

## SAFE DESIGN AND OPERATION OF MATERIALS RECOVERY FACILITIES

This guidance has been developed by the Waste Industry Health and Safety (WISH) Forum to help control safety and health risks associated with the design and operation of materials recovery facilities (MRFs), also sometimes called material recycling or reclamation facilities, recycling plants/factories and similar. The Health and Safety Executive (HSE) was consulted in the production of this publication. It endorses the sensible, proportionate, reasonable, and balanced advice on managing risk during waste-related activities as set out in the guidance.

This guidance is primarily aimed at designers/manufacturers, installers, managers, supervisors, safety professionals and users involved in developing and operating MRFs. It explains how to eliminate or reduce some of the key health and safety risks associated with designing and operating MRFs. This guidance does not aim to be comprehensive and is an overview only: it only covers the most common or main risks. It does not cover general issues which are common to other types of facility and for which there is already an adequate supply of advice. For example, it does not cover first aid provision or PPE (personal protective equipment), except where there are waste specific issues. This guidance also does not aim to be a technical document and you should seek competent advice as required.

Various other WISH and HSE documents are referred to in this guidance and links are provided. You **will** need to read these other documents and should **not** rely on this guidance as your only source of information – it is an ‘umbrella’ document only (see appendix 1 for navigator to other WISH advice). All WISH guidance and similar documents are available as free of charge downloads from the WISH website at: <https://www.wishforum.org.uk/>.



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**Appendix 1.** Navigator table showing other related WISH documents referred to in this guidance

## 1. Introduction and scope

We need to recycle and recover more wastes to provide society with a more sustainable future. We also need to do this safely and with consideration to worker safety, health, welfare, and wellbeing. Over the past two decades the amount of waste recycled and recovered in GB has increased significantly. To achieve this the number and variety of materials recovery facilities (MRFs) and similar sites in operation has also increased significantly. In some areas the risks to worker safety and health have likewise increased. For example, prior to the year 2000 zero fatal machinery safety accidents were recorded by the GB waste and recycling sector. Today, machinery safety is the most common cause of fatal accidents on GB waste management sites, currently running at an average of three fatal machinery accidents a year.

The term 'MRF' is generic and covers a wide variety of facilities. Typically they consist of 'components,' such as screens, picking cabins, over-band magnets etc, aimed at separating mixed or co-mingled wastes into their individual materials and/or changing the physical nature of the waste, such as via balers and shredders. Commonly, these components are linked by means of transporting the waste between them, such as conveyors, 'gravity' chutes and similar. MRFs can be small and simple, such as a basic conveyor system with a picking cabin, or large and complex, such as a completely automated process consisting of many components. This guidance covers all of the above types of facility, including those systems which may be part of a larger assembly, such as a recycling line as pre-treatment for a WtE (waste to energy) plant. It does not directly cover facilities such as hazardous waste treatment plants, anaerobic digestors, composting facilities etc, although the principles may still apply.

As noted on page one of this document, it is not the intention of this guidance to be a 'one-stop-shop' for the safe design and operation of MRFs. Only the main and specific risks are covered. General issues such as office safety, first aid, PPE etc are more than adequately covered in other freely available guidance.

**Tips** – throughout this guidance various 'tips' are given in green tint boxes. These are not part of this formal guidance and are included simply to assist you in making your own decisions.

## 2. Traffic management

MRFs tend to have more and more complex traffic movements than other types of waste facility: collections vehicles depositing wastes, larger lorries taking recyclates away, internal traffic movements by mobile plant etc. In addition, MRFs also tend to have more pedestrians on site. Traffic incidents are one of the most common causes of fatalities on MRF and similar sites. Traffic management needs to be considered carefully during design and operation.

### 2.1 Basic principles

Waste management specific guidance is available at: <https://www.wishforum.org.uk/wp-content/uploads/2019/06/WASTE-09-.pdf> (WISH WASTE 09 'Safe transport at waste and recycling sites'). The general principles of good traffic management can be found in HSE (Health and Safety Executive) guidance at: <https://www.hse.gov.uk/workplacetransport/>. These two sources of information should be studied along with the below. Specifically for MRFs, traffic routes (both external and in buildings) should be properly designed to permit safe traffic movement. A risk assessment should be carried out for all workplace transport activities. Considerations should include:

#### Safe site:

- Is it organised so that pedestrians and vehicles are kept apart, ideally by physical means such as traffic barriers and/or separate vehicle and pedestrian routes?
- If used, are vehicle and pedestrian traffic routes clearly marked and are signs clearly visible?
- Are there site rules for traffic management and are they enforced?
- Are reversing operations, so far as is practical, kept to a minimum?

#### Safe driver – all vehicles including mobile plant:

- Are all drivers/plant operators trained, qualified and competent
- Is their training up to date and are they aware of their health and safety responsibilities?

#### Safe vehicle:

- Is it the right vehicle for the job?
- Is it maintained, inspected, and repaired regularly?
- Can it be accessed safely to minimise the need for work at height?
- Has fitment of appropriate safety devices been considered, such as enhanced mirrors, CCTV (rear-view and other), reversing alarms, radar, flashing beacons?

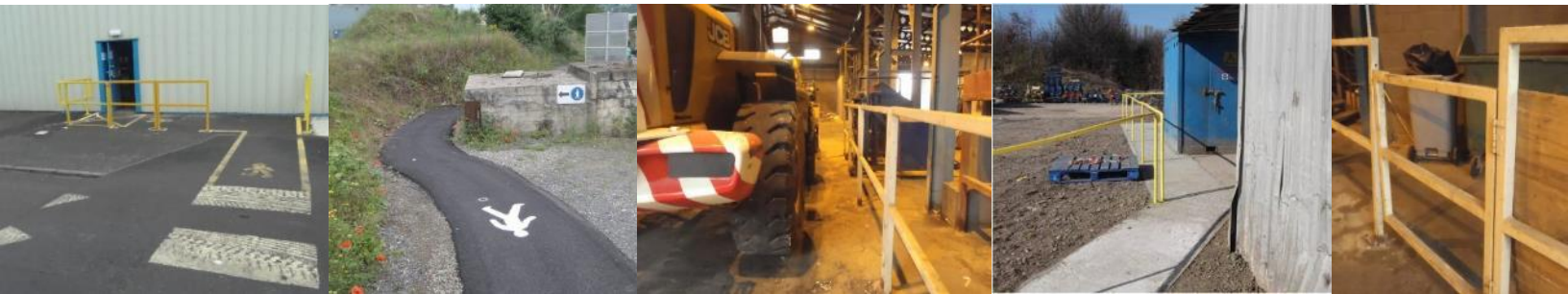
## 2.2 Separation and segregation of pedestrians and vehicles

One of the main underpinning principles of good traffic management is the separation/segregation of pedestrians from moving vehicles: if pedestrians and vehicles are not together in the same area then a pedestrian/vehicle traffic accident cannot occur. MRFs should be designed and operated with the methods below considered, in the order they are listed in:

- Where practical, physical separation of pedestrians and vehicles, such as pedestrian routes which run away from roads and other vehicle movement areas
- Where the above is not practical, physical segregation of pedestrians and vehicles, such as the use of robust traffic barriers between vehicle movement areas and pedestrian areas (traffic cones, plastic barriers etc are not robust physical separation)
- Where neither of the above are practical, the use of clearly marked walkways and their maintenance in good clearly visible condition
- Where none of the above is practical, robust, clear, and enforced rules and procedures

Many MRFs have picking cabins or other 'occupied' areas pedestrians need to access. Walkways to these should be designed to avoid traffic areas. For example, a walkway which runs externally round the rear of a recycling hall to allow pedestrian access to a picking cabin which does not involve them walking across the tipping floor or similar. However, human behaviour needs to be considered. For example, long circuitous pedestrian walkways may result in workers taking shortcuts rather than following allocated routes.

Vehicle access doors, such as roller-shutter doors, should not be used for pedestrian access. Separate pedestrian access doors are required – mixing vehicles and pedestrians in single access doors is not acceptable.



*From left, examples of, controlled pedestrian crossing at an access road, separate walkway between welfare facilities and recycling hall, use of physical barriers inside a recycling hall, separate walkway running to the rear of a recycling hall to allow safe access to picking cabins, example of a pedestrian gate in traffic fencing in a recycling hall*

## 2.3 Picking from the floor' (totting with machine assist)

At some MRFs the practice of 'picking from the floor' (also called 'totting') is used. This is a high-risk activity and has been the cause of several fatal accidents. If at all practical, recycling systems should be designed to eliminate any need for picking from the floor. If picking from the floor cannot practically be eliminated, WISH guidance WASTE 18 'Hand sorting of recyclables ('totting') with vehicle assistance' should be applied – available at: <https://www.wishforum.org.uk/wp-content/uploads/2019/06/WASTE-18-.pdf>.

## 2.4 Sampling and similar activities

Regulation requires the sampling of recyclates, and at many MRFs similar sampling and testing regimes are in place for incoming wastes for quality, identification of non-conforming wastes etc. Where practical such exercises should be visual and undertaken from the cabs of heavy mobile plant. Where this is not practical, such as when detail samples of wastes are required, workers undertaking such duties should be protected from traffic. While the risks may be lower than for 'picking from the floor' the basic principles of physical separation contained in WISH WASTE 18, as above, can be used as the basis for adequate control.



## 3. Machinery safety

The rise in waste recycling and recovery rates over the past two decades has in part been achieved by an increase in the amount of machinery used. Unfortunately, this has also been accompanied by a rise in the number of machinery safety accidents. Waste recycling and recovery operations often use large, powerful, and potentially dangerous machines such as:

- Balers, shredders, and compactors
- Trommel, vibrating, finger, and similar screens
- Conveyors of various types and other mechanical handling systems
- Over-band magnets, eddy-current devices, optical sorting, and similar specialist equipment

These types of machinery have the potential to cause serious injury or worse, and each year waste management workers are killed in machinery accidents. Latest Health and Safety Executive (HSE) data shows that 30% of fatal accidents in British waste management are caused by contact with moving machinery, equivalent to more than 14 fatalities over the past five years (see statistics at <https://www.hse.gov.uk/statistics/industry/waste-recycling.pdf>). In the majority of these cases a failure to securely isolate and lock-off effectively was a primary cause.

### 3.1 Principles of safe machinery

Machinery safety is often a complex and technical area. Unless you have competent advice available internally, it is likely that external competent advice will be required. Recycling and recovery specific guidance is available in WISH WASTE 33 'Principles of machinery safety recycling recovery plant' available at <https://www.wishforum.org.uk/wish-guidance/> and advice on specific items of machinery such as conveyors, balers and trommels at <https://www.wishforum.org.uk/information/>. Guidance is also available from the HSE at: <https://www.hse.gov.uk/work-equipment-machinery/index.htm> and <https://www.hse.gov.uk/waste/machinery.htm>. Despite all of this, you will very likely also need competent advice to interpret and apply the available guidance.

When considering safeguarding the hierarchy of controls given below should be followed:

- First, if practical, eliminate risks through design. For example, designing feed chutes at conveyor transitions in terms of their size and shape to eliminate blockages and bridges so that no one needs to approach a dangerous part to clear them
- If this is not practical, then use fixed guarding. Note: if fixed guarding results in problems such as detritus build-up or blocks this is no reason to discard the option of fixed guarding immediately – there are various options for fixed guarding which are less prone to such problems. For example, the use of drop-out chutes or larger mesh fixed guards

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- If fixed guarding is not practical, the use of other guarding or protection devices such as interlocked guards, machine fencing, photoelectric guards and similar
- If none of the above are practical the use of strict, clear, robust, and enforced procedures and work methods to reduce risk, including clear and robust isolation and lock-off

At all times careful thought should be applied before moving between the steps in the above hierarchy. For example, belt conveyor tracking is a common task at MRFs. In most cases fixed guarding can be designed so that belt tracking can be achieved without the removal of guards, rather than defaulting to the lower-level control of procedures and work methods to reduce risk. Further and more detail guidance on issues such as guarding, emergency stops, interlocks, human factors in machinery safety etc is available in WISH WASTE 33 'Principles of machinery safety recycling recovery plant' available at <https://www.wishforum.org.uk/wish-guidance/>.

## 3.2 Isolation and lock-off

Research indicates that more than 80% of serious and fatal machinery accidents are caused, at least in part, by a failure to adequately isolate and lock-off machinery. More than many other types of facility, MRFs tend to suffer from blocks and bridges and have a higher need for frequent cleaning. Clearing blocks and bridges and cleaning, and other tasks such as maintenance, require planning in advance – they should not be carried-out on an ad-hoc and unplanned basis. Isolation and lock-off are critical parts of this planning.

Advice on secure isolation and lock-off for recycling plants and similar is available on the WISH website as WISH guidance note WASTE 29 'Practical advice on secure isolation (lock-off) for recycling and recovery machinery' at: <https://www.wishforum.org.uk/wp-content/uploads/2021/10/WISH-WASTE-29-Practical-isolation-and-lock-off-guidance-October-2021.pdf>. This guidance should be read, applied, and followed strictly.



*From left, examples of, belt conveyor tail roller guard designed to allow tracking without guard removal, drop-out chute fitted at a feed conveyor aimed at reducing detritus build-up issues, interlocked guard fitted to a baler access hatch, single padlock lock-off at a MRF control panel, lock-off board including individual padlocks and lock-off plate*



## 4. Falls and access

The majority of MRFs have more than one level, even if this is only a picking cabin on legs. In addition, access at a height is often required to clear blockages, for maintenance and similar. Falls are not a common cause of serious accidents at MRFs, but they do occur, and the likely severity should a fall occur is frequently serious. In addition, MRFs are often complicated assemblies with multiple support structures and legs for machinery and other components, which can result in difficult access and egress (see section below on fire).

### 4.1 General access

Access to occupied areas such as picking cabins should be sufficiently wide to allow the easy passage of pedestrians and any tools or other loads they may be required to carry. For example, if bins are to be used in picking cabins to collect high value but infrequently occurring materials, such as copper, aluminium, brass etc, then access needs to be planned and arranged to account for the need to move the bins in and out of the cabin.

Such general access also needs to be well lit, kept clean and clear of debris and other items which may block easy access. 'Labyrinthine' access routes with multiple twists and turns should be avoided where practical and consideration should be given to issues such as head injuries from bumping into low support structures and similar.

Stairs to picking cabins and other occupied areas should be designed to the appropriate standards (you may need to seek competent advice on this topic), not excessively steep, with evenly spaced risers and treads and provided with adequate fall railings and kick plates. Vertical access ladders are not acceptable for general access to picking cabins, although they may be used as part of cabin fire escape routes if space is limited and there are no other options.

### 4.2 Access for blockage clearance and similar 'intervention' tasks

Many MRFs suffer from blockages which need clearing, have a frequent need for debris clearance and general cleaning and all require maintenance. The first consideration is to eliminate or reduce the need for such 'intervention' tasks at a height. For example, the use of auto-oilers or remote lubrication systems or to design waste chutes to minimise the likelihood of blockages and bridges and ensuring that chutes are appropriate for the waste types they will be used with. However, some level of intervention is still likely to be required and access to perform intervention tasks such as blockage clearance, needs to be safe. Interventions are foreseeable and need to be planned in advance, including how access will be arranged.

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**Tip** – mirrors or CCTV above shredders, baler feed chutes and screens or in trommel screens can assist operative in assessing blockages and whether they can be tackled without the need for intervention, such as by reversing shredder elements. At the least operatives can plan better if they know the nature of the blockage in advance, such as knowing what tools to take with them.

Access at a height for frequently required intervention tasks should be fixed wherever practical. For example, if a baler feed chute needs clearing of blockages on a daily basis, then fixed access such as fixed access steps or if not practical because space is limited a fixed vertical access ladder with a suitable work platform at the top, should be provided. Informal and ad-hoc access arrangements such as workers having to climb or walk-up a conveyor to access an area such as a baler feed chute on a frequent basis are not acceptable.

Consideration should be given to machinery safety issues when designing fixed access. For example, a fixed access ladder and work platform provided to access a shredder feed hopper may require an interlocked or lockable hinged plate across the ladder to prevent unauthorised access. Likewise the use of ‘jailers’ bars’ at a work platform used to clear blockages at the top of a baler feed chute – these allow the use of reach tools such as poles but prevent workers from getting into the chute. Other systems can also be considered, such as winch-down ‘drawbridges’ at trommel screen access points over the output chute, which can be padlocked or otherwise secured when not in use.

Where a fixed vertical access ladder is more than 2.2 metres high it should be provided with a fall cage (commonly called a ‘Jacob’s ladder’). Where vertical ladders start from above-ground platforms and there is the risk of someone falling backwards off a ladder over fall railings, enhanced caging, fencing or similar should be provided to prevent such falls. All fixed access systems, including vertical fixed ladders, should be designed to the appropriate standards.



*From left, vertical fixed access ladder and work platform at a baler feed chute, jailers’ bars used at a baler feed chute work platform to allow reach tool use but prevent body access, CCTV showing trommel interior and feed chutes, mirror mounted above a shredder feed hopper, vertical access ladder starting from a raised platform with enhanced fall-back protection provided, interlocked access hatch to a trommel screen – winch mechanism to right is to lower a ‘drawbridge’ over the screen’s output chute to prevent workers accessing the screen interior from falling down it*

For infrequently required intervention tasks mobile access arrangements such as scaffold towers or ladders may be acceptable, provided they are safe, and workers are trained in their use. Mobile access systems such as wheeled scaffold towers and ladders should be secured, such as by use of padlocks and chains, away from the work area when not in use.

## 4.3 Picking cabin waste chutes

The vast majority of picking cabins are above ground level and operate by workers picking specific waste types off a conveyor belt and dropping them down chutes located beside the belt into bunkers or containers below the cabin. Most picking cabins have chutes on both sides of the belt, some only on one side and some also have subsidiary side chutes located at the cabin walls. Whatever the arrangement, the walls of the chute provide fall protection to prevent workers from falling down the hole at the base of the chute and into the bunker or container below.

- Picking cabin chute walls should if practical be at least 1,100 mm high, or at least 950 mm based on risk assessment (see tip below)
- If stand-platforms are used for ergonomic reasons chute height may need raising to maintain an effective rail height of 1,100 mm
- The above applies to all picking cabin chutes including subsidiary side chutes
- Workers should be instructed not to climb onto picking conveyors as this overcomes the fall protection provided by chute sides
- 'Not in use' chutes can often be protected by placing a cover over their tops
- While not strictly a falls from height issue, some picking cabin waste chutes are lined with rubber or similar to reduce noise exposure. Where fitted such linings may potentially cause problems such as an increased risk of blockages or contamination being held in or behind the lining. In addition, if they are to remain effective linings will need periodic replacement

**Tip** – for ergonomic reasons picking conveyors may not be 1,100 mm high. This may result in a 'lip' or rise at the chute top over which wastes need to be lifted to drop down the chute. Chute sides can be inclined to provide a full 1,100 mm at their rear walls sloping downwards to the conveyor so maintaining fall protection without compromising ergonomic efficiency.

## 5. Wastes, appropriate equipment and change management

Many serious accidents occur when there is a problem rather than during 'normal operation.' For example, accidents while attempting to clear a blockage or during a period when temporary arrangements are in place, such as during commissioning of a plant or when testing a recycling system with a new waste type. In all cases, all equipment (powered or unpowered) needs to be appropriate to the job it is used for, and the waste type/s being processed.

### 5.1 Right equipment for the right job with the right waste

#### Machinery

All machinery must be specified, designed, and used appropriately (see WISH WASTE 33 'Principles of machinery safety recycling recovery plant' at <https://www.wishforum.org.uk/wish-guidance/>):

- The machines used in recycling plants were often first designed for other uses, such as agricultural or quarrying. Care must be taken to ensure that they are appropriate for waste and recycling use. For example, just taking a belt conveyor designed for quarry use and 'bolting it onto' a recycling plant or taking an agricultural baler-wrapper and expecting it to handle RDF may well result in problems such as blockages, problems can equal a higher risk of accidents
- Just because a machine can handle one type of waste does not necessarily mean it can handle all types of waste. For example, a baler designed for paper may or may not, dependent on its design, be capable of baling metals. Machinery must be specified and used for what it was intended to do – if in any doubt consult with the supplier or seek competent advice
- Problems such as frequent blockages or stoppages to solve problems with machinery should be investigated to find the root cause rather than simply carrying-on and trying to work-around any issues. Using the right machinery for the right job with the right waste type is very likely to mean fewer interventions, greater operational efficiency, and a lower risk of accidents

#### Chutes

Good chute design can eliminate or at least reduce the occurrence of blocks and bridges:

- Chutes should be sized and designed to accommodate the wastes they will be used for. For example, if longer and more rigid items of waste are used with a narrow chute at some point it is foreseeable that an item of waste will 'bridge' jamming sideways across the chute allowing other wastes to accumulate on top of it so causing a blockage. Or, if large cardboard boxes are fed into a baler chute if the chute is not sufficiently wide the likelihood of a bridge forming is high. Conversely, small particle size wastes such as soils may be suitable for narrower chutes

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- Where practical and dependent on waste type, chute internal walls should be smooth and free from ridges, flanges and similar which may encourage bridges and blockages. You may want to consider, as practical, chutes which are larger at their base than top
- Some chutes have hatches, moving plates etc. For example, a 'diverter' plate at the base of a chute to channel wastes from one container to another or a hatch at the bottom of a picking cabin chute designed to hold wastes until containers can be changed. These plates and hatches can promote blockages and bridges and should be designed to reduce this risk and only used with appropriate waste types
- Chutes where bridges and blockages occur frequently should be investigated to assess if their design and/or size can be modified to reduce the need for intervention
- Employees should be instructed to use reach tools such as poles to tackle bridges and blockages as their first resort and only to enter chutes if it is safe to do so (for example, safe from falls, contact with contaminated, sharp etc wastes, machinery hazards etc)

Whether powered or non-powered all work equipment should be maintained and cleaned to the schedule required in its operating manual or similar to maintain its required operation. Machinery in particular should not be operated on a 'use-it-until-it-breaks' (run to failure) basis – planned regular maintenance is essential to safe machine operation.

**Note.** More detail on blockage clearance and other 'interventions' is available in WISH WASTE 33 'Principles of machinery safety recycling recovery plant' and WISH WASTE 29 'practical advice isolation and lock-off' at <https://www.wishforum.org.uk/wish-guidance/> and for specific items of machinery such as balers, conveyors and trommels, advice is available in the relevant information sheets at <https://www.wishforum.org.uk/information/>.

## 5.2 Changes in waste type

Changes in the types of waste being processed or in the composition of wastes already being handled are common at MRFs. Good change management should be exercised in these cases and changes should be planned for in advance rather than taking a 'suck-it-and-see' approach:

- Before any new or changed waste type is processed machinery and other components, such as non-powered chutes, should be assessed to ensure that they are appropriate to their new use. This will often involve consulting with the machinery or equipment supplier and/or seeking competent advice
- Additional attention should be paid to monitoring of the frequency and location of blockages and other problems when changing waste type being processed. Any changes in the frequency and location of problems such as blockages should be investigated and solved before new waste types continue to be processed



- During changes in waste type instruct your employees to report any changes in the pattern, nature, and location of any problems and not to try and solve such problems themselves in an ad-hoc and unplanned manner

**Tip** – before and during changes in waste type consult with your workers. Often, they will know better than you where blockages and other problems occur and how frequently. Your employees are a valuable resource and source of information, both about the safety and the efficiency of your plant. The use of formal blockage ‘logs’ (a record of blocks, where they occur, why and how often) can also be useful in being able to identify problems and rectify them.

## Change management

It is common for changes to be made at MRFs. Changes in waste type are covered above. Other changes could include:

- Increases or decreases in the volumes of wastes being handled
- Modification or additions to machinery. For example, the addition of a shredder to an existing recycling line, addition of a load conveyor to a baler or a change in the orientation of a conveyor. All modifications and additions to machinery must be risk assessed and competent advice sought as required. Advice on the modification of machinery is available on the HSE’s website at <https://www.hse.gov.uk/work-equipment-machinery/faq-ce.htm>. You should also consider if any modifications may have an effect on other safety and related provisions. For example, emergency stop and other safeguarding provision, fire detection and suppression systems, pedestrian/vehicle routes, access requirements for maintenance, repair, cleaning, blockage clearance etc
- Changes to traffic routing, storage area locations etc. Any change to traffic routes should result in a review of your traffic safety risk assessment to ensure it remains adequate
- Changes to structures such as buildings etc. Consider what the knock-on effects could be, such as any effect on traffic routes, fire escape provision etc. For example, the addition of a new structure which blocks water flow from a fire deluge or sprinkler system
- Changes to work practices and ways of working. Consider how they might affect welfare provision, working time requirements, skills, training, and competency requirements etc

**Note.** *The construction of a new MRF will almost certainly fall under CDM (Construction, Design and Management Regulations). Modifications to machinery, structures, buildings etc may also fall under CDM and you should be aware of this. For more information see:*

<https://www.hse.gov.uk/construction/cdm/2015/index.htm>.

## 6. 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. Stepped work platforms can be used for workers of below average height, but beware degrading the fall protection provided by chute sides
- 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 a waste chute
- What types of materials operators are expected to pick – very light materials may not require a lot of effort, but 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 (although these are not common in MRFs and are often impractical in many picking cabins), foot bars and anti-fatigue insulated matting
- Provide adequate lighting of picking lines
- Do not expose operators to excessive vibration
- Job rotation, where practical, may also assist to give waste pickers a 'break' from picking to undertake other duties

General guidance from the HSE is available at: <https://www.hse.gov.uk/msd/uld/index.htm> and at: <https://www.hse.gov.uk/humanfactors/>. Specific advice on picking conveyors and ergonomics is also available at: <https://www.hse.gov.uk/pubns/geis4.htm>.

**Note.** *This section, and section 7 below, cover what are often termed 'occupational health' issues. Further guidance is available in 'WISH WASTE 27 Health and hazardous substances' and 'WASTE 30 Health surveillance for the waste and recycling industry', both available at <https://www.wishforum.org.uk/wish-guidance/>.*

## 7. Working environment

Many wastes are by their nature 'dirty' and/or contaminated. They can also often be dusty. The machinery and other equipment used in MRFs is often noisy and vehicle operations such as the tipping of wastes can produce noise and dust. Waste collection crews usually have a transient exposure to such hazards, and mobile plant operators are often in air-conditioned and filtered cabs (although this does depend on whether they keep windows and doors closed on tipping floors). However, other workers, and in particular those working at picking belts, may not be so protected.

### 7.1 Picking cabins

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

- Noise, from machinery, vehicles, wastes dropping between conveyors etc
- Moving vehicles, both collection vehicles and mobile plant
- Tipping and loading operations, in particular for wastes such as glass or dusty wastes
- Excessive dust, from the operation of machinery and wastes dropping between conveyors and movement of vehicles on tipping floors etc
- Vibration, from machinery such as screens

Picking cabins provide a degree of isolation from these hazards and enable you to provide economical heating for staff. Picking cabins need to be kept clean and free of excessive debris and detritus. At least daily cleans of picking cabins should be in place, ideally with a weekly deeper clean of surfaces. As a manager, think – would you want to work in your MRFs picking cabin? Picking cabins should have sufficient space for workers to perform their tasks in an ergonomic manner and should be fitted with suitable storage for PPE and other essential items such as vacuum cleaners.



*From left, daily clean-down in a MRF picking cabin, typical picking belt in a cabin, dust can be a problem in MRFs (in this case a new and particularly dusty waste stream), picking cabins should be kept clean and free of excessive debris etc, unlike this one – would you want to work here?*

## 7.2 Dust & bioaerosols

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 such as silica and bioaerosols. Almost all tipping floors will be a significant source of 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 with fresh air
- 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](http://www.hse.gov.uk/lev)
- Making sure the machinery design and location does not compromise ventilation
- Fitting suitable ventilation/air filtration in vehicles, including mobile plant (particularly in the waste tipping area) and ensuring drivers are trained to keep doors closed in contaminated areas such as tipping floors and keeping the interior of vehicles clean
- Providing facilities to enable rejection of heavily contaminated loads
- Providing cleaning equipment, such as vacuum cleaners (either portable or from an installed central vacuum system) rather than compressed air or sweeping which can create dust clouds
- Workplace monitoring is also frequently required, such as dust monitoring

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](http://www.hse.gov.uk/waste) and on HSE's Control of Substances Hazardous to Health (COSHH) website [www.hse.gov.uk/coshh](http://www.hse.gov.uk/coshh).

**Tip** – some of the hazards associated with operating MRFs may be fairly obvious, such as the risk of a traffic accident. However, 'unseen' hazards such as dusts and bioaerosols, may be less obvious to workers. Inform your workers of these risks: if they are aware, it is more likely that they will follow the controls such as good cleaning practices you have put in place to reduce risk.

## 7.3 Noise

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

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- Over-band magnets
- Eddy-current devices
- Changes in conveyor direction/level (where one conveyor drops waste onto another)
- Screens (vibrating, trommel screens, optical sorters, compressors etc)

Further guidance on the legal requirements and methods for reducing noise exposure can be found on HSE's website at [www.hse.gov.uk/noise](http://www.hse.gov.uk/noise). If noise is likely to be an issue, you should conduct noise monitoring of your workplace, likely via a competent external consultant. Based on the results of such surveys you may need to designate some areas of your facility as a hearing protection zone.

## Welfare and hygiene

In MRFs there are important environmental, welfare and hygiene considerations. You should:

- Provide a 'reasonable' working temperature at workstations. Where the work involves 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 such as picking from the belt, blockage clearance etc easier to perform
- 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. 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, and should be cleaned at least daily
- 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, such as appropriate gloves where skin is likely to become contaminated (any task which involves handling wastes)
- Advise workers 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 from the HSE at: <https://www.hse.gov.uk/pubns/indg244.htm> and specifically for waste and recycling at: <https://www.hse.gov.uk/waste/health.htm>. Guidance on skin care is available at <https://www.hse.gov.uk/skin/>. For advice on occupational health surveillance in waste management see WISH guidance note WASTE 30 at: <https://www.wishforum.org.uk/waste-30-health-surveillance-for-the-waste-and-recycling-industry-feb-2021/>.

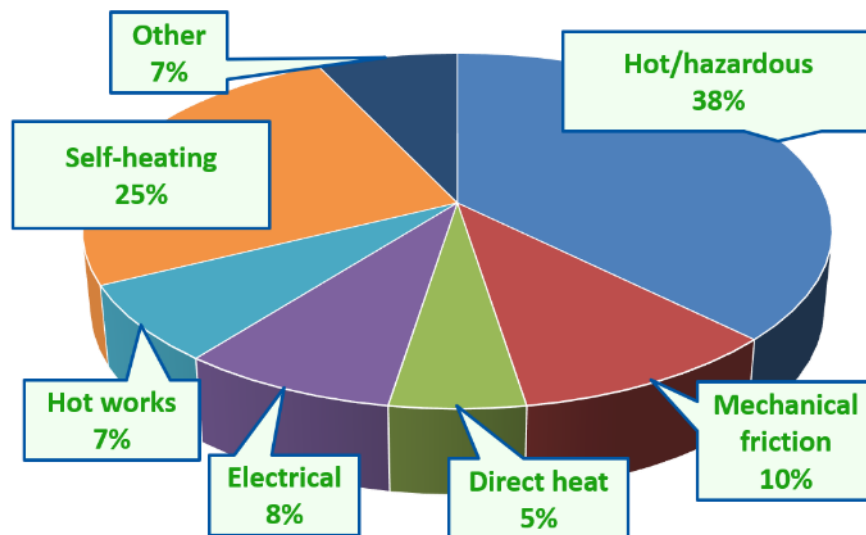


## 8. Fire and waste/recyclates storage

Fires are a real and serious risk at MRFs, in particular in waste reception, during processing and while recyclates are in storage awaiting off-take. Outside of fire risk, waste and recyclates storage at MRFs needs to be planned and considered carefully.

### 8.1 Causes of fires at MRFs and fire escape

The diagram below shows the most common causes of fires at MRFs and similar recycling and recovery plants.



- **Hot/hazardous** – fires caused by hot and/or hazardous substances and items in received wastes, such as lithium and other batteries, flammable liquids, gas cylinders, chemicals etc
- **Self-heating** – particularly a problem when recyclates are stored in an inappropriate manner and/or for too long a time period
- **Mechanical friction** – usually in processing areas from sources such as badly maintained and slipping belt conveyors, shredder elements etc
- **Electrical** – electrical faults in processing machinery, space heating, lighting, other general electrical systems etc
- **Hot works** – failure to control hot works such as welding and grinding
- **Direct heat** – items placed on space heaters, overheating hydraulic systems etc
- **Other** – wide variety of causes from discarded smoking materials to arson

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Extensive guidance on controlling fire risk at MRFs and other similar sites is available in the WISH guidance note WASTE 28 'Reducing fire risk at waste management sites', available as a free download at: <https://www.wishforum.org.uk/wp-content/uploads/2020/05/WASTE-28.pdf>.

While WASTE 28 includes much useful information on controlling fire risk, its concentration is on preventing fires rather than on fire life safety. Guidance on fire life safety is freely available online. You can also contact your local FRS (fire and rescue service – local fire brigade). They will usually be happy to visit your site and give advice. Your insurer can also be a useful source of advice.

Specifically relating to fire escape from MRFs, and in particular picking cabins, escape routes:

- Must conform to the required escape distances
- Should be well lit and clearly signed
- Should be easy to follow and free from multiple 'twists-and-turns' (often an issue at MRFs where machinery and picking cabin support structures may be a problem)
- Kept free from obstructions and excessive debris and detritus
- In some MRFs, fire escape routes run through machinery fencing enclosures. In these cases machinery safeguarding must still be adequate while allowing easy exit. Such arrangements must only be for emergency use and not for general access and egress, and machinery should automatically shut down in the event of a fire alarm or detection
- Frequent fire 'drills' should be conducted, in particular where a MRF has a high turn-over of workers or a high use of temporary workers, as can often be the case for MRFs

**Tip** – arranging fire escape routes from picking cabins can sometimes be difficult. There is a tendency to first get workers to ground level from the cabin and then out of the building/hall. An alternative can be to take the fire escape route direct out of the building/hall at picking cabin level via a raised walkway then provide steps down to ground level on the external wall of the building/hall.



*From left, lithium battery from a hand drill 'going-off' on a picking conveyor belt (no one was hurt), fire in a MRF hall (sprinkler system has activated), large fire in baled waste plastic storage, tackling a fire at a MRF reception area, firefighting at a waste wood storage area*

## 8.2 Storage issues

Inappropriate storage can result in higher fire risk as above see WASTE 28 'Reducing fire risk at waste management sites', available as a free download at: <https://www.wishforum.org.uk/wp-content/uploads/2020/05/WASTE-28.pdf>. Storage can also cause other issues, such as stability, including but not limited to:

- Storage of wastes and recyclates should be planned and not ad-hoc
- Your storage plan should include the maximum safe storage capacity of your site and any individual storage areas – you should not exceed this even if this means ceasing to accept wastes until you can reduce storage to safe levels
- Include contingency in your planning, such as for periods when you cannot move materials off site, bank holidays and other foreseeable changes in waste volumes accepted
- Loose storage should be stable and not so high and/or steep as to cause stability problems
- Generally, baled storage should be no more than 4 metres high or four bales high whichever is the lower. If bales are not regular in shape storage should be less than this for stability reasons – workers have been fatally injured by collapsing bale stacks
- Stacking of bales to a greater height than 4 metres or four bales high may be acceptable if alternative stacking methods are used, such as the interlocking of bales or pyramidal stacking. However, such methods may pose operational challenges and access, consideration of factors such as water hose throw distance for effective firefighting should be included and you are likely to require competent advice
- Storage bunker, bay and other similar walls must be constructed appropriately, stable, robust, checked periodically and repaired as required. Further detail on 'containment walls' is available in WISH WASTE 32 'Bunker and bay walls' at: <https://www.wishforum.org.uk/wish-guidance/>

## 8.3 Loading areas

Loading areas for the offtake of recyclates pose traffic (see section above) and other risks:

- Loading areas should not impede traffic or impinge on pedestrian and similar areas
- Drivers should either remain in their cabs during loading or move to a safe area for the duration of loading and pedestrians should not be allowed into loading areas during loading
- Workers should not be in/on trailers or curtain-sided lorry beds during loading and consideration should be given to falls from trailers/lorry backs and load security
- Ramps should be appropriate, only used on level ground, subject to pre-use checks, provided with side rails and only used by competent and trained mobile plant operators
- Consideration should be given to the prevention of lorry drive-away during loading

## 9. Disclaimer and WISH

Nothing in this guidance constitutes legal or other professional advice and no warranty is given, nor liability accepted (to the fullest extent permitted under law) for any loss or damage suffered or incurred because of reliance on this guide. The guidance is not a substitute for duty holder judgment and/or professional safety advisor's judgment, Notwithstanding the good practice in this guidance, duty holders are responsible for ascertaining the sufficiency and adequacy of their internal and independent procedures for verifying and evaluating their organisation's compliance with health and safety law. WISH accepts no liability (to the fullest extent permitted under law) for any act or omission of any persons using the guidance

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.

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. This guidance and other WISH documents are available as a free of charge download at: <https://www.wishforum.org.uk/>.

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## Appendix 1. Navigator table to other WISH advice referred to in this guidance

This is an ‘umbrella’ document and does not seek to cover detail that can be found elsewhere. You should not rely on this guidance on its own. Throughout this guidance reference is made to other WISH documents. You should also read these documents. The ‘navigator’ table below summarises these. All WISH guidance (WASTE XX documents) is available at: <https://www.wishforum.org.uk/wish-guidance/> and information documents (INFO XX) at: <https://www.wishforum.org.uk/information/>. Please note that the below only covers WISH documents. Other advice, such as from the HSE, is also noted in this guidance. Please follow the links given to access this other advice.

Section of this guidance	Referred to WISH document	Description
<b>Traffic management</b>	WASTE 09. Safe transport in the waste management and recycling industry	Safe traffic management on waste management sites. Note – on-site issues only and not traffic safety on the public highway
	WASTE 18. Hand sorting of recyclables (‘totting’) with vehicle assistance	Design of locations, operating safety and other safety issues associated with the high-risk activity of picking from the floor (totting)
<b>Machinery safety</b>	WASTE 29. Practical advice lock-off recycling machinery	What is lock-off, when to apply it and operational and training issues for the safe lock-off of recycling and recovery machinery
	WASTE 33. Principles of machinery safety recycling recovery machinery	Safeguarding, guards, interlocks, emergency stops and similar aimed at reducing the risk of machinery accidents
	INFO 20. Machinery safety - conveyors	Dangerous parts of belt conveyors, safeguards to be used and advice on the safe design and operation of conveyors
	INFO 21. Machinery safety – trommel screens	Dangerous parts of trommel screens, safeguards to be used and advice on the safe design and operation of trommels
	INFO 22. Machinery safety – horizontal balers	Dangerous parts of balers, safeguards to be used and advice on the safe design and operation of balers
	Note. The above information documents are the start of a series – more will be issued	
<b>Falls and access</b>	NA, but see machinery documents above for specific access issues	
<b>Wastes, appropriate equipment and change management</b>	WASTE 33. Principles of machinery safety recycling recovery machinery	Safeguarding, guards, interlocks, emergency stops and similar aimed at reducing the risk of machinery accidents
	WASTE 29. Practical advice on lock-off for recycling machinery	What is lock-off, when to apply it and operational and training issues for the safe lock-off of recycling and recovery machinery
	Note. Above referred to documents as relating to blockage clearance and other interventions etc	
<b>Ergonomics</b>	NA	
<b>Working environment</b>	WASTE 27. Health and hazardous substances in waste and recycling	Common health hazards while collecting and sorting wastes, including exposure to hazardous substances and biological hazards
	Health surveillance in waste management	What health surveillance is, when it may be required for waste management workers and advice on surveillance schemes
<b>Fire and wastes/recyclates storage</b>	WASTE 28. Reducing fire risk at waste management sites	Managing fire safety during the reception, treatment (processing) and storage of solid combustible wastes
	WASTE 32. Containment wall safety (bunker, bay etc walls)	Safe design, checking and use of common forms of bay, bunker etc walls used at waste management sites