

Intruder alarm systems in buildings —

Part 4: Codes of practice —

Section 4.1: Code of practice for planning and installation

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Foreword

This Section of BS 4737 has been prepared under the direction of the Furniture and Household Equipment Standards Committee.

The requirements for the installation of intruder alarm systems in buildings were originally published as Sections 1.1 and 2.1 of BS 4737, which were both withdrawn on publication of BS 4737-1. In conjunction with the revision of BS 4737 those aspects of installation not capable of precise specification and recommendations for the planning of an installation are issued in this code of practice.

The main objectives of BS 4737 are to maximize the effectiveness of intruder alarm systems, in respect of the detection and signalling of unauthorized intrusions, and to minimize the incidence of false alarms.

BS 4737 is being revised and published in Parts as follows.

- *Part 1: Specification for installed systems with local audible and/or remote signalling;*
- *Part 2: Specification for installed systems for deliberate operation;*
- *Part 3: Specifications for components (incorporating a revision of the existing Sections 3.1 to 3.14 of BS 4737);*
- *Part 4: Codes of practice;*
- *Section 4.1: Code of practice for planning and installation;*
- *Section 4.2: Code of practice for maintenance and records;*
- *Part 5: Glossary of terms.*

In planning an alarm system it should be recognized that no system can guarantee detection of, or immunity from, intruders. The purpose of a system is to confer on the property or persons at risk a level of security that, through careful planning, is in balance with the degree of determination and expertise of the intruder. In making this evaluation, all physical circumstances of the risk need to be assessed, but the degree of security decided upon has to be consistent with a system which is in every sense practical and reliable and which cannot become an unacceptable burden to the general public or police.

Furthermore no alarm system, however well planned and installed, can possibly be completely reliable or tamper-proof. The successful operation of an alarm system requires the active cooperation of the subscriber in carrying out the necessary procedures carefully and thoroughly. The usefulness of the whole system can be jeopardized by lack of care or inadequate attention to routine maintenance and servicing. This care has to be extended to the security of keys and of information regarding the system, its installation and method of operation.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 24, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Section of BS 4737 gives recommendations for the planning and installation of intruder and/or deliberately-operated alarm systems in buildings. It covers the range of systems specified in BS 4737-1 and BS 4737-2.

The recommendations given in this code of practice cover the installation of all systems from basic to the most complex. All recommendations appropriate to a particular installation are applicable.

NOTE The titles of the publications referred to in this Section of BS 4737 are listed on the inside back cover.

2 Definitions

For the purposes of this Section of BS 4737, the definitions given in BS 4737-1 and BS 4737-2 apply, together with the following.

2.1 commissioning

the completion of installation and testing of a system prior to its handover to the subscriber

2.2 environmental protection

the protection of equipment against physical damage which might result from exposure to the elements or to the materials and hazards of building operations taking place simultaneously with installation

3 Planning

3.1 Consultation

3.1.1 General. The requirements for an alarm system in a building and for keyholders should be ascertained as accurately as possible by consultation between appropriate interested parties, such as subscribers, architects, consultants, alarm companies, organizations providing central station facilities, the telecommunications company, the local police, insurers, the Health and Safety Executive and any other public authorities concerned. Where means are to be provided for transmission of alarm signals to a police or central station, there should be early consultation and agreement between the interested parties.

3.1.2 Plans and specifications. On the basis of consultation, specifications and, if appropriate, plans should be prepared showing:

- a) details of the proposed alarm system;
- b) details of the electrical services;
- c) the accommodation required for equipment;

- d) ducts, chases, conduits, etc. required for wiring.

Systems should consist of: one or more detectors and/or one or more sensors with associated processors; one or more control equipments; one or more warning devices and/or signalling equipments; the necessary power supply equipment; and, where appropriate, an independent standby battery supply, all of which should be for the sole use of the alarm system.

Wiring diagrams should be agreed, in collaboration with those responsible for other services, to enable the necessary ducts, chases, sleeves, etc. to be specified before any building operations commence. The need for segregation of the alarm wiring and equipment should be taken into account at this stage.

NOTE Attention is drawn to the "Regulations for Electrical Installations", 15th Edition, 1981, Institution of Electrical Engineers (IEE)¹.

3.1.3 Security of information. It is essential that all documents concerned with the planning and specification of a system should be treated as confidential to the authorized representatives of the parties concerned.

The maintenance of security is of paramount importance and steps should be taken to ensure the safe custody of all equipment and documentation pertaining to an installation. A system should be instigated to ensure that the vetting of alarm company employees is effectively carried out, and all such employees should carry identification cards, which should include a photograph of the bearer, the bearer's signature, the company's name and address and the date of expiry of the card.

3.2 Time schedule

3.2.1 Preparation. A typical list of events to be taken into consideration, probably but not necessarily in the order stated, in preparing a time schedule is as follows:

- a) survey of the building or examination of the plans and an assessment of the usage of the building;
- b) system design for estimating purposes, embracing the requirements and/or recommendations of all interested parties;
- c) costing procedures;
- d) submission and consideration of a specification and quotation;
- e) contacting the telecommunications company regarding the provision of appropriate lines;
- f) placing of the order for the system;

¹ Available from the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London WC2R 0BL.

- g) detailing of the planning programme for installation;
- h) production and delivery;
- j) installation of the system;
- k) commissioning and testing of the system by the alarm company;
- m) consideration and agreement on the action to be taken in the event of activation of the system;
- n) handover of the system to the subscriber and training in operating procedures;
- p) connection of any specified remote signalling if unavailable at the time of handover;
- q) notification of the police and environmental health officer in accordance with local requirements.

3.2.2 Critical path chart. It will be normal practice for all the stages given in **3.2.1** to be included in a critical path chart, for larger installations. Control and indicating equipment for some large installations will almost certainly have to be specially manufactured and the importance of ordering such equipment is emphasized. In buildings under construction or reconstruction, alarm system wiring should be carried out at times and stages of building or decorating work agreed with the main contractor and other contractors. Installation of alarm equipment should be carefully integrated with the operations of other trades to minimize damage from wet building and decorating processes, damp, dust, etc. Temporary environmental protection may be necessary.

3.2.3 Partial operation. Final connection and switching on of the system should be made at a time agreed between the subscriber and the alarm company. There may however be an interim period of partial operation either during partial occupation of the building or to provide security during construction. Such operation is a matter for agreement among interested parties and should be reviewed regularly.

NOTE The subscriber should be instructed to take into account the necessary comings and goings of tradesmen during any period(s) of partial operation during construction.

3.3 Survey

3.3.1 Inspection of premises and contents. The premises to be protected and their contents should be inspected to determine the design requirements of an alarm system that will give adequate detection and warning/signalling capability. The points listed under a) and b) should be considered, together with any police, insurance and any other requirements which are available.

a) *Premises:*

- 1) construction and layout;

- 2) occupancy;
- 3) non-occupancy;
- 4) keyholding;
- 5) environment;
- 6) location;
- 7) adjacent premises and their occupancy;
- 8) disposition of occupants;
- 9) general access to premises;
- 10) existing security of the building;
- 11) doors and windows;
- 12) previous intrusions;
- 13) fire and health and safety regulations;
- 14) noise pollution.

b) *Contents:*

- 1) type;
- 2) value;
- 3) bulk;
- 4) insurance;
- 5) previous losses;
- 6) estimates of a single loss;
- 7) ease of removal;
- 8) ease of disposal;
- 9) availability of replacements;
- 10) effect of loss;
- 11) disposition of contents.

3.3.2 Environmental and related factors. The existing and potential environmental conditions at the premises should be taken into consideration when planning the type of system to be installed. Whilst protection against mechanical damage, weather, dampness, corrosion, oil and adverse industrial atmospheres is specified in BS 4737-1 and BS 4737-2, there may be other factors to be considered which are only ascertainable by close inspection and/or questioning.

Whilst it is impossible to define all such hazards, they fall into two main groups: those present within the area to be protected or immediately adjacent thereto, which come under the control of the subscriber; and those which are beyond the subscriber's control but which could affect the stability of the alarm system.

Examples of factors that may be under subscriber control are:

- a) water pipes;
- b) ventilation fans and loose metal louver shutters attached thereto;
- c) suspended signs;
- d) air conditioning;

- e) lifts;
- f) fluorescent lighting;
- g) telephone bells;
- h) automatic heating systems;
- j) vermin and birds;
- k) extraneous noises;
- m) draughts from ill-fitting doors and windows.

Examples of factors usually outside subscriber control are:

- 1) the effects of road, rail and air traffic;
- 2) tunnelling under foundations;
- 3) building construction nearby;
- 4) premises partly occupied by other parties;
- 5) adjacent premises, when occupied, affecting alarmed premises;
- 6) extreme weather conditions;
- 7) prefabricated or lightweight building construction;
- 8) radio frequency interference;
- 9) transients on mains electricity supplies.

The site should be checked for any other factors requiring special consideration. Examples are:

- i) sectors where a “clean-air” atmosphere is maintained;
- ii) the presence of flammable or explosive substances, e.g. gas, dust, vapour or volatile liquid²⁾;
- iii) access to the building in case of emergency;
- iv) the likelihood of unwanted operation, e.g. by close passers-by;
- v) any expectation of alteration to the required protection in the near future;
- vi) any unusual properties of the building or its contents or function, e.g. problems with the power supply;
- vii) any restrictions to which the fabric of the building is subject and any special fire regulations.

3.3.3 Siting of control equipment. Control equipment should be so located that it is not visible from the outside of the building and the user has adequate access for ease of operation. Sufficient working space should exist at the equipment for a service engineer to carry out maintenance. Care should be taken to ensure that the equipment does not protrude into an area frequently used by the subscriber, which could result in accidental injury.

The extent of security accorded to the control equipment is important and an alarm-protected enclosure for the control equipment may be required.

When determining the location of the control equipment, consideration should also be given to the exit/entry route(s) and to any remote indications which may be required to ensure that the user has full knowledge of the state of the alarm system at the times of setting and unsetting.

3.3.4 Type and siting of sensors and detectors.

Sensors and detectors, other than deliberately-operated devices, are designed to sense or detect a person or persons disturbing or moving through fixtures or areas protected by the sensor or detector. It is important during the survey to ensure that a sensor or detector will not respond to any disturbances that are not required to be detected when the system is set.

3.3.5 Setting and unsetting times. In order to assess the suitability of using central station facilities to monitor setting and unsetting times, it will be necessary to ascertain the times at which, or periods during which, the setting and unsetting procedures will be carried out, by hour and by day, with any tolerances and with special arrangements for holidays. Irregular setting and/or unsetting times may well preclude the full use of a central station procedure. In considering this matter, due regard should be taken of the comings and goings of cleaners, maintenance staff, etc.

3.4 System design

3.4.1 Function and operation. Following the initial survey and before the start of installation, a comprehensive functional and operational system design should be drawn up. Every element of the installation should be adequate for, and compatible with, the specification of protection agreed. This may require the application of specialist expertise and careful consideration of the matters referred to in 3.4.2 to 3.4.5.

3.4.2 Multiple circuit installations. In multiple circuit systems each circuit should be separately indicated at the control equipment and/or at the ancillary control equipment. Any circuit creating the initial alarm activation during the set period and causing a transmission from the signalling equipment should be identifiable at the control equipment and/or at the ancillary control equipment when the system is unset.

This alarm indication should be clearly visible if any audible alarm indication is muted during unsetting and should remain until the system is reset.

²⁾ The use of equipment in such areas is covered by BS 5345. Such use may require the approval of the appropriate licensing authority, e.g. the county council or fire brigade in the case of an area licensed for the storage of petroleum spirit.

After the initial alarm activation, it should not be possible for subsequent alarm activations from the same device or circuit to cause a transmission from signalling equipment during the set period.

It is permissible for any further alarm activations after the initial alarm activation to be indicated at the control equipment and/or at the ancillary control equipment, provided that the initial alarm indication is readily identifiable as such.

Unsetting the system before resetting after an alarm activation during the set period should not preclude a transmission from the signalling equipment when a deliberately-operated device is activated.

Where systems incorporate multiplexing techniques to send and/or receive information on the state of detection circuits and/or detector(s) to or from the control equipment, each detection circuit and/or detector should be separately indicated at the control equipment and/or at the ancillary control equipment.

Where a number of detection circuits are connected over a common cable to the control equipment and indicated at the control equipment as a zone of detection, each detection circuit should be separately indicated at the control equipment or within the area of the detection circuit.

Detectors and/or sensors which incorporate electronic processing should have an associated latching alarm indication. Where detectors with multiple sensors are used, these should incorporate features to facilitate corrective maintenance procedures.

To assist with maintenance and fault location and identification, the number of non-indicating detectors and/or sensors should be limited to 10 on each detector circuit.

When using continuous wiring or metallic foil as part of a detection system, a surface area of not more than 50 m² should be protected by one detection circuit.

NOTE It is permissible to use a combination of protective switches, continuous wiring and metallic foil in proportion to the above limits, e.g. a circuit that protects a surface area of 25 m² by continuous wiring and/or metallic foil could also include five protective switches.

3.4.3 Entry and exit routes. The entry route(s) and exit route(s) are normally but not necessarily the same. They are used to provide the means by which, during the agreed unsetting procedure and the agreed setting procedure, an authorized keyholder may move between the point of first entry and the control equipment and the control equipment and the point of final exit.

Initiation of the setting procedure of the system or a part thereof should be effected by means of the control equipment.

If any detection circuit/device is not in the correct state when an attempt is made to finally set the system, the system should remain unset. An internal indication, audible throughout the exit route and immediately outside the exit door, should be maintained and the operation of any remote signalling equipment should be inhibited. Remote signalling equipment should also be inhibited if there is any deviation from the exit route.

Completion of the setting procedure should be accomplished by any or a combination of the following.

- a) Operation of a key-operated shunt lock fitted to the exit door,
- b) Operation of a pushbutton switch mounted outside the protected premises and adjacent to the exit door.

NOTE The pushbutton switch is not used on entry.

- c) Operation of a door switch fitted to the exit door.
- d) A timed exit procedure whereby following initiation of the setting procedure the keyholder has to leave the protected premises before a set time has elapsed.

NOTE It is not advisable to use a timed exit procedure for a remote signalling system because of the possibility of a false alarm if the allowed time is accidentally exceeded.

- e) Operation of a detector switch mounted at the point of final exit.

Unsetting should only be able to be initiated by a switch operated by physical entry into the protected premises.

The period(s) of time allowed for any timed exit or entry should be discussed at the time of survey and put as a proposal in the specification. A final decision should be made when the system is commissioned and handed over to the subscriber.

The period of time which has been agreed after practical application should be entered on the system record (see 4.7.4).

3.4.4 24 h monitoring. For the earliest possible diagnosis and rectification of faults the system should be such that, when it is unset, any 24 h detection circuit(s) and detectors comprising continuous wiring (see 4.2.2) and foil on glass (see 4.2.3) are continuously monitored. Fault conditions should be indicated audibly and visibly at the control equipment, which should identify the circuit in fault condition. The indication should remain until the fault condition has been rectified. It is permissible to cancel the audible indication only, provided that the system, or part thereof, cannot be set whilst the audible indication is cancelled.

3.4.5 Routing of cables. It is important for large installations that, during the survey and before installation commences, the project supervisor inspect the premises to define and plan the routing of the cables with the person conducting the survey. Where a number of cable pairs follow a common route over a significant distance, it may be more economical to use multicore cables. If cables may be subjected to accidental damage, they should be mechanically protected. In domestic, office or showroom environments, concealed cable runs should be planned wherever practicable. Exposed cable runs between control equipment, audible warning devices, signalling equipment and associated power supplies should be mechanically protected to provide improved security.

Where a large number of cables are to be run along a common route, consideration should be given to the use of conduit or trunking. Where necessary, cables passing underground or through ducts should be specified as armoured or protected by conduit. Careful attention should be paid to the loading of supply cables and voltage losses on long lengths of cable to ensure that the correct operating voltage is maintained at the equipment. Particular attention should be given to the IEE's "Regulations for Electrical Installations", especially to the requirements for the separation of cables carrying different voltages. Alarm system cables should not be run adjacent to mains cables unless suitable screening is applied, i.e. screened cables, earthed conduit, etc. Where alarm system cables have to cross mains cables, they should do so at right angles to the mains cables.

Where alarm system cables are run within areas having potentially explosive atmospheres, reference should be made to BS 5345.

4 Installation

4.1 General

4.1.1 Personnel. The installing engineer(s) should have the complete specification to ensure:

- a) that all necessary stores and equipment are available to complete the installation;
- b) that both the required positioning of all equipment is known and units can be fitted in the positions specified;
- c) that movement detector(s) are fitted in the correct position(s) and attitudes.

No deviation from the specification should be made by an installing engineer without the authority of the surveyor or of the installation supervisor.

Supervision of the installing engineer(s) is of vital importance to ensure that all of the requirements of BS 4737-1 or BS 4737-2, as appropriate, are being complied with and that installation is neat and tidy.

4.1.2 Equipment. All equipment, before being despatched to the site for installation, should be inspected and tested to ensure that units are operational before being fitted. Suitable storage and packaging in the transport vehicle should be used to reduce the risk of damage to delicate electronic equipment in transit. Consideration should be given to, and appropriate provision made for, the safe storage of equipment once received on site prior to installation.

4.1.3 System wiring. Before commencing installation, a period of time should be spent inspecting the building with regard to the proposed circuit runs and any potential problems such as environmental or mechanical damage.

Junction boxes incorporating tamper detection should be used at the discretion of the installer and insurer for high risk installations.

To facilitate rapid tracing of faults in interconnecting wiring, all cables should be identifiable at their ends. Sufficient test points, contained within junction boxes, should be provided for efficient fault identification.

NOTE The breaching of cable insulation for test purposes is against good electrical engineering practice.

The following important points should be observed during the installation.

- a) Interconnecting wiring, whether it be in conduit, trunking or a surface run, should not pass through a lift shaft.
- b) Interconnecting wiring should not be run in trunking carrying mains wiring unless the interconnecting wiring is adequately screened and earthed, or is otherwise segregated from the mains wiring, or is insulated to the level of the highest voltage present in the mains cables.