



## Packaging machinery: Safeguarding palletisers and depalletisers

### Food Information Sheet No 27

#### Introduction

This information sheet gives practical advice on safeguarding palletisers and depalletisers to meet the requirements of the Provision and Use of Work Equipment Regulations 1998 (PUWER), the Supply of Machinery (Safety) Regulations 1992 (SMR) and BS EN 415-4: 1998 *Safety of packaging machines - Part 4: Palletisers and depalletisers*.

HSE investigated 30 serious accidents on palletisers and depalletisers between 1997 and 2001. They were the third-highest cause of investigated packaging machinery accidents for that period.

The advice in this guidance covers new machines and explains how the safeguarding options in BS EN 415-4 affect existing machinery.

#### Hazards

Most accidents happen when operators or maintenance personnel enter the machine and become trapped between fixed parts and moving parts such as transfer heads, sweepers, pushers etc. Many serious and fatal accidents have occurred when the head or trunk have been trapped in the machine mechanism.

Entry into the machine is necessary for a number of reasons. Adjustment, clearing of blockages, cleaning and maintenance all require personnel to go into areas where they could be at risk of injury unless the proper precautions are taken. The risk is made greater by the unexpected nature of machine movements, which respond to the varying speed of product delivery.

There are also hazards from falling loads, sudden movements of jammed product or pallets that are freed, or by movement due to the failure to dump stored energy in pneumatic and hydraulic systems.

#### Safeguarding

Personnel access into a palletiser or depalletiser should be via a dedicated route other than the pallet load entry/exit openings. Doors provided for this purpose should be safeguarded using interlocking devices with guard locking, and openings should have suitable electro-sensitive protective equipment (ESPE) acting as a trip device.

In practice, the result will normally be perimeter fencing with interlocked personnel access doors and photoelectric safety systems at the pallet load entry and

exit points. Perimeter fencing has to be of an adequate height and strength. The strength of fencing will have to take into account falling loads where they could pose a risk to personnel. Where robots are used, perimeter fencing will have to be strong enough to confine ejected loads.

Following worker entry into a palletiser or depalletiser, the machinery should only be able to be restarted by an intentional action at a control device located outside the danger zone. If a person could be inside the machinery without the knowledge of others (eg on larger machines) then trapped key interlocking devices or presence-sensing devices should be provided to prevent a restart with a person still inside a danger zone.

From the main control position of the palletiser or depalletiser, the operator should be able to ensure that there are no people in a position where they could be at risk.

Inside the palletiser or depalletiser, all parts of transmission machinery that can be in motion and are accessible should be protected by fixed guards.

Operator entry through the entry or exit points for pallet loads, unit loads or empty pallets should be prevented by at least one of the following three methods:

- electro-sensitive protection equipment (ESPE);
- interlocked movable guards with guard locking; or
- fixed guarding.

#### ***Electrosensitive protection equipment (ESPE)***

The ESPE must be configured to allow product to pass but to stop the machine when a person enters.

These systems can work by directly discriminating between a person and a load (eg by length), with the trip function being muted during the passage of a load. Alternatively, they can be designed to detect the direction an object is moving through an opening and the object's size, initiating a stop command if the detected characteristics do not match those of a pallet load. Information on these techniques is provided in Annex A of BS EN 415-4. ESPE used in this application should meet the requirements of BS EN 61496-1: 1998 *Safety of machinery. Electrosensitive protective equipment. General requirements and tests*.

Guidance on the integration of such devices into machinery control systems is published in HSE booklet *Application of electrosensitive protective equipment using light curtains and light beam devices to machinery*.

### **Interlocked movable guards with guard locking**

When a full pallet is ready for output, movable guards on the exit are signalled to unlock. The pallet then pushes the guards open. Closing of the guards is automatic, for example via springs. The cycle can only restart when the lock on the guards is closed, this is confirmed by a two-lock control.

### **Fixed guarding**

Fixed guarding should be at least long enough to accommodate two loaded pallets from the palletiser. The second pallet forms the barrier to entering the machine while the first is removed. The first pallet can only be removed when the second pallet is in position. This method of safeguarding is the lowest standard and is limited to use in low-risk applications on palletiser outfeeds, as no protection is available at start-up.

### **Safety-related control system integrity**

Interlocked safeguarding systems provided to protect personnel should have a safety integrity selected from Categories 2, 3 and 4 as defined in BS EN 954-1: 1996 *Safety of machinery. Safety related parts of control systems*.

The selected category will depend upon the amount of risk reduction being implemented by the safety-related parts and the technology being used. The selection should therefore be based on a risk assessment. However, most machines will have safety functions implemented using electrotechnical equipment for which Category 2 would be appropriate.

Category 2 means that, in addition to ensuring the proper design and use of well-tried components, checks of the safety function are carried out by the machine control system (normally every machine cycle) to detect faults. Although Category 2 systems will be most common, Category 3 or even Category 4 may be appropriate in higher-risk applications.

### **Manual operations**

Manual operations that require regular whole, or part-of, body access into the machine should only be carried out via an interlocked access. Resetting should be by a control located outside the machine adjacent to the point of access. The safety integrity of the system should be as described above.

### **Stored energy**

When a machine is stopped by the operator controls or a safety device, residual energy sources such as hydraulic

and pneumatic should be rendered safe. Guidance on this is given in BS EN 982: 1996 *Safety of machinery. Safeguarding requirements for fluid power systems and their components - Hydraulics* and BS EN 983: 1996 *Safety of machinery. Safeguarding requirements for fluid power systems and their components - Pneumatics*.

The energy associated with suspended loads or parts of the machine which may be released should be restrained. Restraints should be automatic and be capable of holding a full load. Means of achieving this type of restraint include mechanical or hydraulic locking, braking or anti-fall devices.

For maintenance activities, additional means of restraint should be provided, eg a direct-acting hydraulic ram with a normally closed non-return valve could act as the anti-fall back device, plus a mechanical 'scotch' of sufficient strength. Further information regarding isolation and energy dissipation for frequent short interventions and major maintenance is given in BS EN 1037: 1996 *Safety of machinery. Prevention of unexpected start-up*.

### **Maintaining machinery safeguards**

This may take the form of operator checks, routine inspections (record of last inspection should be kept), periodic maintenance or use of the diagnostic function available in some electronic control systems. Intervals should be based upon experience and information from the machinery manufacturer or component supplier.

Operator checks should establish that there are no obvious faults, that the guards are in place, and that interlocks, photoelectric devices and emergency stops are not patently defective.

Functional tests may be included in operator checks or in routine or periodic maintenance, depending on the risk.

People carrying out checks should be competent to do so. Suitable checks on safeguarding should be carried out during the installation and commissioning of the machines before handover to production.

In addition to these hardware-type checks, other systems may be required to monitor safe systems of work.

### **New machinery**

#### **Supplier duties**

Suppliers of new palletisers and depalletisers must ensure any machine they supply complies with relevant 'essential health and safety requirements' (EHSRs) set out in SMR, which enacts the European Machinery Directive in the UK.

Suppliers can comply with the EHSRs by building their palletising and depalletising machinery in conformity with

BS EN 415-4. Instructions provided with machines should include maintenance and monitoring regimes for the safeguards.

In addition to new palletisers and depalletisers, SMR also applies to substantially refurbished machinery from within and outside the European Economic Area (EEA).

BS EN 415-4 deals with all hazards under the Machinery Directive except those specifically excluded in the scope of the standard (ie hazards from heat, noise, vibration, radiation, fumes, gas, dust and hazards from the contents of loads handled by the machine). Where these hazards exist, the supplier still has to comply with the EHSRs and can use other published standards where these exist to assist in ensuring the risks are controlled.

### **Purchaser duties**

Companies purchasing machines have duties under PUWER to ensure that new equipment they bring into use meets the EHSRs set out in SMR and should ensure the machinery is in fact safe and suitable for the intended application. Purchasers can ensure new equipment meets these requirements by specifying in purchase contracts that equipment should comply with BS EN 415-4 and then by checking on delivery that the Declaration of Conformity confirms this.

### **Existing machinery**

Existing palletisers and depalletisers are subject to PUWER and should be suitable for their purpose, properly maintained and safe to use and clean.

Users should use the safeguarding options for new palletisers and depalletisers as a benchmark for existing machines. Where the standard of safeguarding is found to be lower than for new machines, a risk assessment should be carried out to see if it is reasonably practicable to upgrade the guarding and safety at the machine.

Improvement may be needed in basic hardware, systems of work and in training and supervisory procedures.

All improvements should form an integrated package since improved guarding alone may lead to tampering if there is a significant increase in the difficulty of carrying out production and maintenance tasks.

### **Further reading**

#### **BSI publications**

BS EN415-4: 1998 *Safety of packaging machines - Part 4: Palletisers and depalletisers*

BS EN 61496-1: 1998 *Safety of machinery. Electrosensitive protective equipment. General requirements and tests*

BS EN 954-1: 1996 *Safety of machinery. Safety related parts of control systems*

BS EN 982: 1996 *Safety of machinery. Safeguarding requirements for fluid power systems and their components - Hydraulics*

BS EN 983: 1996 *Safety of machinery. Safeguarding requirements for fluid power systems and their components - Pneumatics*

BS EN 1037: 1996 *Safety of machinery. Prevention of unexpected start-up*

#### **HSE publications**

*Supplying new machinery* Leaflet INDG270 HSE Books 1998 (single copy free or priced packs of 15 ISBN 0 7176 1560 X)

*Buying new machinery* Leaflet INDG271 HSE Books 1998 HSE Books 1998 (single copy free or priced packs of 15 ISBN 0 7176 1559 6)

*Effective purchasing procedures for equipment in the food and drink industries* Leaflet INDG323 HSE Books 2000

*Five steps to risk assessment* Leaflet INDG163(rev1) HSE Books 1998 HSE Books 1998 (single copy free or priced packs of 10 ISBN 0 7176 1565 0)

*Safeguarding flat belt conveyors in the food and drink industries* Food Information Sheet FIS25 HSE Books 2001

*Provision and use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance* L22 (Second edition) HSE Books 1998 ISBN 0 7176 1626 6

*Application of electrosensitive protective equipment using light curtains and light beam devices to machinery* HSG180 HSE Books 1999 ISBN 0 7176 1550 2

#### **Other publications**

*Product standards: Supply of Machinery 98/644* (Explanatory booklet on the Supply of Machinery (Safety) Regulations 1992). Available from DTI Hotline Tel: 0870 150 2500

*Supply of Machinery (Safety) Regulations 1992* SI No 3073 The Stationery Office ISBN 0 11 025719 7

*Supply of Machinery (Safety) (Amendment) Regulations 1994* SI No 2063 The Stationery Office ISBN 0 11 045063 9

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

**Further information**

British Standards are available from BSI Customer Services, 389 Chiswick High Road, London W4 4AL Tel: 020 8996 9001 Fax: 020 8996 7001 Website: [www.bsi-global.com](http://www.bsi-global.com)

The Stationery Office (formerly HMSO) publications are available from The Publications Centre, PO Box 276, London SW8 5DT Tel: 0870 600 5522 Fax: 0870 600 5533 Website: [www.clicktso.com](http://www.clicktso.com) (They are also available from bookshops.)

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995 Website: [www.hsebooks.co.uk](http://www.hsebooks.co.uk) (HSE priced publications are also available from bookshops.)

For information about health and safety ring HSE's InfoLine Tel: 08701 545500 Fax: 02920 859260 e-mail: [hseinformationservices@natbrit.com](mailto:hseinformationservices@natbrit.com) or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG. You can also visit HSE's website: [www.hse.gov.uk](http://www.hse.gov.uk)

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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