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design, manufacture, installation & maintenance of  
**rising security screens**  
– code of practice

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## Introduction

Rising security screens have proved to be very effective in defeating attempted armed robberies, although, alone, they cannot be the complete answer to the armed robber. It is clear that an integrated security strategy must include a full risk assessment, management of health and safety and training alongside the consideration of the part to be played by individual products, including rising screens. In that regard, this code of practice is intended to be a valuable source of information to assist specifiers and end-users.

This code of practice, which was developed by members of the Physical Security Equipment Section of the British Security Industry Association in consultation with the Directorate of Science and Technology of the Health & Safety Executive and end-users, represents a standard of good practice and therefore takes the form of a series of recommendations. Rising security screens are designed for the protection of life and limb and this code of practice is concerned with that issue and the safety and confidence of the end-users and staff who use rising security screens. End-users have welcomed the code and many of their suggested amendments have been incorporated.

The code is divided into two parts. Part 1 is intended for use by end-users and specifiers and covers the design, manufacture, installation, after-sales service and end user staff education for rising screens. Part 2 is intended as guidance for manufacturers to meet the various technical regulatory requirements.

## Part 1

### 1. Scope

The scope of Part 1 of the code is to provide advice to users and specifiers as to the best practice and recommended minimum criteria for bullet resistant rising screens.

The code applies primarily to opaque rising screens that are bullet resistant to BS 5051, Part 1:1988 Class G2 and Class S86 (Draft BS 5888 Class M2 and Class MS86 and Provisional EN 1063, Class B4 and Class SG2). The principles of this code may be applied to lower or higher levels of bullet resistance.

The code makes recommendations for the design, manufacture and installation of rising security screens to comply with the Supply of Machinery (Safety) Regulations 1992 and the Supply of Machinery (Safety) (Amendment) Regulations 1994. Those recommendations are specific to the screens themselves and to the manner in which they should be integrated into the general work place environment in order to maintain the integrity of bullet resistance.

Recommendations are also made for after-sales service and end-user staff training in order to maintain the effectiveness of the rising screens throughout their useful life and for end-users to meet their obligations under the Provision and Use of Work Equipment Regulations (1992) and the Workplace (Health, Safety & Welfare) Regulations (1992).

It must be emphasised that a rising screen is a safety and security critical system. As such, end-users should seek the advice of the original manufacturer for all matters relating to its installation, modification and maintenance.

Compliance with this code of practice does not confer immunity from relevant statutory and legal requirements nor does it necessarily satisfy all the requirements that might be specified by an insurance company.

The code of practice covers matters which are specific to the rising screens. There are other considerations that should be addressed by end-users in their overall assessment when installing rising screens. These include:

- Surveillance of the public area when screens have been activated.
- Policy for staff conduct when under duress.
- Policies for staff conduct after screens have been activated, including customer relations.
- Policies for providing both immediate assistance and lowering of the screens in the event that a robber attempting to cross the screen line should become trapped.

### 2. References

Relevant standards, regulations, etc. referred to in this code of practice and that may be useful are listed at Appendix A. The advice contained in the HSE publications "Violence at work; a guide for employers" and "Prevention of violence to staff in banks and building societies" may prove useful.

## 3. Definitions

For the purposes of this code of practice, the following definitions apply:

### 3.1 Authorised technician

A person who is fitted, by virtue of academic qualifications, experience, knowledge and training on the particular types of security screens, to carry out installation, repairs and servicing.

### 3.2 Automatic input trigger

Any switching mechanism that may be switched by the action of a robber and is connected by cabling or wire-free communication path to the Control System to activate the rising screen. Typical forms of automatic input triggers are:

- Infra-red beams
- Pressure pads

### 3.3 Bullet resistance

The tested performance of a material to withstand the tests specified in the various standards:

- BS 5051, Part 1:1988
- Draft BS 5888
- Provisional EN 1063

### 3.4 Control system

The electrical/electronic system to recognise valid input triggers to activate the operating system and to monitor, display and record system events, warnings, faults, malfunctions, etc.

### 3.5 Operating system

The system to store energy and release it to drive the screens into their closed position. The operating system most commonly uses pneumatic power but may use electrical or hydraulic power.

### 3.6 Personal input trigger

Any hand or foot operated switching mechanism that is connected by cabling or wire-free communication path to the Control System to activate the rising screen. Personal input triggers are sometimes referred to as activation devices or activators. Typical forms of personal input triggers are:

- Foot kicks or switches
- Note, bait or money clips
- Single, dual or triple push buttons

### 3.7 Public side

The face of the screen that is normally exposed to the public.

### **3.8 Rising security screen**

A security screen designed principally for the protection of personnel in environments where there is a risk of violent attack, particularly in those situations where staff are dealing with cash transactions. The screen incorporates an operating system which, when activated, causes a bullet resistant panel to rise quickly, closing the aperture between the staff and aggressor.

### **3.9 Staff side**

The face of the screen that is normally exposed to the staff.

## **4. Design**

In practice there are two basic types of rising screen:

- Standing counter screen: the work surface is generally at 1015-1150mm from finished floor level on the Public Side suitable for a standing customer.
- Interview screen: the work surface is generally at 700-800mm from finished floor level on the Public Side suitable for a seated customer.

Individual manufacturers have their own designation of these types and their own layouts of the operating and control systems within those screens. This code of practice seeks to maintain each manufacturer's flexibility of detailed design.

Particular attention should be paid to the following design criteria:

### **4.1 Safety**

The design of a rising screen should recognise that the operating system involves the release of a large amount of stored energy and that its operation, particularly accidental operation, carries the risk of injury to the public, who are likely to be unaware of its existence and potential danger, and to staff, who should be well trained in its safety features, its proper use and its potential dangers.

Specifiers, designers and manufacturers should ensure that the screen itself and its location within the working environment minimise the risk of injury to public and staff.

The Supply of Machinery (Safety) Regulations 1992 and the Supply of Machinery (Safety) (Amendment) Regulations 1994 (collectively referred to as SM(S)Rs) apply to the manufacture and supply of rising security screens. BS EN 60204:1993 and BS EN 983:1996 apply to the electrical and pneumatic equipment of rising security screens.

Although individual components of the rising security screen system may be marked as CE indicating that they comply with essential health and safety requirements of the SM(S)Rs and other relevant standards, the CE mark to indicate compliance with SM(S)Rs cannot be legally applied to the screen system until it is fully installed with its power supplies, operating and control systems, input triggers and counterwork.

## 4.2 Counter design

Ergonomic studies should be undertaken to determine the design of the counterwork and any counter fittings, including hampers, surrounding a rising screen in order to minimise the risk of a member of the public being able to lean over the line of the rising screen and to preclude most members of the public and staff from leaning over the line of the rising screen without adopting an abnormal posture. Factors which should be considered in the ergonomic study include:

- The height of the counter above the finished floor
- The depth of the counter top from the public edge to the nearest rising element of the screen
- The height above the counter top of any hamper
- The spacing between any hampers
- The position of any hamper in relation to the public edge of the counter and the nearest rising element of the screen.

Typical measures that may be applied to prevent the public or staff from leaning over or placing objects on top of the screen line include:

- Acrylic or glass hamper blades
- Vertical wires or acrylic bars

The design principles outlined above to restrain members of the public from being able to lean over the rising screen line should also be applied to the design of the staff side of the counterwork.

It is recommended that, for reasons of public and staff safety, signage is displayed to discourage customers from leaning over the screen line. e.g. PLEASE DO NOT LEAN OVER THIS LINE. Any signage should comply with the Health and Safety (Safety Signs and Signals) Regulations 1996.

Counter design and the fixing of counter fittings should not provide any kind of foot or hand hold to assist a would-be raider to climb onto or over the counter. Queue barriers could be considered on the public side of the screen to impede any attempt by a would-be raider to take a running jump at the counter line. The design and positioning of any queue barriers should make it difficult for them to be used as a "stepping stone" to vaulting the counter. The hampers, wires and bars mentioned above may also impede attempts to vault or climb over the counter.

Under no circumstances should there be any fixed horizontal elements that might constitute a scissor action with the rising screen.

## 4.3 Bullet resistant protection

Each manufacturer should state the ballistic resistance of its screen and be able to demonstrate that the materials used pass the specified tests.

It is essential that the stated ballistic resistance is maintained across the full width of the screen, including joints and guide rails, exposed to the public side from floor level to the specified height.

For an opaque screen it is most strongly recommended that the bullet resistance should offer protection against the heaviest, commonly available handguns. That level of protection is achieved if the material will withstand tests specified in any or all of the following:

- BS 5051, Part 1:1988 Class G2 and Class S86
- Draft BS 5888 Class M2 and Class MS86
- Provisional EN 1063, Class B4 and Class SG2

Particular circumstances of assessed risk or geographical location may require higher levels of bullet resistant rating.

It is recommended that the specified bullet resistance of rising screens should extend from floor level to a minimum of 2000mm above floor level on the public side when the screens are in the raised position. Consideration should be given to increasing the level of ballistic resistance if the floor on the staff side is significantly higher than on the public side.

**Note:** The recommendation for ballistic protection to 2000mm is taken from British Standard BS 5357:1996 for the installation of security glazing.

The operating and control systems should all be sited behind the ballistic resistant elements of the rising screen. As much as possible of the operating and control systems should be located within the carcass of the rising screen, although this is far from being an essential feature. The objective is to avoid deliberate or accidental tampering or damage by would-be raiders or others.

Any structures that flank the rising screens, such as walls, doors, glazed partitions, etc., should be designed and installed to provide the same level of ballistic resistance as the rising screen. Special attention should be paid to the joints between screens and between screens and adjoining structures to ensure that bullet resistance is maintained.

**Note:** Various materials may be bonded to the public side of the screen to diminish the risk and/or effect of ricochets. Such materials would normally only be applied to the face of the screen above the counter line up to a height of 2000mm above the floor on the public side.

#### 4.4 Further protection

The design of the rising screen and its installation should ensure that the space above the bullet resistant line is adequately protected against physical attack and that, when the screen is raised, no line of sight can be established between the public and staff sides of the screen. The risk of an attacker standing on a counter and gaining physical or line of sight/point of aim access to the staff side of the screen via the ceiling tiles and ceiling void should be considered.

It is advisable that signage should be applied to the public side of the screen that is exposed when the screen is raised to inform attackers and the general public that the screens are part of a security system that has been activated and that the police have been called.

#### 4.5 Operational Requirements

The recommended minimum requirements for any rising screen system under normal operating conditions are:

- A first response time to close from counter height to 2000mm above the floor on the public side of less than 500 milliseconds from the first screen movement.
- A full closure response time of less than 1 second from the first screen movement.
- A reaction time of less than 50 milliseconds between the control system command to the operating system and the first movement of the screen.

- Where the screen manufacturer's control system includes the activation devices, a reaction time of less than 50 milliseconds between device activation and the control system command to the operating system for hard wired devices; and less than 150 milliseconds for wire-free devices.
- Where activation triggering is provided by a third party system, a reaction time of less than 50 milliseconds between third party system input signal and the control system command to the operating system.
- Wire-free input trigger systems should comply with BS 6799: Class II, Class III with the time to report an interfering signal reduced to 2 seconds and Class IV paragraph (c).
- All screens in a multi-screen installation to rise simultaneously.
- Battery back-up to the Control System for at least 18 hours.
- Control system to monitor continuously the state of critical operating system functions including mains power and, for pneumatic systems, air pressure.
- Control system to provide warning signals to alert staff in the event of other operating system parameters (such as battery level) drifting out of their set range for normal operation but before drifting out of their functional set range.
- Control system to create a warning signal to alert staff of any abnormal condition, failure or malfunction of the rising screen system.
- Ability of the control system to test the activation devices independently of the operating system. This is particularly important where the screen control system is activated by an alarm system that is not provided by the screen manufacturer. In that case, both systems should be capable of being tested independently.

In any abnormal operating conditions, such as mains electrical power failure or compressor failure, screens must be capable of at least two activations using energy derived from reserve air reservoirs and/or electrical batteries. The use of reserve energy on successive activations will progressively increase the first response time and the full closure response time. In such abnormal operating conditions, the control system should annunciate a warning signal to staff if the response times will be more than 150% of either of the times specified for normal operating conditions.

#### **4.6 Maintenance access**

The design of the rising screen should ensure safe and easy access to parts of the operating and control systems for maintenance and repair. Lift off panels for maintenance should weigh less than 20kg and not measure more than 1200mm wide in order to allow "one-man" removal.

#### **4.7 Standards Compliance**

Different British Standards, statutory regulations and European norms apply to the various parts and components of the rising screen, operating and control systems. Each manufacturer should be able to state the standards, etc. with which it complies and to be able to demonstrate that compliance. A list of relevant standards, etc. is given in Appendix A.

## 5. Manufacture

Each manufacturer is free to choose its materials and methods of manufacture. Manufacturing criteria that should receive particular attention are:

### 5.1 Quality procedures

The manufacturer's quality system should be such that compliance of the finished product with the client specification can be demonstrated.

To conform with BSIA policy, the manufacturer's quality system should be certified by a UKAS approved authority as conforming to ISO 9001 or 9002.

### 5.2 Product testing

The manufacturer should be able to certify that prior to despatch each product:

- Has been tested.
- Meets the operational requirements.
- Has been inspected for dimensional accuracy.

The manufacturer should recommend which of the above tests and inspections should be repeated on site during installation and commissioning and in service.

## 6. Installation

Because a rising screen is a safety and security critical system, it is recommended that the installation and site acceptance tests should be carried out by an authorised technician who should complete the manufacturer's check list (see Appendices to Part 2 of this Code of Practice). One copy of the check list should be retained by the authorised technician and one copy by the specifier or end-user for record purposes.

**Note:** This recommendation is taken from British Standard BS 7036:Part 1:1996.

Each installer should be able to demonstrate that it has the necessary skills, capabilities, competencies and authorised technicians:

- To install the rising screens, operating and control systems.
- To commission the installed equipment.
- To provide training to end-user staff in the operation of the screens.
- To provide advice on the effect of the screens on the structure of the building, including static and dynamic loadings.
- To provide advice on the integration and interfacing of the rising screen into other security features of the building/workplace.

## 7. After-sales service

Each manufacturer should be required to recommend and justify, with independent technical advice as necessary, the frequency and scope of work for the service and maintenance of its products.

It is the responsibility of the end-user to ensure that rising screen systems are adequately maintained to ensure safe operation.

To ensure safe operation, long term reliability and working efficiency, a rising security screen installation (including activation devices and safety features) should be:

- a) Regularly maintained by a rising screen system authorised technician in accordance with the recommendations of the manufacturer or an independent, competent person
- b) Inspected annually in accordance with the recommendations of this Code of Practice by completion of the authorised technician checklist given in Part 2.

**Note:** This recommendation is taken from British Standard BS 7036:Part 1:1996.

Because a rising screen installation, including its operating and control system, is a safety and security critical system, it is recommended that only an authorised technician should carry out the service and maintenance and any necessary repairs or modifications to the rising screens.

It is recommended that the manufacturer should provide a site installation logbook in which to record the installed system parameters and any service interventions. The full installation and service history of the site should be recorded in the logbook that should be held by the end user staff. Manufacturers should be able to demonstrate:

- The organisation and staffing to provide a suitable service
- Adequate mean times to respond to calls for remedial action
- Adequate mean time to repair
- Availability of spare or replacement parts

Authorised technicians employed by each manufacturer should carry with them at all times a valid identity card issued by the manufacturer with the individual's photograph and a telephone number for verification. In the event that no such identification is presented, entry to premises and especially to the staff side of the screens should be refused. Security screening of personnel in accordance with BS7858 may be required by end-users.

## 8. End-user staff training

Rising screens require activation by end-user staff to be effective. It is essential that end-user staff are properly trained in the operational aspects of the rising screens.

It is recommended that the manufacturer supply both a fully detailed operator's manual and a short form operating instructions for daily reference by staff. The operator's manual and operating instructions should be provided to the end-user's branch/office staff at the time of the staff training.

Each manufacturer or installer will have its own requirements and recommendations for staff training but should include as a minimum the following points:

- Stand clear and away from both sides of the screen during test activation and when the screens are being lowered.
- Keep the line of the screen clear of all objects by a well ordered regime for counter discipline such that all stationery and other ancillary counter equipment has a standard position and other customer information is located away from the rising screen.
- Ensure that all staff, including part time staff, are trained to operate the screens and know the location of activation devices.
- The need for regular practice/training in activation of the screen system at least twice per working day.
- Ensure that all staff are aware of and carry out daily test procedures.
- Ensure that all staff are aware of the safety features of the screens and that they should not allow themselves, their colleagues or their customers to lean over the screen line.
- No member of the end-user staff should interfere with the internal operation of the screen. e.g. By attempting to recover any objects that may fall into the carcass of the screen. By tampering with any switches, hoses, etc.
- Unauthorised personnel should not be allowed to carry out any service, maintenance or modification work on the screen.
- Contact telephone number for the manufacturer.

In the event that a robber attempting to cross the screen line should become trapped, there should be staff members present who are suitably trained to provide both immediate assistance and lowering of the screens to release the trapped person.

**Note:** If the staff training is available from the manufacturer in a video format and if required by the client, it is recommended that the video be made available at each site where screens are installed as well as at the client's head office.

## Appendix A

### Part 1 – List of References

#### Regulations

Supply of Machinery (Safety) Regulations 1992  
Supply of Machinery (Safety) (Amendment) Regulations 1994  
The Health and Safety (Safety Signs and Signals) Regulations 1996  
Pressure Systems & Transportable Gas Container Regulations 1989  
Provision and Use of Work Equipment Regulations 1992  
Workplace (Health, Safety & Welfare) Regulations 1992

#### Normative standards

##### **Pressure vessels**

BS EN 286:1991 Simple Unfired Pressure Vessels designed to contain air or nitrogen

##### **Safety of machinery**

BS EN 60204:1993 Safety of Machinery - Electrical Equipment of Machines, Specification for General Requirements

BS EN 983:1996 Safety Requirements for fluid power systems and their components - pneumatics

BS EN 292:1991 Safety of Machinery, Basic concepts, General principles of design

#### Informative standards

##### **Electrical installations**

BS 7671:1992

##### **Bullet resistance**

BS 5051, Part 1

Draft BS 5888

Provisional EN 1063

Provisional EN 1522-1

Provisional EN 1523-1

##### **Installation of security glazing**

BS 5357

##### **Wire-free alarm systems**

BS 6799

**Alarm systems**

BS 4737 Part 3 Sections 3.1, 3.3, 3.11, 3.14, 3.30

BS 4737 Section 4.1

**EMC compliance**

BS EN 50130-4:1996

**Work station design**

BS 5490:Part 1

BS 7179:Part 5

Provisional EN 527-1

**Security screening of personnel**

BS 7858

**Signage**

BS 5378: 1980 Parts 1 and 2: 1980 and Part 3:1982

**Additional reading**

HS (G) 100 1993. HSE Books ISBN 0-7176-0683-X

IND (G) 69L (Rev). HSE Books ISBN 0-7176-1271-6

## Part 2

### A. Scope

The scope of Part 2 of the Code is to provide advice to manufacturers as to the best practice and recommended minimum criteria for the manufacture of bullet resistant rising screens to comply with essential health and safety requirements as specified in The Supply of Machinery (Safety) Regulations 1992 (S.I. 1992 No. 3073) and The Supply of Machinery (Safety) (Amendment) Regulations 1994 (S.I. 1994 No. 2063). Hereafter, these regulations are referred to as "SM(S)Rs".

The essential health and safety requirements that relate to the design and construction of bullet resistant rising screens are set out in Paragraph 1 of Schedule 3 of the SM(S)Rs.

Paragraphs 2 to 6 of Schedule 3 and Schedule 4 of the SM(S)Rs DO NOT APPLY to the design and construction of bullet resistant rising screens.

For ease of reference, the paragraph numbering of Section B of this Part 2 of the Code corresponds with the paragraph numbering of Schedule 3 of the SM(S)Rs.

### B. Essential health and safety requirements

#### 1. General remarks

##### 1.1 Definitions

The definitions in Part 1 of the Code, apply to this Part 2.

The definitions in paragraph 1.1.1 of Schedule 3 of SM(S)Rs have the following specific meanings:

1. "Danger zone" means the area above the rising screen for the full height of the screen's possible vertical movement, including - for maintenance - the area below the screen in its raised position, and 10mm either side of the screen's vertical plane.
2. "Exposed person" means any member of the end-user's staff or member of the public transacting normal business with the end-user staff or an authorised technician.
3. "Operator" means any authorised technician carrying out maintenance work.

In addition to those definitions:

"User" means any member of the end-user's or owner's staff who activates the screen.

##### 1.2 Principles of Safety Integration

- a) The function of rising screens is to create a physical barrier to the threat and use of firearms and other weapons of physical attack by a robber against members of staff in an otherwise open plan environment. In normal use, no exposed person should be able to put any body part (other than hand, wrist or arm) into the danger zone. In normal maintenance operations the equipment should be capable of being rendered inoperative while an authorised technician is in the danger zone.

The event of a robber attempting to cross the screen line is an abnormal, although foreseeable, situation. The machinery should be designed such that this abnormal situation should not cause death or serious injury. In this context, any non-life threatening injury, such as a fractured arm or leg, is not considered to be serious.

- b) The design of rising security screens should apply the following principles in the order given:
  - 1. Eliminate or reduce risks as far as possible.
  - 2. Provide protection measures in relation to risks that cannot be eliminated.
  - 3. Inform users and authorised technicians of the residual risks by written instructions and training.
- c) The combined experience of Europe's major manufacturers of rising security screens has been applied to the drafting of this code in order to envisage and address all known normal and abnormal uses and situations of rising security screens.
- d) The ergonomic factors which might affect exposed persons should be considered in the design of the rising security screens. In situations where the manufacturer of the rising security screen is neither the designer nor the manufacturer of the counterwork that encase the screen, the manufacturer should provide written advice to that designer and/or manufacturer.
- e) Rising security screens are intended to be used by users who are normal office staff and not expected to wear or use any personal protective equipment.
- f) Rising security screens require no special equipment or accessories for normal use by users. Authorised technicians should be equipped with the necessary tools, equipment and spares to adjust and maintain the screens without risk.

### **1.3 Materials and products**

Rising security screens involve no abnormally hazardous materials or products.

The screens are manufactured from stable metals and compounds, predominantly steel, aluminium and glass reinforced plastic, with industrially applied finishes such as polyester powder coating and paint.

The most common fluid involved in the rising screens is air compressed to a maximum pressure of 10 bar. There is therefore no risk of spillage. There is a risk of sudden discharge of compressed air from a fractured vessel or pipe and the procedure for venting the compressed air is hazardous if not properly conducted.

If lubricants or other fluids are used in rising screen systems, any risks arising from them should be assessed.

### **1.4 Lighting**

The rising security screens will be installed in areas of normal office environment lighting and require no additional lighting for users.

Maintenance operations inside the carcass of the screen may require additional lighting. It is not appropriate that such lighting be a permanent feature of the screen. Such additional lighting as may be necessary should be supplied by the authorised technician in the form of portable lighting as part of his normal tools and equipment.

### **1.5 Design of machinery to facilitate its handling**

Rising security screens will be permanently installed into buildings and, once installed, will not be handled again until possible future removal.

To facilitate the handling of screens during manufacture and installation, screens, and their component parts as necessary, should be provided with one or more of the following handling aids:

- Threaded holes for the attachment of eye-bolts.
- Threaded holes for the attachment of manoeuvring handles.
- Threaded holes for the attachment of stability stays for especially long or narrow screens.
- Blank holes for sling hooks.

Installation operations may require equipment such as castors, wheeled trolleys and levers for manoeuvring the screens into their final positions. Such manoeuvring equipment should be supplied by the authorised technician as part of his normal tools and equipment.

Inspection panels for the maintenance of rising screens by authorised technicians should be designed to weigh less than 20kg and measure not more than 1200mm wide in order to allow safe removal by one person.

## 2. Controls

### 2.1 Safety and reliability of control systems

The control system for each installation of rising security screens will normally have three distinct functional modes of operation:

- Emergency activation by users, in the event of a robbery, threat of robbery or perceived risk of attempted robbery.
- Daily test and training activation by users.
- Test and diagnostic activation by authorised technicians as part of installation and maintenance routines.

For the first two of these modes, the users should only have access to the electrical/electronic personal and automatic input triggers and the system user control panel. For the third mode, the authorised technician should have access to all electrical, electronic and pneumatic controls.

The control system should be designed and constructed in such a way that:

- It and its activators will withstand the rigours of normal use.
- Errors in logic of the control system will not lead to misactivation of the rising screen.
- Extraneous signals will not cause misactivation of the rising screen.

### 2.2 Control devices

Personal and automatic input triggers should be dedicated to the triggering of the rising security screen. If additional functions/outputs are required as a consequence of trigger activation, these should be provided by logical outputs of the Control System.

Fixed Personal Input Triggers should be positioned and secured in place at each work station on the staff side of the screen and elsewhere as appropriate. The fixing point of the personal input triggers should be such that it will not be possible for an exposed person to put any body part (other than hand, wrist or arm) into the danger zone at the same time as activating the trigger. The fixing point of each personal input triggers should be such that it is positioned ready to hand/foot with minimal other movement for instantaneous activation of the screen, but not so that normal movements might cause an activation.

The design of personal input triggers should be such that it will require a conscious, positive action by the user in order to operate the trigger, e.g:

- Lifting a foot bar.
- Depressing a cowl/shroud to gain access to a foot pedal.
- Double push of a single push button.
- Simultaneous push of both/two buttons of a double/triple push button.
- Full removal of a fiche/note from a note/bait/money clip.

The design of foot operated personal input triggers should be such that casual movement of a member of staff's foot cannot cause screen activation without a deliberate action.

Portable personal input triggers should be designed so that placing them on a flat or uneven surface will not cause an unintended activation and so that the triggering point on the device is adequately shrouded from unintended activation by casual handling.

Automatic input triggers should be positioned and secured in place so that they cannot be activated by any normal event in the course of normal daily transactions across the rising security screen. Automatic input triggers should be positioned such that they can only be activated by a person attempting an abnormal action, such as an attempt to cross the screen line in order to effect a robbery. Automatic input triggers pose a risk of injury to a robber in such abnormal situations but the other safety features of the rising security screen should prevent serious injury.

The user's control panel of the control system should be fitted with visible and audible indicators of the status of the rising security screen system.

The user's control panel should be positioned so that a user or an authorised technician has visibility of the rising screen line while in a position to read/hear the control panel indicators.

The control devices available to an authorised technician should be designed for safe operation and maintenance of the screen system by means of isolating circuits and manual overrides.

### **2.3 Starting**

The operating system should be designed so that it will require a user to make a deliberate action of the control system in order to release the stored energy to activate the screens.

The functional purpose of a rising security screen installation requires that any user may use any personal input trigger or that any automatic input trigger may be activated to start the rising screens.

The operating system should be designed so that authorised technicians may control the amount of stored energy in it and to control the rate of release of stored energy to test and activate the screens for installation and maintenance.

### **2.4 Stopping**

The functional purpose and the speed of operation of a rising security screen installation is such that the screens are not designed to be stopped after emergency or test/training activation until they reach the end of their mechanical travel and, when the screens have reached the end of their mechanical travel the force that applied the motion is maintained to retain the screens in their closed position.

Therefore, rising security screens are designed without any means of either normal or emergency stopping before they reach the end of their mechanical travel.

The design of rising security screens may incorporate a means of stopping for maintenance purposes. These means should only be available to authorised technicians.

### **2.5 Mode selection**

The control system should be designed with the means to switch between ON and OFF modes. In the OFF mode, the processing of all and any signals that may be received from personal or automatic input triggers should be disabled so that no input trigger will cause the screen to activate.

The control system may have additional functional modes, e.g. for maintenance, that may provide partial functionality for authorised technicians. The control system should allow authorised technicians to activate, part-activate, de-activate, isolate or reconnect the screens from the control panel without recourse to the normal control devices.

### **2.6 Failure of the power supply**

The functional purpose of a rising security screen installation requires that it should continue to operate in the event of a mains electrical power failure. The control system should be designed with an integral battery back-up to provide continuous low voltage, direct current electrical power to the control system and operating system for a number of hours following mains failure.

The control system should be designed with a mains power supply unit to trickle charge the battery continuously and to protect the battery from any disturbances of the mains power supply voltage or phase.

When operating on battery power alone, the control system should be designed to provide an alarm signal to users and authorised technicians when the battery voltage falls to within 10% of its cut off voltage. The low voltage alarm signal should not significantly increase the current drain from the battery.

### **2.7 Failure of the control circuit**

A rising security screen is required to operate even in the event of failure of or damage to an activation control circuit from the control system to the operating system. Rising security screen systems should be designed with a redundant control circuit path and such that failure of the primary circuit is signalled to the user.

Rising security screen systems should be designed so that failure of or damage to one activation control circuit will not cause a misactivation.

### **2.8 Software**

Any control system software that governs the display and/or indicators for the user's control panel should be designed for use by personnel who may have no software knowledge: i.e. all text should be in plain language and all visual indicators should have a printed text legend. The control system software should be protected against changes of function by users.

## 3. Protection against mechanical hazards

### 3.1 Stability

Rising security screens are intended to be permanently installed in buildings and fixed to the structure of the building. Screens should be designed with drilled, and where necessary threaded, holes so that they may be fastened to the building structure.

Paragraph 1.5 above deals with the stability of screens during the manufacturing and installation phases.

### 3.2 Risk of break-up during operation

The principle, foreseeable risks of break-up during operation of a rising security screen are:

- Fracture, loosening, disconnection or other failure of one or more pneumatic cylinder mounts.
- Rupture or disconnection of a pressurised pneumatic hose or fitting.
- Failure of a screen panel guide or mullion.
- Jamming of screen's vertical movement.

The rising security screen design should include a retaining shroud around the pneumatic cylinder mounts so that even if the detailed mounting should fail, any movement of the end of the piston rod or the cylinder base will be constrained in a safe manner.

All fixed pneumatic hoses and fittings should be designed to be constrained against movement and chafing. All pneumatic hose and fittings which move with the movement of the screen panels should be designed with adequate freedom to move without chafing or kinking. All pneumatic hose routes, whether fixed or moving, should be designed to ensure that the minimum bending radii for hoses are not less than those recommended by the hose manufacturer. Wherever possible, the routes of pneumatic hosing should be retained within the carcass of the rising screen.

The fact that a rising security screen is essentially a two-dimensional plane moving only in a vertical direction significantly reduces any potential hazard from the risk of a failure of a screen panel guide or mullion or a screen jam. Rising security screens should be designed so that the screen panel guides and mullions are capable of maintaining accurate, reliable, long life operation and are such that the screen can operate safely even in the event of failure or jamming of the guides or mullions.

### 3.3 Risks due to galling or ejected objects

The principle, foreseeable risks of falling or ejected objects during operation of a rising security screen are:

- Rupture of a pneumatic hose or fracture of a pneumatic fitting during screen activation or before a screen is lowered after activation
- Foreign objects jamming the descent of the screens until dislodged
- Objects having been placed on or over the rising screen line prior to activation of the screen.

The rupture of a hose or the fracture of a fitting while a screen is rising or when it is raised will cause an immediate loss of air pressure in all or part of the system. The consequence of that will be a very rapid descent of the screen panels under their own weight. The noise of the compressed air release will normally cause an instinctive movement by users away from the danger zone. The design of the screens allows vertical travel only which should contain this rapid movement within the danger zone.

If a foreign object jams the descent of a screen and is subsequently dislodged, the pneumatic cylinders will have been depressurised and there will be rapid descent of the screen panels under their own weight. The risk of such an incident is remote but there is no practical means to avoid such occurrence. Users should be instructed not to attempt to free a jammed screen under any circumstances. Authorised technicians should be trained and instructed to re-pressurise the operating system before attempting to dislodge any foreign object.

If an object is on or in the path of the rising screen when it is activated, the object will be propelled upwards and then fall back under its own weight. Rising security screen installations should be equipped with signage and/or guards to discourage untrained and unfamiliar members of the public from placing any object on the screen line. Staff should be trained not to place objects on the screen line or allow free-standing objects to be nudged over the screen line and to remain vigilant against a member of the public placing any object on the screen line. The design and positioning of ancillary user equipment, not part of the rising screen, should ensure that the equipment cannot overhang or interfere with the screen line.

### **3.4 Risks due to surfaces, edges or angles**

In the normally lowered position, a rising security screen installation should be flush with the horizontal working surface with no exposed edges or angles and no gaps greater than 1mm. If a rising screen is prevented by an obstruction from lowering to its normal position, any exposed edges or surfaces should be smooth.

In the normally raised position, the exposed vertical surface of the screen panels should be smooth with no sharp edges.

The leading edge surface of the screen should be designed to present as broad an area as practicable to reduce the pressure exerted on any obstruction.

### **3.5 Risks related to combined machinery**

Not applicable to rising security screens.

### **3.6 Risks related to variations in the rotational speed of tools**

Not applicable to rising security screens.

### **3.7 Prevention of risks related to moving parts**

The principle, foreseeable risks relating to the moving parts of a rising security screen installation are:

a) In normal situations

- Screen activation while a hand, wrist or arm of a member of staff or a member of the public or both is across the screen line.
- Proximity of members of the public to unprotected rising screens.
- Fingers or hand of a member of staff in the screen recess as the screen lowers into its rest position.

b) In abnormal situations

- A robber is attempting to cross the screen line at the moment of activation and may be hit by or trapped by the rising screen.
- Foreign objects jamming the descent of the screens until dislodged.

With foreknowledge of these possible eventualities, in order to maintain the functionality of the screen, the design of the rising security screen should ensure that a hand, wrist or arm resting on the screen line at the moment of activation is safely pushed aside by the initial movement of the screen. The design should maximise the surface area of any eventual point of impact in order to minimise the pressure exerted on the point of impact.

Where rising screens are installed with narrow counterwork which would allow members of the public to stand or sit close to the danger zone, the screens and/or counterwork should be fitted with robust, fixed guarding to prevent any body member reaching or leaning over the screen line.

The discharge of compressed air from the rising security screen Operating System naturally creates an audible warning signal for some time before the screens start to descend and throughout the descent travel. The design of the final stage of the screen's descent movement should include a spring loaded element so that, in the last resort, fingers and hands cannot be trapped by the screen's weight, only by that last spring force. The design of the signage affixed to the rising screen panels should include a warning to staff of MOVING PARTS on all moving parts which are exposed when the screen is activated.

The design of a rising security rising screen should anticipate the possibility of a robber being struck by or trapped by the activation of the screen at the moment that the robber attempts to cross the screen line. The design of the screen should ensure that the closing force will not cause death or a life-threatening injury.

See 3.3 above for the reduction of risk due to jamming or blockages.

### **3.8 Choice of protection against risks related to moving parts**

The carcass and moving panels of a rising security screen are only part of the overall machinery installation which will only be complete with the fitting of the counterwork and other items which form part of the overall safety guarding.

The nature of rising security screens, which are in themselves moving guards, means that additional guarding is not appropriate other than described in 3.2, 3.3 and 3.7 above.

## **4. Characteristics of guards and protection devices**

Not applicable to rising security screens other than described in 3.7 above.

## **5. Protection against other hazards**

### **5.1 Electricity supply**

A rising security screen installation requires mains electrical power for the control system as described in 2.6 above and for the compressor. The screen itself is a metallic mass and all exposed metalwork should be properly earthed.

The mains power supplies will be 230/240 Volt, Single Phase, 50 Hertz, normally fused at 13 Amps at the point of connection to the fixed wiring.

In order to comply with the EU Low Voltage Directive, the design of the screen's electrical system should comply with British Standard EN 60204:1993 Safety of Machinery - Electrical Equipment of Machines, Specification for General Requirements.

## **5.2 Protection against static electricity hazards**

The nature of rising security screens makes it most improbable that there is any risk of the build-up of static electricity within the machine. Any such build-up would be discharged through the screen's earthing system.

## **5.3 Protection against energy supply hazards other than electricity**

The majority of rising security screens are powered by the release of stored compressed air.

In order to minimise and afford protection from the risks of this energy source, rising security screens should comply with the following:

- Pressure Systems & Transportable Gas Container Regulations 1989.
- British Standard EN 286:1991 Simple Unfired Pressure Vessels designed to contain air or nitrogen.
- British Standard EN 983:1996 Safety Requirements for Fluid Power Systems and their Components - Pneumatics.

In the event of failure of the compressed air system there is a residual risk of a screen descending under its own weight - see 3.3 above.

## **5.4 Errors of fitting**

It should not be possible to fit or refit any of the moving parts (pneumatic cylinders, moving screen panels) of a rising security screen incorrectly.

The design of pneumatic and electrical connections should, as far as possible, preclude any incorrect connections being made. The authorised technician's check lists to be completed after each installation or maintenance should include connection checks.

## **5.5 Extreme temperatures**

Not applicable to rising security screens.

## **5.6 Fire**

The only source of heat in a rising security screen is the compressor. The selection of compressor for the screen design should include a thermal overload switch.

## **5.7 Explosion**

A rising security screen is manufactured from solid metals and plastics and the only fluid used is air, none of which pose any explosion hazards. However, over-pressure of the compressed air reservoir could lead to a risk of sudden release of stored energy in an explosive manner – see 5.3.

## **5.8 Noise**

In the normal state, rising security screens emit no noise. After each activation the compressor recharging the air reservoirs will emit airborne noise for approximately 2-5 minutes. The discharge of compressed air to atmosphere before and during the lowering of the screens will emit airborne noise for approximately 30-60 seconds. The discharge of compressed air to atmosphere from the air reservoirs during maintenance operations will emit airborne noise for approximately 1-2 minutes.

None of these noise emissions should exceed 70 dB(A) in order to avoid any health or safety hazard.

The selection of the compressor should ensure that it does not exceed this noise level. The design of the screen should include permanently fixed silencers on compressed air outlets to atmosphere to ensure that this noise level is not exceeded.

### **5.9 Vibration**

The only source of vibration in a rising security screen is the compressor.

The design of compressor mounting should include measures to reduce the effects of vibrational movement at the interface with staff and customers.

### **5.10 Radiation**

Not applicable to rising security screens.

### **5.11 External radiation**

The control system of a rising security screen could be adversely affected by external electro-magnetic radiation.

The control system should be designed to comply with British Standard EN 50130-4:1996 Alarm Systems - Electromagnetic Compatibility.

### **5.12 Laser equipment**

Not applicable to rising security screens.

### **5.13 Emissions of dust, gases, etc.**

Not applicable to rising security screens.

### **5.14 Risk of being trapped in a machine**

The risk for a robber being trapped in a rising security screen is dealt with in 3.7 above. In such circumstances there should be staff members present who are suitably trained to provide both immediate assistance and lowering of the screens to release the trapped person.

### **5.15 Risk of slipping, tripping or falling**

The only risk of slipping, tripping or falling in relation to rising security screens is the possibility of tripping over the interconnecting cables or pneumatic hoses.

All interconnecting cables and pneumatic hoses should be clipped or secured to the screen structure or other surfaces or run in raceways, conduits or trunking.

## 6. Maintenance

### 6.1 Machinery maintenance

The restricted space available within the carcass of rising security screens requires that maintenance operations are conducted close to the danger zone if the screens are in the raised position.

The manufacturer should specify any safety equipment (i.e. screen props) to be used when carrying out maintenance work close to the danger zone and a safe operating method for carrying out that work.

### 6.2 Access to operating position and service points

The design of the rising security screen should include removable panels to provide safe access to the operating and control systems for maintenance, repair and replacement work. The panels should be secured in place by fixings requiring tools for their removal (not slot-headed screws).

### 6.3 Isolation of energy sources

The design of the operating and control systems should provide means of isolation of the compressor and control system from the electrical supply. This should normally be by removable plug.

The design of the operating system should provide for the safe discharge of compressed air to atmosphere. Certain maintenance operations and tests require the operating system to be charged with compressed air, either at full or reduced working pressure. The manufacturer's maintenance instructions should specify the safety measures to be adopted in these circumstances.

### 6.4 Operator intervention

Not applicable to rising security screens.

### 6.5 Cleaning of internal parts

Not applicable to rising security screens.

## 7. Maintenance

### 7.1 Information devices

The manufacturer should provide an unambiguous and easily understood user's manual. The manual should include health and safety warnings. The manual should be provided in two formats:

- An abbreviated format with concise instructions for daily reference.
- A fully detailed format containing all instructions, descriptions and information that may be required by users.

The control system should include visible and audible alarms to users if any malfunction is detected that will prevent the operation of the rising screen.

### 7.2 Warning Devices

The control system should include visible and audible warnings to users if any malfunction is detected that may jeopardise the operation of the rising screen. An authorised technician should be able to verify the correct functioning of these warning devices as part of the maintenance routine.

### 7.3 Marking

Each rising security screen should be marked with the following minimum particulars:

- Name and address of the manufacturer.
- Designation of the series or type.
- Serial number, if any.
- Year of construction.

A single rising screen is not a complete machine until it is installed with the installation's control system and operating system and counterwork. Therefore, no individual rising screen should bear the CE Mark.

At a client's request, a complete rising screen installation may bear the CE Mark in accordance with Annex III of the EU Machinery Directive if the complete installation complies with the Machinery Directive.

### 7.4 Instructions

a) All rising screen installations should be supplied with instructions including the following:

- Name and address of the manufacturer
- Designation of the series or type
- Year of construction
- Foreseen use of the rising screen installation
- Likely user workstations
- User instructions for safe
- Use, including avoidance of unsafe practices
- Testing/training.

Authorised technicians should be supplied with the following instructions for safe:

- Handling
- Installation, including check lists
- Putting into service, including check lists
- Adjustments
- Maintenance, including check lists
- Use of special tools.

Typical formats for the check lists mentioned above are given in Appendices B, C and D of this code of practice.

- a) The instructions should be in English or other language required by a customer for export purposes.
- b) The authorised technician instructions should include all drawings and diagrams necessary for the various operator procedures.
- c) Any literature describing the rising screens should not contradict any user or authorised technician instructions as regards safety aspects.
- d) Not applicable to rising security screens (installation to reduce noise/vibration).

- e) On the basis that the level of airborne noise has been designed in accordance with 5.8 above, the user and authorised technician instructions should state that the equivalent continuous A-weighted sound pressure level at workstations does not exceed 70 dB(A).
- f) Not applicable to rising security screens (installation in explosive atmosphere).
- g) The user instructions referred to in (a) above should take account of the level of general education of staff who will use the rising security screens.

## Appendix B

### Part 2 – Checklist for installation

- 1) Screen fixings to structure
- 2) BR integrity to structure
- 3) Electrical earth continuity
- 4) Wiring secured to structure, conduit or other raceway
- 5) Electrical power supply correctly fused, isolated and marked
- 6) System decompressed to atmosphere.

## Appendix C

### Part 2 – Checklist for putting into service

- 1) Electrical earth continuity
- 2) Wiring secured to structure, conduit or other raceway
- 3) Electrical power supply correctly fused, isolated and marked
- 4) Control system monitor functions
- 5) Air pressure relief valve function at the correct set pressure
- 6) Input trigger functions
- 7) Screen functionality
- 8) Auxiliary output functions
- 9) Access panels and safety guards fitted
- 10) Counterwork fitted with adequate safety distances and structural strength
- 11) Hampers fitted as required with adequate safety distances
- 12) Operator manuals supplied
- 13) Staff operational and safety training completed.

## Appendix D

### Part 2 - Checklist for maintenance

- 1) Condensate drained from system
- 2) Control system monitor functions
- 3) Air Pressure relief valve function at the correct set pressure
- 4) Input trigger functions
- 5) Screen functionality
- 6) Auxiliary output functions
- 7) Access panels and safety guards fitted.