Safe systems of work for cleaning sheet-fed offset lithographic printing presses

Printing Information Sheet No 1

Introduction

This information sheet has been produced by the Printing Industry Advisory Committee (PIAC) in response to concerns about the large number of accidents that continue to occur during the operation and maintenance of printing presses. It deals primarily with safety issues, as other PIAC publications cover health risks. It provides guidance for employers and supervisors on suitable defined safe systems of work appropriate for various cleaning and maintenance tasks on sheet-fed printing presses used in the offset lithographic process. Employees will also find it useful. The safe systems of work described have been established following risk assessment which takes into consideration the nature of the cleaning task, the safeguarding arrangements and the machine controls provided.

Remember that the Management of Health and Safety at Work Regulations 1999 require you to carry out a risk assessment and implement any necessary control measures, including safeguarding and safe systems of work. Regulations 5 and 6 of the Provision and Use of Work Equipment Regulations 1998 (PUWER 98) require that safeguards are maintained, inspected and tested. There is a safeguard checklist on the back page which will help to ensure you comply with this requirement.

Accident history

Table 1 Accidents involving work at all types of printing presses reported to HSE under RIDDOR 1991/92-1995/96

Year	*1991/92*	*1992/93*	*1993/94*	*1994/95*	*1995/96*
All	133	99	89	97	87
Major	17	12	13	19	12

As a result of significant under-reporting, these figures only represent a fraction of accidents involving printers. Employers are reminded that the reporting of accidents is a requirement of the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1995. You can be prosecuted if you fail to do this.

Causes of accidents

Approximately 70 accidents which occurred during cleaning tasks at presses were investigated by Health and Safety Executive (HSE) inspectors from 1986-1996. Table 2 shows the number of accidents at sheet-fed offset presses, at what speed they were running and the parts of the press involved.

Table 2 Investigated accidents at sheet-fed offset presses

	Inking/ damping rollers	*Blanket/plate/ impression cylinders*	*Transfer cylinders*	***Total***
Production speed	4	-	-	4
Crawl/inch speed	7	19	5	31

More detailed analysis has shown that most of the accidents are caused by:

- inadequate safeguards allowing access to in-running nips;
- guards failing due to lack of maintenance, or guards being removed;
- control performance deteriorating (eg inch travel/crawl speed increasing) due to lack of maintenance;
- unsafe systems of work for cleaning the press.

Examples of incidents involving sheet-fed offset presses

An operator was seriously injured when cleaning the plate cylinder of a four-colour Man Roland Ultra lithographic press on continuous slow crawl. The cleaning cloth was taken into the nip between the plate and blanket cylinders. The trip nip bar caused the press to stop only when his left hand had been taken in as far as the wrist, ie the stopping performance of the cylinder was excessive.

A printer suffered a crushed left-hand finger and friction burns on his palm when the cleaning cloth he was using was pulled into the inking rollers of a Rotaprint sheet-fed offset press running at production speed. The inking roller guards had been raised as they were not interlocked.

An operator was injured while cleaning a Heidelberg MOVP. The interlocked guard was open to give access to the cylinders, which were being moved using the inch control. Due to lack of maintenance, the length of inch movement was excessive. While cleaning the cylinders, his cloth was caught between the transfer and impression cylinders, drawing his right-hand middle finger into the nip. The inch-stop-lock-clean system was not being used.

What you need to do: A step-by-step approach

PIAC recommends that you use the following step-by-step approach to help you to decide on the appropriate system of work for your presses.

Remember to consult employees and safety representatives at all stages of the process - they have valuable insights into the daily operation of systems and machinery.

Step 1: Assessing safeguarding standards for print units

Compare the safeguarding standards (ie the combination of cylinder stopping performance, trip/nip bar position and maximum crawl speed) on your own machines against those in Table 3 and decide whether you need to upgrade what you now have to meet current standards. These standards are commonly accepted and practicable and PIAC believes all printers can achieve them. Standards will differ slightly for the make, model, type and age of the press so that the same system of work for a cleaning operation may not be appropriate for what may appear to be similar presses. The control definitions in Table 3 are in italics and they are explained following the table.

Table 3 Safeguarding standards

Hazard	*Safeguard*
In-running nips between inking and damping roller assemblies	● All enclosing interlocked guards with either no powered movement or *true inch* or *hold-to-run slow crawl* only when the guard is raised.
In-running nips between the plate, blanket and impression cylinders	● An enclosing interlocked guard which allows limited powered movement when raised by means of *true* or *limited inch*, or *hold-to-run* or *continuous slow crawl*; and a trip nip bar adjusted to within 6 mm of the cylinder surface which either meets the performance standard in 'control definitions', or is supplemented by cylinder gap covers for both plate and blanket cylinders, or there is no facility for *continuous slow crawl*; **or** ● an enclosing interlocked guard as above supplemented by fixed nip bars adjusted to within 6 mm of the cylinder surface and gap covers for both plate and blanket cylinders. Fixed nip bars are not adequate in the absence of cylinder gap covers unless there is no facility for *continuous slow crawl*; **or** ● on certain old machines, trip nip bars which do not meet the performance standard in 'Control definitions' or fixed nip bars, in either case adjusted to within 6 mm of the cylinder surface and close fitting gap covers for both plate and blanket cylinders. There should be no facility for *continuous slow crawl*. Users should plan to upgrade such presses by the addition of enclosing interlocked guards.
In-running nips between impression/transfer cylinders	● An enclosing interlocked guard which allows limited powered movement when raised by means of *true or limited inch.* An emergency stop (or 'stop-lock') control should be provided at each print unit.
Unexpected start-up during multi-person cleaning	● Pre-start audible warning device.

Control definitions

True inch - a single depression of the control button causing a cylinder movement of 25 mm. It should not be possible to cause uninterrupted movement of the cylinders by repeated depression of the button.

Limited inch - a single depression of the control button causing a cylinder movement greater than 25 mm but less than 75 mm. It should not be possible to cause uninterrupted movement of the cylinders by repeated depression of the button.

To test inch movement - mark the cylinder and machine frame, inch and measure.

Hold-to-run slow crawl - uninterrupted movement of the cylinders at 1 m per minute caused by continued depression of the control button. Crawl speed may be increased to a maximum of 5 m per minute **only** if there is no substantial increase in hazard.

Continuous slow crawl - uninterrupted movement of the cylinders at 1 m per minute which does not require continued depression of the control button. Crawl speed may be increased to a maximum of 5 m per minute **only** if there is no substantial increase in hazard.

To measure crawl speed - count the number of revolutions per minute and multiply by the cylinder circumference.

Trip nip performance standard - on tripping, the length of movement of the trip bar should be greater than the stopping distance of the cylinder, ie cylinder movement ceases within the deflection travel distance of the bar. To test:

- With the press stationary, measure the total deflection of the trip nip bar (t).
- Mark the cylinder and machine frame.
- Operate the crawl control.
- Push the trip nip with a cardboard tube when the two reference marks are in line.
- Measure the distance moved by the cylinder (c) and compare measurements (t) and (c); (t) should be greater.

Step 2: Decide on the appropriate safe system for cleaning

This is determined by the standard of safeguards and the machine controls. Apply the following hierarchy:

- Reduce the frequency of cleaning to that necessary to maintain the quality of work, so reducing the need to approach hazardous parts.
- Use automatic wash-up systems. Where provided, make full use of automatic inking roller and blanket wash-up systems.
- Select a safe system of work which ensures that operators do not need to place their hands near accessible in-running nips. Appropriate methods of work for press cleaning are listed in Table 4.

Additional precautions

- Apply cleaning solvent with a suitable cloth folded to form a pad without loose edges, using close-fitting impervious gloves.
- Keep cleaning solvent within a suitable sealed container to prevent spillage and evaporation.
- Put used cleaning cloths in a closed, fire-resisting container.
- Provide adequate ventilation.

Defined safe systems of work for press cleaning

There are three main safe systems:

Inch-stop-lock-clean. In this system, the press is subject to limited movement using the inch button, stopped and the power isolated using the emergency stop button before applying the solvent-soaked cloth. **In multi-person operation, each person must retain control over the re-setting of their own emergency stop button so that it is not possible for another person to cause the press to move unexpectedly.**

Inch-stop-clean. In this system the cylinders are rotated enough to expose the next section of cylinder surface to be cleaned. The hand with the cleaning cloth is held clear of the cylinder while it is rotating. The cylinder should be stationary before the solvent-soaked cloth is applied. For machines with a *true or limited inch* control, several depressions of the button may be required to expose enough of the cylinder surface to clean. **Multi-person cleaning is acceptable using this system only where zoned print unit controls are provided, ie cylinder movement at each print unit can occur and be controlled independently of the rest.**

Continued overleaf

Table 4 Appropriate systems of work for press cleaning

Warning: Failure to ensure the safeguarding conditions for the appropriate system of work could result in contravention of the requirements of PUWER 98.

Task	*Risk factors*	*System of work*
Cleaning inking rollers, multi- or single-person	Absence of nip bars	● Use of demountable wash-up tray.
Cleaning plate and blanket cylinders, single-person	Absence of gap covers allowing access behind trip nip/nip bars	● Auto wash-up. ● *Inch-stop-clean*, forward motion. ● Forward *slow crawlcleaning* **only** if there is safeguard checking and a trip nip to the performance standard in 'Control definitions'.
Cleaning plate and blanket cylinders, multi-person	Absence of gap covers allowing access behind trip nip/nip bars Unexpected start-up	● *Inch stop-lock-clean*. ● If press has zoned controls allowing independent movement of print unit cylinders, *inch-stop-clean*, forward motion. ● Forward *slow crawl cleaning* only if there is safeguard checking and trip nips to the performance standard in 'Control definitions'.
Cleaning impression and transfer cylinders, multi- or single-person	Relative inaccessibility; absence of nip bars and hazard from grippers	● *Inch-stop-lock-clean*. ● For presses with dedicated, zoned true inch controls beneath the foot board **only**, *inch-stop-clean*.

A variation of this system can be used on presses with semi-automatic plate change. By making use of the plate change cycle, and pre-cocking the cylinder position, there is almost a complete revolution at slow speed which is enough to allow cleaning of the whole cylinder surface without allowing exposure to the cylinder gap.

Slow crawl cleaning. In this method, the cleaning cloth is applied to the cylinder as it rotates at very slow speed. Movement is controlled using *hold-to-run slow crawl* controls or non-hold-to-run controls (*continuous slow crawl*).

Step 3: Train and instruct employees

As an employer, you need to train and instruct employees in the appropriate system of work and safeguard checks for their press. Systems of work and guard checklists need to be documented. Make sure you discuss the options with employees and safety representatives and agree safe systems of work with them.

You should ensure that the press controls are understood and that the reason a particular system of work is needed is properly explained**.** Make it clear that employees will be accountable for this work. You also need to explain what they should do if a safeguarding or control defect is found and you should support any employee who identifies a hazardous defect. Any such defects should be investigated and dealt with before continuing to use the machine.

It is a good idea to attach a guard checklist to each press. This will act as a reminder and will show that the minder has an important role to play.

Safeguard checklist

Check that:

- interlocked guards prevent motion at production speed when raised;
- cams on interlocking guards have not moved out of adjustment;
- trip nip and fixed nip bars are adjusted to within 6 mm of the cylinder surface;
- gap covers are fitted (where provided);
- trip nip performance and inch travel have not deteriorated;
- the crawl speed is limited to 1 m per minute;
- pre-start warning devices are audible.

Step 4: Monitoring and review by managers

Completion of the press operator's daily and weekly checks will help to ensure compliance with regulation 5 of PUWER 98, and managers need to make periodic checks that these agreed procedures are being implemented. Satisfy yourself for example that:

- safeguard checklists have been completed and signed, and any defects noted and reported;
- the correct system of work is being used.

Where your risk assessment has shown that slow crawl cleaning is appropriate, to ensure compliance with regulation 6 of PUWER 98, the performance of the trip nip device should be checked at regular intervals. This is because deterioration of the trip nip performance would lead to a significant risk to the operator during cleaning on slow crawl. The results of the check should be recorded and kept until the time of the next inspection.

If you routinely find problems, investigate to find the root cause, and then reassess. By doing this you will also be able to determine the most appropriate frequency for inspection.

Further information

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

HSE priced publications are also available from good booksellers.

For other enquiries ring HSE's InfoLine Tel: 08701 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ. Website: www.hse.gov.uk

This leaflet was prepared by the Printing Industry Advisory Committee and has been agreed by the Health and Safety Commission. It 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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