books 2012

www.hse.gov.uk/pubns/indg90.htm

Workplace health, safety and welfare: A short guide for managers Leaflet INDG244(rev2) HSE Books 2007

www.hse.gov.uk/pubns/indg44.htm

Stay clean – stay healthy. Looking after your health in the waste/recycling industry INDG415 HSE Books 2007

www.hse.gov.uk/pubns/indg415.htm

HSE materials recovery facility website www.hse.gov.uk/waste/mrf.htm

HSE waste website www.hse.gov.uk/waste

HSE transport website www.hse.gov.uk/workplacetransport/index.htm

Controlling fire and explosion risks in the workplace: A brief guide to the Dangerous Substances and Explosive Atmospheres Regulations Leaflet INDG370(rev1) HSE Books 2013 www.hse.gov.uk/pubns/indg370.htm

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Fire and explosion risks from pentane in expandable polystyrene (EPS) HSE Books 1998

www.hse.gov.uk/pubns/PPS1.htm (Advice about fire-fighting equipment, means of escape etc is available from your local fire authority)

Managing offensive/hygiene waste Waste22 HSE Books 2009 www.hse.gov.uk/pubns/waste22.htm *Providing and using work equipment safely: A brief guide to the law* Leaflet INDG291(rev1) HSE Books 2012

www.hse.gov.uk/pubns/indg291.htm

Safe working with flammable substances Leaflet INDG227 HSE Books 1996

www.hse.gov.uk/pubns/indg227.htm

Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Third edition) HSE Books 2008 ISBN 978 0 7176 6295 1

www.hse.gov.uk/pubns/books/l22.htm

Workplace transport safety: A brief guide Leaflet INDG199(rev2) HSE Books 2012

www.hse.gov.uk/pubns/indg199.htm

Workplace transport safety: An employers' guide HSG136 (Second edition) HSE Books 2005 ISBN 978 0 7176 6154 1 www.hse.gov.uk/pubns/books/hsg136.htm

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

Further information

This guidance is issued by the Waste Industry Health and Safety (WISH) Forum to help control safety and health risks. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance. Some parts of the guidance represent good practice and may go further than the minimum needed to comply with the law.

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