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MACHINE SAFETY

Guide to Machine Guarding for the Waste Management & Recycling Industry

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Introduction

Waste management and recycling is one of the most dangerous industries in the UK, a fact that is reflected in the statistics published annually by the HSE (Health and Safety Executive). Although the industry has made huge improvements in the last ten years or so, there is still ample scope for improvement.

Of course, it has to be recognised that this industry faces challenges not encountered elsewhere. For example, in manufacturing industry the raw materials, components, sub-assemblies and finished products are all known and clearly defined, which makes it easy to design processes such that operatives are safeguarded. In contrast, the waste and recycling sector is often dealing with unknowns; there is no realistic way to have complete control over what a householder places in a wheelie bin, what a builder loads into a skip or what is deposited at a household waste recycling centre (HWRC). With national governments and local authorities under pressure to reduce landfill and increase recycling, the waste management and recycling industry must find ways to increase throughout and efficiency, but without compromising health and safety.

This industry is multi-faceted and the health and safety challenges vary widely, depending whether we are talking about MRFs (materials recovery facilities, also referred to as materials recycling facilities or materials reclamation facilities), HWRCs, kerbside collections, waste transfer stations, the recovered paper sector, and incineration and energy from waste (EfW). Furthermore, the industry is fragmented inasmuch as it is operated in part by local authorities, but with private contractors, small and medium-sized enterprises, and community and third sector organisations all playing significant roles as well.

There are many ways in which health and safety can be improved in the waste management and recycling industry, ranging from improving the health and safety culture, to better management of vehicle movements, but this present guide focuses on one key area: machine guarding for the many different types of machinery and conveyor that are encountered in this industry. It also touches on the provision of suitable measures to ensure that work at height is carried out safely.

This guide discusses what the requirements are within the context of legislation, regulations and standards. It also provides advice on how to apply the standards and, towards the end, there are lists of useful resources and sources of additional information

Why is machine guarding necessary?

In 2017/18 there were 12 fatal injuries and 1778 non-fatal injuries in the waste management and recycling industry*. These figures equate to 10.26 fatalities and 1602 non-fatal injuries per 100,000 workers. To put this into context, the table below shows the equivalent figures for three comparable industries – in particular, note the number of fatalities and injuries per 100,000 workers:

Industry	Fatalities	Fatalities per 100,00 workers	Non-fatal injuries	Non-fatal injuries per 100,000 workers
Waste management and recycling	12	10.26	1778	1602
Mining and quarrying	4	3.27	204	194
Construction	38	1.64	4919	358
Manufacturing	15	0.52	12,234	463

* Source: HSE statistics for 'Waste collection, treatment and disposal; materials recover'

In February 2018 the ESA (Environmental Services Association) published a report Spotlight on health and safety: Contrasting performance in the waste and recycling industry. In this report the ESA points out that its members represent around one-third of all employees in the industry and its members have achieved substantial reductions in accidents; between 2009 and 2016 the number of injuries fell by 70 per cent. However, over the same period, the ESA reports that HSE statistics show a reduction of only 20 per cent across the sector as a whole, so some operators clearly have much further to go to improve their safety standards.

The importance of guarding

Machinery plays a vital role in the waste management and recycling industry, yet there is also a reliance on manual labour for activities such as sorting and picking, and for cleaning machinery and clearing blockages. Whenever there is a person interacts with a machine or conveyor, there is a risk. Machine guards should be designed, manufactured and installed so as to prevent people from coming into contact with dangerous parts of the machine. In addition, if large items are being moved on a conveyor, then these items can also present a hazard that needs to be safeguarded. Machine guards can also prevent people from being struck by objects falling from conveyors or being ejected from machinery.

In some cases guards can, as well as preventing access to dangerous parts, perform secondary roles, namely reducing noise levels in the working environment and/or containing dust or fumes.
If guards are well designed they will not interfere with efficient operation; ill-considered guards invariably do. Worse than that, poorly designed guards encourage operators, maintenance staff and management to bypass them, which can increase risks significantly.

Machine safety regulations

Machinery safety in the UK is driven by two main sets of regulations:

- The Supply of Machinery (Safety) Regulations 2008 as amended (which is the UK implementation of the European Machinery Directive 2006/42/EC, requiring all machines placed on the market in the European Economic Area (EEA), Switzerland and Turkey to carry a CE mark)

- The Provision and Use of Work Equipment Regulations 1998 (PUWER 98)
  In addition, there are The Health and Safety at Work etc Act 1974 (HSWA) and The Management of Health and Safety at Work Regulations 1999.

The Supply of Machinery (Safety) Regulations 2008 obliges the machine manufacturer or supplier to ensure the machine is safe and to apply the CE mark to indicate the machine's compliance. On the other hand, PUWER requires the machine 'user' (ie the organisation, not the individual user) to ensure the machine is safe before it is put into use for the first time and then inspected periodically thereafter.

Broadly speaking, The Health and Safety at Work Act places a responsibility on employers to protect workers and others from risks to their health, safety and welfare. This is the primary piece of legislation covering occupational health and safety in Great Britain.

Under The Management of Health and Safety at Work Regulations 1999, employers (and self-employed people) are required to carry out a suitable and sufficient risk assessment of their activities, after which risks can be eliminated or reduced as far as is reasonably practicable. These risk assessments also need to be reviewed regularly.

Note that The Supply of Machinery (Safety) Regulations 2008 applies to complete machines and 'safety components' – in some circumstances this includes machine guards. If guards are retrofitted to improve the safety of machinery, they may need to be CE marked by the manufacturer to indicate their compliance. See 'Useful Resources' below for a Guide to the New Machinery Directive, a White Paper CE Marking of Guards, and the European Commission has published both a Guide to application of the Machinery Directive 2006/42/EC and a report Safety fences as safety component under the Machinery Directive 2006/42/EC. Alternatively, contact Procter Machine Safety if in doubt whether or not there is a need to CE mark guards or, indeed, other components for which guarding is a secondary function – such as covers, lids and acoustic enclosures.

Guarding standards

In practice, the way suppliers and users of machines can most easily meet their legal obligations is to ensure that machines, guards and other safety devices conform to harmonised European standards (Euronorms). These standards have been developed to ensure an equally high standard of machine safety across the EU. The good news for users of machines in the UK is that these standards incorporate most of the principles of BS 5304:1975 and 1988 (the Code of practice for safety of machinery), which served British industry well for a long period. Although no longer current, this ex-standard is available from BSI as a Published Document, PD 5304:2014, Guidance on safe use of machinery.

The main standards and other documents applying to machine safety and machine guarding are shown in the tables below. These tables include standards relating to the design of control systems because safety devices such as guard interlocks, emergency stop pushbuttons and hold-to-run switches need to be integrated correctly within a machine's safety-related control system.

Machinery Directive Harmonised Standards are classed as A-type, B-type and C-type standards, so the tables below are divided the same way, with non-harmonised standards and other documents shown at the end. The tables focus on the main standards; readers should use the 'Useful resources' section of this present guide to check whether any other standards need to be applied to the machinery or equipment in question. In the tables below the 'BS' designation is for the British Standard, which is the UK implementation of the European (EN) or International (ISO or IEC) standard where applicable.

A-type standard: there is only one A-type standard. It specifies basic concepts, terminology and design principles applicable to all categories of machinery.

BS EN ISO 12100:2010	Safety of machinery: General principles for design. Risk assessment and risk reduction

B-type standard: these deal with specific aspects of machinery safety or specific types of safeguard that can be used across a wide range of categories of machinery (NB the following list is not exhaustive).

BS EN ISO 4413:2010	Hydraulic fluid power. General rules and safety requirements for systems and their components
BS EN ISO 4414:2010	Pneumatic fluid power. General rules and safety requirements for systems and their components
BS EN ISO 7731:2008	Ergonomics. Danger signals for public and work areas. Auditory danger signals
BS EN ISO 13849-1:2015	Safety of machinery. Safety related parts of control systems. General principles for design

BS EN ISO 13849-2:2012	Safety of machinery. Safety-related parts of control systems. Validation
BS EN ISO 13855:2010	Safety of machinery. Positioning of safeguards with respect to the approach speeds of parts of the human body
BS EN ISO 13856-1:2013	Safety of machinery. Pressure-sensitive protective devices. General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors
BS EN ISO 13856-2:2013	Safety of machinery. Pressure-sensitive protective devices. General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars
BS EN ISO 13856-3:2013	Safety of machinery. Pressure-sensitive protective devices. General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices
BS EN ISO 13857:2008	Safety of machinery. Safety distances to prevent hazard zones being reached by upper and lower limbs
BS EN ISO 14119:2013	Safety of machinery. Interlocking devices associated with guards. Principles for design and selection
BS EN ISO 14120:2015	Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards
BS EN ISO 14122-1:2016	Safety of machinery. Permanent means of access to machinery. Choice of a fixed means of access between two levels

BS EN ISO 14122-2:2016	Safety of machinery. Permanent means of access to machinery. Working platforms and walkways
BS EN ISO 14122-3:2016	Safety of machinery. Permanent means of access to machinery. Stairways, stepladders and guard-rails
BS EN ISO 14122-4:2016	Safety of machinery. Permanent means of access to machinery. Fixed ladders
BS EN 60204-1:2018	Safety of machinery. Electrical equipment of machines. General requirements
BS EN 62061:2005 +A2:2015	Safety of machinery. Functional safety of safety-related electrical, electronic and programmable electronic control systems

C-type standards: these deal with safety requirements for particular types of machine or groups of machine. When a C-type standard deviates from an A-type or B-type standard, the C-type standard takes precedence. NB the following list is not exhaustive.

BS EN 618:2002 +A1:2010	Continuous handling equipment and systems. Safety and EMC requirements for equipment for mechanical handling of bulk materials except fixed belt conveyors
BS EN 619:2002 +A1:2010	Continuous handling equipment and systems. Safety and EMC requirements for equipment for mechanical handling of unit loads
BS EN 620:2002 +A1:2010	Continuous handling equipment and systems. Safety and EMC requirements for fixed belt conveyors for bulk materials
BS EN 61496-1:20131:2015	Safety of machinery. Electro-sensitive protective equipment. General requirements and tests

Non-harmonised standards and other documents

BS EN 1837:1999	Safety of machinery. Integral lighting of machines
BS 4531:1986	Specification for portable and mobile troughed belt conveyors
PD 5304:2014	Guidance on safe use of machinery
BS 5667-1:1979 (ISO 1819-1977)	Specification for continuous mechanical handling equipment - safety requirements. General
BS 6753:1986	Specification for shotbolts (solenoid operated) for guarding machinery
BS EN ISO 13854:2019	Safety of machinery. Minimum gaps to avoid crushing of parts of the human body
BS EN ISO 14118:2018 *See note*	Safety of machinery. Prevention of unexpected start-up
BS EN 16252:2012	Machines for compacting waste materials or recyclable fractions. Horizontal baling presses. Safety requirements
BS EN 16500:2014	Machines for compacting waste materials or recyclable fractions. Vertical baling presses. Safety requirements

Note: Although EN ISO 14118:2018 is not yet harmonised, its predecessor was (EN 1037:1995+A1:2008).

PD ISO/TR 18569:20042:2016	Safety of machinery. Permanent means of access to machinery. Working platforms and walkways
BS EN ISO 14122-3:2016	Safety of machinery. Guidelines for the understanding and use of safety of machinery standards
PD ISO/TR 23849:2010 PD IEC/TR 62061-1:2010 4:2016	Guidance on the application of ISO 13849-1 and IEC 62061 in the design of safety-related control systems for machinery
BS EN 61496-2:2013	Safety of machinery. Electro-sensitive protective equipment. Particular requirements for equipment using active opto-electronic protective devices (AOPDs)

Other types of machinery, such as cranes and handheld power tools, also have their own requirements. A full list of standards harmonised to the Machinery Directive is available on the European Commission's website (see 'Useful Resources' below).

Additional information is also available from the HSE's website: see the Industries section, then Waste management or Recycling.

Risk assessment and reduction

Today the accepted approach to the design of any machine guarding system is based on risk assessment. BS EN ISO 12100:2010 sets out different methods; these must take account of the probability and degree of possible harm relating to any foreseeable injury. More guidance on Risk Assessment can be found in the HSE's leaflet Risk Assessment - A brief guide to controlling risks in the workplace INDG163 (rev4), which has replaced the previous publication Five steps to risk assessment. Most HSE publications can be downloaded for free, or hard copies can be purchased.

A free Risk Assessment Calculator is also available from Procter Machine Safety. This is based on the requirements of BS EN ISO 12100:2010 and is designed to be simple to use thanks to checklists (see 'Useful Resources' below).

Once a machine has been assessed, if the resultant risk is considered unacceptable, measures should be applied to reduce the risk rating — which often includes guarding. This iterative process is repeated until the measures applied reduce the risk to an acceptable level.

Risk reduction measures should be implemented in a hierarchical, three-step process:

1. Inherently safe design (ie design-out the hazards to eliminate them)
2. Safeguarding and complementary protective measures
3. Information for safe use

Additional measures may also be required such as training, safe working procedures, permit-to-work systems and personal protective equipment – but only after the above steps have been taken.

Working with the standards

BS EN ISO 14120, which is the main guarding standard having replaced BS EN 953, covers all machinery from simple drive couplings to complex installations involving robots, conveyors and processing machinery. The standard lists those aspects of machinery, people and the design and construction of guards that need to be considered.

Machine aspects to be considered are, of course, the functions of the machine and the hazards arising from these. Obvious ones include entanglement or impact from moving parts, and less obvious ones are, for example, the potential for ejection of broken tools, hazardous materials and invisible emissions including noise and radiation. Guards should minimise exposure to these hazards by the selection of appropriate materials, construction methods and correct safety distances — as specified in BS EN ISO 13857.

Materials of construction for guards

Machine guarding can be constructed from a variety of materials and the skill of the designer lies in creating a system that will be fully compliant with the regulations and standards, yet will also be user-friendly, cost-effective, aesthetically pleasing and robust enough for the operating environment.
The main choice of infill materials is between sheet steel, welded wire mesh and clear polycarbonate. If ejected items are an issue, sheet steel is preferred unless the items will be larger than the apertures in welded mesh.
For machines in the waste management and recycling industry, polycarbonate is unlikely to be used except for windows in sheet steel guards where process visibility is required but there is a risk of items being ejected.

On machines where process viewing is necessary, adequate lighting must be provided to ensure compliance with BS EN 1837, Safety of machinery. Integral lighting of machines, and to discourage operatives from attempting to bypass the guarding.

Guards for waste management and recycling machinery often need to be more robust than those used in manufacturing environments. This is because they may have to withstand accidental impacts from mechanical handling equipment or heavy items falling from conveyors.
If noise reduction needs to be incorporated, acoustic foam or other sound-deadening material can be added to sheet metal panelling. Sealing around guards also helps to reduce noise levels, and sealing is highly beneficial if dust needs to be controlled.

How are the machines operated and maintained?

The successful design of machine guards needs a clear understanding of all the ways in which people interact with the machine at all phases of its life including commissioning, production and maintenance. Before designing any guarding, the designer should talk to the machine operators and maintenance staff. If the machine operates for more than one shift per day, operators and maintenance staff from all shifts should be consulted because the working practices may not be the same.

Well-designed guards permit machines to be loaded, unloaded, cleaned and maintained efficiently without exposing people to hazards (note that around 25-30 per cent of fatal injuries in the manufacturing industries occur while maintenance is being carried out).

Fixed or movable guards

Machine guards can be considered as one of two types: fixed or movable. Fixed guards are attached using welds, rivets or threaded fasteners, while movable types are hinged, sliding or rise-and-fall guards equipped with interlocks to prevent the machine from operating while the guards are open.

BS EN ISO 14120:2015 requires fixings for fixed guards to remain attached to the guard or the machinery when the guard is removed. While this appears to make the situation clear, in fact designers need to be decide whether or not a guard (or other component with a secondary safety function) is a 'fixed guard' and whether or not it is foreseeable that the guard will be removed for maintenance, cleaning or other reasons (if not, then there is no need to use retained/captive fasteners). More information about fixings for fixed guards is available in a free White Paper from Procter Machine Safety, How to specify fixings for machine guards (see 'Useful Resources' below).

Both fixed and movable guarding needs to comply with the standard covering safety distances to prevent hazard zones being reached, namely BS EN ISO 13857. A free Safety Distance Calculator is available from Procter Machine Safety for establishing the required safety distances and heights of machine guards in accordance with BS EN ISO 13857 (see 'Useful Resources' below).

Access control

The section of BS EN ISO 14120 covering human aspects addresses the human/machine interaction, including reducing the need for frequent access and ensuring that, where the need for access cannot be eliminated, access is controlled so that the machine can only be approached when it is in a safe condition. This is usually achieved by interlocking the access guards/gates. The need for non-essential access can be reduced by, for example, designing guards with good process viewing and locating lubrication points and rodding points outside the guarding.

If interlocks are required, it is vital to select components that are suitable for the machine's risks and safety-related control system, depending whether the designer is working to functional safety standard BS EN ISO 13849-1 or BS EN 62061. Typically the interlocks will be of the mechanical type using roller plungers or metal tongues, switches incorporated within hinges, or non-contact types utilising coded magnetic or electronic technologies.

Whichever type is selected, the switches must be sufficiently robust and installed correctly if they are to perform properly and not start to fail (either to a safe or unsafe condition) when the guard hinges or runners begin to wear. BS EN ISO 14119 gives more information about interlock selection.
For perimeter guards and machinery where whole-body access is possible, key exchange systems are often the most appropriate, as the person entering the guarded area can take a key with them to prevent the machine from being restarted (assuming the safe system of work is followed). See the 'Useful resources' section below for a white paper about trapped key interlocking and the guidance contained in PD ISO/TS 19837:2018.

When is access required?

If frequent access is required and the machine has a short stopping time, photo-electric guards can be very effective, though care must be taken to observe the correct distance between the guard and hazard (see BS EN ISO 13855). Other options are laser area scanners and pressure-sensitive mats. However, although these options will prevent a person from coming into contact with dangerous machinery they will not prevent items from being ejected from the machine. Furthermore, photoelectric devices are susceptible to a build-up of dirt, so they may not be appropriate for many applications in the waste management and recycling industry.
Conventional opening guards can be manually operated or powered. In the case of powered guards, it may be necessary to install 'safe edges' on the leading edges of the guards to prevent them becoming hazards themselves.

Two of the changes introduced when BS EN ISO 14120 replaced BS EN 953 relate to the choice of fixed or movable guards where access is required only for machine setting, process correction or maintenance.

- first, EN 953 stated that movable guards should be used if the frequency of access is 'high (e.g. more than once per shift)' but ISO 14120 defines 'high' as 'e.g. more than once per week';
- second, in EN 953 fixed guards should only be used 'if the foreseeable frequency of access is low, its replacement is easy, and its removal and replacement are carried out under a safe system of work', with no definition provided for 'low', so users were left to assume that 'low' is any frequency that falls outside the scope of 'high'. In contrast, ISO 14120 defines 'low' as 'e.g. less than once per week'.

There is an ambiguity here regarding whether fixed or movable guards should be used if access is required once per week (not more, not less), as this is a foreseeable situation (maintenance or cleaning might be scheduled to take place weekly). It could be argued that the guard designer should err on the side of safety and specify (interlocked) movable guards rather than fixed guards that are removed and replaced under a safe system of work. On the other hand, the designer may be tempted to save costs by installing fixed guards that do not require hinges or linear bearings, or the interlock, wiring and additional inputs on the safety-related control system.

The other issue here is that under EN 953 the frequency of access was considered to be high if access was required more than once per shift; in contrast, ISO 14120 redefines 'high' as once per week, which could result in many more machines meeting this criterion and therefore having to be equipped with movable guards rather than fixed guards. The implications for design and manufacturing costs could be considerable.

Safe systems of work

There will be times when workers need to enter machines or remove guards for maintenance or to clear blockages. If so, it is essential that the machine remains safe while people are working on it. Usually the machine will be isolated from the electricity supply, but it may also be necessary to ensure that hydraulic or pneumatic systems cannot move; any stored energy should be dissipated before work starts. When the power sources have been isolated, they should be locked off using a padlock or other secure means – and if more than one person is working on the machine, they should each have their own lock. Finally, before any work commences, the effectiveness of the isolation procedure needs to be verified by a competent person, and a sign displayed on the machine to indicate that maintenance is being undertaken.

Most importantly, all of the above needs to be carried out in accordance with a formal plan – or safe system of work – prepared following a risk assessment. For higher-risk work, a 'permit to work' system can be implemented, which places even tighter controls on authorisation and working procedures.

Working at height

Workers may need to access a machine or process to gain a view of a process, undertake maintenance or clear blockages. Falls can occur when gaining access to a place of work or from the place of work itself – and it may be that the place of work was not designed for that purpose. Whenever working at height is required, a suitable risk assessments and safe system of work must be in place. If access is required regularly, it might be appropriate to install a permanent means of access, such as fixed stairways, ladders or stepladders, working platforms, walkways and guard rails.

If in doubt, ask.

This guide is intended to explain some of the issues relating to machine guards for use in the waste management and recycling industry. It does not contain sufficient information to enable a full set of standards-compliant guards to be designed from scratch.

If further assistance is required, Procter Machine Safety can advise on current regulatory requirements as well as undertake risk assessments and site surveys, and then design, manufacture and install bespoke close-fitting guarding, including electrical integration, to suit virtually any machine or process.

For perimeter guarding, Procter Machine Safety offers a choice of modular systems. Standard elements include sliding, hinged and lifting guards, as well as fixed panels with infills of welded wire mesh, sheet steel and polycarbonate. Furthermore, the company can also design and manufacture bespoke components to complement the standard elements where these would not be suitable. Customers pay only for what they need because they can select from a choice of modular systems of different strengths and specifications — or use a combination of different specifications for various areas around a machine. All perimeter guards are offered on a supply-on basis or Procter can provide an installation service if required.

Useful resources

These are all available free of charge on request or to download.
Email: info@machinesafety.co.uk
Download: https://www.machinesafety.co.uk/free-downloads

Risk Assessment Calculator
Based on the requirements of BS EN ISO 12100 and designed to be simple to use.

Safety Distance Calculator
Establishes machine guard safety distances and heights in accordance with BS EN ISO 13857.

Guide to the New Machinery Directive 2006/42/EC
Written primarily for machine builders and suppliers who need to CE mark machines.

On Your Guard: A Designer's Guide to Machinery Guarding Standards
Presents the machinery guarding and related standards, and provides tips for designing standards-compliant guards.

White paper: Machinery Directive and Fixings for Fixed Guards
Explains the requirements for guard fixings under the Machinery Directive.

White paper: CE Marking of Machine Guards
Explains under what circumstances guards need to be CE marked to the Machinery Directive.

White paper: EN 349, Minimum Gaps to Avoid Crushing
Explains the requirements relating to minimum gaps to prevent crushing.

Note: EN 349 has been superseded by EN ISO 13854 but the contents of this white paper are still valuable.

White paper: Trapped Key Interlocking and PD ISO/TS 19837:2018
Explains the official guidance on implementing trapped key interlocking systems.

White paper: Machinery Guarding for PUWER
Explains the requirements for machine guarding within the context of PUWER.

White paper: Differences Between BS EN 953 and BS EN ISO 14120
Explains the changes introduced when BS EN ISO 14120 superseded BS EN 953.

White paper: Conveyor Guarding
Explains the hazards associated with conveyors, regulations and standards, and how to safeguard conveyors without adversely affecting productivity.

White paper: The 2014 Edition of PD 5304
Explains the changes in the latest edition of BSI's Guidance on safe use of machinery.

Machine Accident Investigation Kit
To help companies meet their statutory obligations and prevent future accidents.

Ergonomics Guidance
European Commission publication Guidance on the application of the essential health and safety requirements on ergonomics.
Download: https://ec.europa.eu/growth/sectors/mechanical-engineering/machinery

Spotlight on health and safety: Contrasting performance in the waste and recycling industry
Report published by the ESA (Environmental Services Association) in February 2018.
Download: http://www.esauk.org/application/files/1415/3589/6449/20180216_ESA_Spotlight_on_health_and_safety.pdf

Designing and Operating Material Recovery Facilities (MRFs) Safely
Formal guidance published by the Waste Industry Safety and Health (WISH) Forum in 2015.
Download: https://wishforum.org.uk/wp-content/uploads/2017/02/WASTE-13-.pdf

Guidance for the Recovered Paper industry (INDG392)
Formal guidance produced by the Health and Safety Executive (HSE) in consultation with the Recovered Paper Association and the Independent Waste Paper Processors Association.
Download: http://www.hse.gov.uk/pubns/indg392.pdf

Further information

Procter Machine Safety
Tel: 02920 855 758
Email: info@machinesafety.co.uk — Website: https://www.machinesafety.co.uk

SATECH (low-cost modular perimeter guards)
Tel: 02920 855 754
Email: satech@machinesafety.co.uk — Website: https://www.machinesafety.co.uk/satech

Nelsa (standard machine shop guards from Procter)
Tel: 02920 855 751
Email: nelsa@machinesafety.co.uk — Website: https://www.machinesafety.co.uk/nelsa

BSI
Tel: 0345 086 9001
Email: cservices@bsigroup.com — Website: https://shop.bsigroup.com

Health and Safety Executive
Tel: 0300 003 1747
Website: https://www.hse.gov.uk

HSE Books
Note: many publications are now available to download for free as PDF files.
Tel: 0333 202 5070
Email: hseorders@tso.co.uk — Website: https://books.hse.gov.uk

Department for Business, Energy & Industrial Strategy (BEIS)
Tel: 020 7215 5000
Email: enquiries@beis.gov.uk — Website: www.gov.uk/beis

European Commission
List of standards harmonised to the Machinery Directive 2006/42/EC, official guide to application of the Machinery Directive and guidance on ergonomics and safety fences used as safety components
Website: https://ec.europa.eu/growth/sectors/mechanical-engineering/machinery

About the author

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