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NATIONAL SECURITY INSPECTORATE

**NSI CODE OF PRACTICE
FOR THE DESIGN
INSTALLATION AND MAINTENANCE
OF CCTV SYSTEMS
NCP 104
(ISSUE 2)**

This Code of Practice is to be read in conjunction with the NSI Regulations relating to approval by NSI and the NSI Criteria for approval. No company shall hold out or claim that it adheres to this Code, save by virtue of holding NSI approval, or having obtained the written permission of NSI.

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National Security Inspectorate

Code of Practice for the Design, Installation and Maintenance of CCTV Systems

LIST OF CONTENTS

INTRODUCTION

1. SCOPE
2. REFERENCES
3. DEFINITIONS AND ABBREVIATIONS
4. GENERAL CONSIDERATIONS
5. OPERATIONAL REQUIREMENT
6. SYSTEM OPERATIONAL CRITERIA
7. SYSTEM DESIGN CRITERIA
8. INSTALLATION
9. COMMISSIONING, HANDOVER AND DOCUMENTATION
10. MAINTENANCE

APPENDIX 1 CHECKLIST FOR ESTABLISHING PERFORMANCE REQUIREMENTS

APPENDIX 2 EFFECTIVE OBSERVED ANGLES OF VIEW FOR A TYPICAL RANGE OF FOCAL LENGTHS

ATTACHMENTS

1. COMMISSIONING CHECKLIST FOR CCTV SYSTEMS
2. HANDOVER CHECKLIST FOR CCTV SYSTEMS
3. ACCEPTANCE CERTIFICATE
4. CORRECTIVE MAINTENANCE REPORT
5. PREVENTIVE MAINTENANCE REPORT

In this document, material (such as guidelines, information, recommendations, advice) that does not form a mandatory requirement of this Code is shown in italics.

FOREWORD

Closed-circuit television, in its simplest form, is a means of providing images from a television camera for viewing on a monitor via a private transmission system. There is no theoretical limit to the number of cameras and monitors that may be used in a CCTV installation but in practice this will be limited by the efficient combination of control and display equipment with the operator's ability to manage the system. The successful operation of a CCTV system requires the active co-operation of the users in carrying out the recommended procedures.

Note 1: In conjunction with the application of BS EN 50132-7: 1996, this Code of Practice aims to assist specifiers, installers, users, insurance companies and police in selecting the level of CCTV equipment best suited to a particular application and to provide minimum requirements for the design, installation and maintenance of CCTV systems.

Note 2: This Code of Practice is regarded as PROVISIONAL pending publication of all parts of European Standard EN 50132.

Note 3: Attention is drawn to British Standard Code of Practice BS 8418 for remote monitored, detector activated CCTV systems.

1. SCOPE

This Code of Practice, together with BS EN 50132-7: 1996, specifies requirements for the design, installation and maintenance of CCTV systems used in security applications.

Typical examples of security applications are perimeter surveillance, access control, safety, and property protection. Examples of events that may be monitored by these applications include hold-up, theft, sabotage, vandalism, hazards and evacuation.

CCTV that is used purely for process control falls outside the scope of this Code of Practice.

NSI NACOSS Gold and Systems Silver approved companies shall comply with:

- This Code of Practice (NCP 104) and BS EN 50132-7: 1996, or
- BS 8418 and BS EN 50132-7: 1996.

This Code of Practice does not recommend the extent or degree of the protection in the security application, nor does it necessarily cover all the requirements for any other surveillance applications.

For ease of cross-referencing, this Code of Practice is structured along the lines of BS EN 50132-7: 1996. Refer to BS EN 50132-7 for details of further requirements.

2. REFERENCES

2.1 Normative References

- BS EN 50132-7 1996 Alarm systems - CCTV surveillance systems for use in security applications, Part 7. Application guidelines
- BS EN 60529 1992 Specification for degrees of protection provided by enclosures (IP code)

Attention is drawn to the Requirements for Electrical Installations, BS 7671, also known as the IEE/IET Wiring Regulations.

Attention is drawn to Part P (Approved Document P) of Schedule 1 of the Building Regulations, which relates to legal requirements for electrical installations in dwellings in England and Wales. Further information about Part P can be found at www.communities.gov.uk.

2.2 Informative References

- BIP 0008 Code of practice for Legal Admissibility and evidential weight of information stored electronically*
- BS 5979 Remote centres receiving signals from fire and security systems – Code of practice*
- BS 7958 Closed circuit television (CCTV) – Management and operation – Code of practice*
- BS 8418 Installation and remote monitoring of detector activated CCTV systems – Code of practice*
- BS 8495 Code of practice for digital CCTV recording systems for the purpose of image export to be used as evidence*
- BS EN 62305 Protection against lightning*

3. DEFINITIONS

For the purpose of this Code of Practice the definitions given in BS EN 50132-7: 1996 apply and, in addition, the following definitions apply:

- 3.1 Environmental housings:** Equipment containers and associated accessories, such as heaters, washers and wipers, to meet specified environmental conditions
- 3.2 Video distribution amplifier:** A device which provides multiple outputs from one video signal such that interference with one output will not affect others
- 3.3 Video motion detector:** A detection device generating an alarm condition in response to a change in the signal from one or more closed circuit television cameras
- 3.4 Video transmission:** A generic term given to the transmission of video signals

4. GENERAL CONSIDERATIONS

4.1 Data Protection Act

Attention is drawn to the Data Protection Act 1998 (DPA).

The Information Commissioner's Office (ICO) published a CCTV Code of Practice in 2008 to replace the first version, which was issued in 2000. The purpose of the ICO Code of Practice is to give guidance on how CCTV systems can comply with the DPA. To obtain a copy of the Code of Practice go to www.ico.gov.uk.

- Note 1: Section 3 of the ICO CCTV Code of Practice 2008 includes guidance on when the use of cameras is exempt from the DPA. This replaces previous guidance given by the ICO who should be contacted in cases of doubt.
- Note 2: A checklist for users of limited CCTV systems monitoring small retail and business premises is included at Appendix 2 of the ICO CCTV Code of Practice 2008 to assist users in complying with the DPA.
- Note 3: NSI approved companies installing CCTV systems should draw their customers' attention to the ICO CCTV Code of Practice and should make them aware of the need to notify CCTV systems to the ICO, except where the DPA does not apply.
- Note 4: Where necessary, companies should provide written instructions to customers on how to use their CCTV systems in such a way as to ensure that they are operated within their intended scope and purpose.
- Note 5: Attention is drawn to British Standard Code of Practice BS 7958 for management and operation of CCTV (see also 7.11 of NCP 104).

4.2 SIA Licensing and use of NSI approved monitoring centres

Attention is drawn to the Security Industry Authority's (SIA's) requirements for the licensing of individuals engaged in public space surveillance (CCTV) and in other security related activities (see www.the-sia.org.uk).

NSI approved companies installing CCTV systems and entering into contracts with customers to provide CCTV monitoring services should ensure that in relevant circumstances they only use monitoring companies where the individuals providing the CCTV monitoring service hold the appropriate SIA licenses.

Similarly, where customers are likely to enter into their own contracts with third-party providers of monitoring services, NSI approved companies should advise customers to ensure that in relevant circumstances they only use monitoring companies where the individuals providing the CCTV monitoring service hold the appropriate SIA licenses.

NSI approved companies should use monitoring centres that hold NSI ARC Gold approval for the monitoring of CCTV systems.

In the case of CCTV system installations complying with BS 8418, NSI approved companies shall use only monitoring centres that hold NSI ARC Gold approval as Remote Video Response Centres (RVRCs) (or other RVRCs approved by an independent third-party approvals organization acceptable to NSI and complying with ISO 9001, BS 5979 and BS 8418).

4.3 Performance

The performance of a CCTV system is primarily dependent upon the available light level. It is important that a thorough evaluation of the scene and the illumination is carried out as part of the system design (see 7.8 below).

The combination of cameras and lenses, signal transmission means, monitors and perimeter lighting should be selected to permit, within the system response time, the detection of an intruder easily on the monitor(s) in, or near to, the detection zone by day and night under all likely weather conditions.

Brief guidance to users of digital CCTV systems is given in Home Office Scientific Development Branch (HOSDB) Publication No. 09/05 "UK Police Requirements for Digital CCTV Systems" (for further details, search the HOSDB website for publications).

When deciding how best to record and save video images, the following should be considered as a minimum:

- a) *Number of days of video needed to be retained.*
- b) *The required image quality required from the recorded video.*
- c) *Number of images (frames) per second required to be recorded.*

It is important that there should be sufficient image storage capacity to meet the requirements for image quality and retention time.

5. OPERATIONAL REQUIREMENT

Refer to Clause 5 of BS EN 50132-7: 1996.

Persons without appropriate knowledge and expertise may need to become involved in writing specifications for CCTV security systems and one approach to this is to write an Operational Requirement (detailing what the CCTV system is expected to be able to achieve) for subsequent development into a full technical specification by a suitable qualified person.

Attention is drawn to Home Office Scientific Development Branch (HOSDB) Publication No. 55/06, "CCTV Operational Requirements Manual" (for further details, search the HOSDB website for publications).

The company shall enquire as to whether or not the customer (or a person acting for the customer) has prepared an Operational Requirement and/or other documented requirements for the proposed CCTV system.

The company shall prepare a System Design Specification (as part of the quotation) for a CCTV system to meet the customer's needs, expectations, and patterns of usage of the premises, taking into account any Operational Requirement and/or other customer documented requirements (see 7.11 below).

It is of course permissible for the customer to amend the requirements for the CCTV system during the negotiation of the contract.

6. SYSTEM OPERATIONAL CRITERIA

Refer to Clause 6 of BS EN 50132-7: 1996.

The system(s) shall be easily controlled and monitored by the operator(s). If more than one operator is to be able to control equipment simultaneously, this shall be allowed for in the system design, taking into account more than one operator controlling the same camera and allowing for one operator to pass control to another.

Where remotely controlled cameras return automatically to a pre-programmed view, an operator wishing to observe the same scene on another camera shall be able to switch rapidly between selected pictures. If a method of temporarily over-riding the automatic program is utilised, a warning shall be given to remind the operator to return the system to automatic control.

7. SYSTEM DESIGN CRITERIA

Refer to Clause 7 of BS EN 50132-7: 1996.

The importance of a correct and adequate survey for installation is paramount; design has a substantial bearing on the performance and reliability of a CCTV system.

The CCTV system(s) specified shall give the required performance under the specified scene illumination(s) and environmental conditions.

A checklist is included at Appendix 1 for guidance.

7.1 Surveillance zone determination criteria

Attention is drawn to the CCTV Code of Practice published by the Information Commissioner's Office. The installation of a CCTV system may give rise to privacy issues in relation to nearby premises and / or areas falling within the fields of view of cameras. Installers should resolve potential privacy issues with prospective customers through the careful design of systems and the use of privacy zones.

Wherever intruder detection is within the area of coverage of CCTV cameras, consideration shall be given to the number of monitors required in relation to the number of detection zones to be monitored, the speed of display of information on monitors in order to capture relevant information, and the means for recording images.

7.2 Criteria for determining the number of cameras and their locations

Cameras shall be mounted in serviceable positions, free from obstructions and, where possible, avoiding direct bright light sources within the field of view or shining directly onto the lens.

The combined effective fields of view of the cameras in a perimeter security system shall cover the entire detection zone of any associated perimeter intruder detection system.

In a perimeter security system, where multiple cameras are used, each camera and its support should be included in the effective field of view of at least one other camera where possible.

7.3 Camera and lens selection criteria

A camera and lens shall be compatible and shall be selected to cover the area to be viewed, taking into account any person or object required to be identified.

Note: Sub-clause 7.6 of BS EN 50132-7: 1996 recommends object sizes in relation to the operator task.

7.4 Camera selection

The type(s) of camera selected shall be suitable for the application(s).

There are many different types of camera available with suitability for different applications. A camera that produces good results during daylight hours may not perform after dusk and a camera suitable for low light level conditions may not work with infrared lighting.

Available light level will have a major influence on the choice of camera and it should be noted that the sensitivity of a camera measured under laboratory conditions rarely matches results under natural operating environments.

Colour cameras respond in a similar manner to the human eye but require significantly higher light levels to provide full video signal compared with monochrome cameras. Monochrome cameras have varying degrees of red and infrared response depending on the imaging device used. Therefore in selecting a camera for a particular application it is necessary to consider the type of light source and the spectral response of the imaging device in addition to the scene reflectance and lens.

7.5 Lens selection

The focal length of the lens shall be selected to give the required angle of view.

Effective observed angles of view for a typical range of focal lengths are given in Appendix 2.

Where lighting conditions dictate, lenses shall be fitted with a remotely controlled, or electronically controlled, iris to respond to changes in ambient lighting and to stabilise the video signal over the working range.

A lens shall be selected with particular regard to the likely ambient conditions at the location, including:

- (a) Available scene illumination
- (b) Temperature
- (c) Humidity
- (d) Dust and airborne particles
- (e) Contamination
- (f) Lens filter to suit the lighting environment.

7.6 Recommended object sizes

The recommended minimum object sizes are as follows:

- For identification of the object – not less than 120% of screen height
- For recognition of the object – not less than 50% of screen height
- For detection of the object – not less than 10% of screen height
- For crowd control – not less than 5% of screen height

Refer to sub-clause 7.6 of BS EN 50132-7: 1996 for further details.

7.7 Ancillary equipment

The environmental conditions under which equipment will be expected to operate shall be taken into account and environmental housings affording appropriate protection shall be specified.

Equipment should be installed to manufacturers' instructions. Equipment exposed to direct sunlight may require appropriate shielding to avoid the possibility of overheating. To reduce the risk of condensation a heater should be installed within housings installed in external locations. External dome camera housings may require a heater and fan.

Where there exists the possibility of penetration by solid objects, dust or water, environmental housings affording appropriate protection shall be specified in accordance with BS EN 60529.

7.7.1 Camera housings

A camera and its supporting hardware shall be securely mounted.

The camera mounting bracket or pole and its fixings shall support safely the weight and the windage of the camera and of any associated hardware.

7.7.2 Pan and tilt units

Mechanisms shall be specified to take account of the following:

- (a) The maximum required pan and tilt rotations and any intermediate preset stops within these.
- (b) The required rotational speed.
- (c) The maximum supported load.

In the interests of safety, it is recommended that extra-low voltage mechanisms should be specified.

A prominent warning notice shall be affixed to moveable camera positioning equipment indicating that sudden movement of the equipment can occur.

The following environmental considerations shall be taken into account:

- (i) Rigidity, taking into account potential wind velocity.
- (ii) Weather conditions, including humidity and the potential for ice formation.
- (iii) Operating temperatures.
- (iv) Dust, airborne particles and other potential types of contamination.

The manufacturer's recommendations for installation should be followed.

Unless one preset position is used, consideration should be given to the method of movement and to requirements for limit stops or similar safety devices.

7.7.3 Towers and brackets

Before erecting brackets or towers the following environmental considerations shall be taken into account:

- (a) Rigidity, taking into account potential wind velocity, equipment type and equipment mounting and fixing positions.
- (b) Electrical interference and the possibility of damage by lightning (see BS EN 62305).
- (c) Dust, airborne particles and other potential sources of corrosion or contamination.

Equipment should be installed according to the manufacturer's instructions.

Equipment shall be so installed as to provide appropriate safety and accessibility for maintenance, taking into account any environmental constraints and the security of the installation.

Where movement of towers is possible, cables shall be carefully selected and installed and their safety and ease of tampering considered.

The alignment and mounting of line of sight (e.g. optical and microwave) transmission equipment is often critical and consideration shall be given to the method of alignment and to the rigidity of the mounting; natural movements, such as those experienced by tall buildings, can seriously affect system performance.

7.8 Evaluation of the scene and illumination

Refer to sub-clause 7.8 of BS EN 50132-7: 1996.

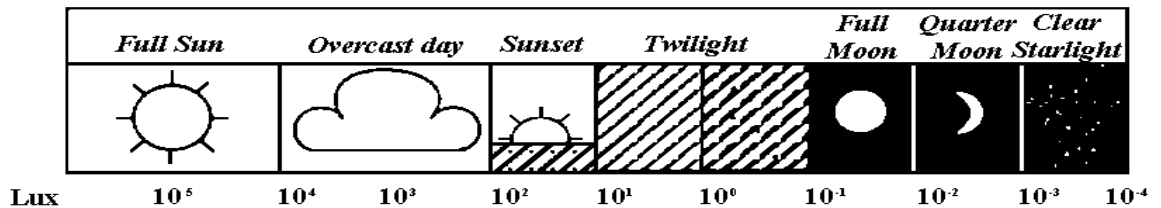
A survey of the site shall be undertaken and an appropriate plan shall be prepared.

The survey should identify areas where lighting may need to be adjusted and/or additional lighting may need to be provided. The selection of cameras and lenses suitable for operation under the proposed light levels may then be carried out with certainty.

The performance of a CCTV system is primarily dependent upon the available light level. It is important, therefore, that the limits of light levels within which a CCTV installation is intended to function are expressed in units of illumination (e.g. lux).

An indication of typical light levels is given in Figure 1 below.

Figure 1. Chart of relative light levels



By way of general indication only, some other typical light levels are given below. Substantial variation can occur, especially towards lower light levels, according to weather conditions.

Typical Light Levels

Moonless, overcast night sky	0.0001 lux	Well lit main road	10 lux
Moonless, clear (i.e. starlight) night sky	0.001 lux	Stairs/Passages	60 lux
Quarter moonlight on a cloudless night	0.01 lux	Offices/Retail Store	250/500 lux
Deep twilight	1 lux	Daylight	10,000/25,000 lux
Twilight	4 lux	Full sunlight	32,000/130,000 lux

Light level measurements taken using a light meter should normally not be regarded as giving exactly the same as the lux levels received at cameras.

7.9 Selection of the video transmission system

Where utilised in exterior applications, and unless otherwise specified, transmission equipment shall be protected to the requirements of IP 65 of BS EN 60529: 1992.

The selected transmission method shall have an input and output impedance matching that of the connected equipment.

Transmission shall be effective over the required distance taking into account possible signal loss due to cable and environmental effects.

The manufacturer's recommendations should always be followed.

7.9.1 Main video transmission systems

Refer to sub-clause 7.9.1 of BS EN 50132-7: 1996.

a) Coaxial cable transmission

The cable shall be suitable for video transmission and for the environmental conditions.

Unless otherwise specified, the cable screen shall provide at least 90% coverage and the cable size shall allow for the fitting of high frequency video connectors such as the BNC and UHF types.

Long cable runs may require the use of video amplification and video equalising equipment and, as the requirements for such equipment are dependent upon both the type of cable and the video equipment used, the manufacturer's recommendations should always be followed.

b) Twisted pair cable transmission

Existing transmission lines shall be tested to establish that they will perform satisfactorily.

Twisted pair cable transmission normally requires video correction controls. These controls should only allow adjustment by means of a special tool or should be covered by a protecting plate.

c) Microwave and radio frequency transmission

Where applicable, systems shall meet the relevant requirements of the Office of Communications (Ofcom) and any necessary licences shall be obtained.

Correct alignment and mounting of transmitting and receiving devices is essential.

Particular attention should be given to the method of alignment provided and the rigidity of the mounting.

d) Infra-red and laser transmission

Some infra-red and laser devices can damage the eye. In such cases suitable warning labels shall be fitted and the necessary precautions specified by the HSE shall be taken.

Correct alignment and mounting of transmitting and receiving devices is essential.

e) Fibre optic transmission

Fibre optic transmission should utilise commonly available types of cable with appropriate fibre optic connections.

f) Network transmission

Equipment used to connect CCTV systems to telecommunications networks shall have relevant (e.g. BABT) approval.

The above methods are given as examples and are not intended to prohibit the use of other transmission methods such as Internet Protocol (IP).

7.9.2 Selection criteria for video transmission

Refer to sub-clause 7.9.2 of BS EN 50132-7:1996.

7.9.3 Monitors

The resolution of the monitor shall not limit the overall system performance and over-scanning shall not exceed 10%.

Consideration shall be given to the environmental conditions in which the monitor will operate.

The manufacturer's recommendations should normally be followed with particular regard to:

- (a) *Operating temperature;*
- (b) *Humidity;*
- (c) *Dust and airborne particles;*
- (d) *Background lighting, in particular that falling directly onto the screen.*

Appropriate access should be provided for servicing.

7.9.4 Control equipment

Control equipment shall be selected so that the system is able to meet the Operational Requirement (see 5 above).

Control equipment capability should take account of foreseeable future requirements.

Control equipment may be a proprietary computer.

The manufacturer's specified environmental conditions shall be provided in respect of:

- (a) Temperature and humidity;
- (b) Dust and other forms of air contamination;
- (c) Vibration;
- (d) Electrical interference.

The following shall be taken into consideration when siting control equipment:

- (1) Ventilation
- (2) Access for maintenance
- (3) User access for archiving etc.
- (4) Physical security and supervision
- (5) Convenience for operator use.

7.10 Control centre configuration

Refer to sub-clause 7.10 of BS EN 50132-7: 1996.

CCTV control centres (monitoring centres) vary considerably in size and complexity depending upon the surveillance application (e.g. city / town centre scheme, industrial estate, housing estate, large commercial building, small business, dwelling) and the needs of the customer. For example, the control centre may be located at the premises where the CCTV system is installed, or at a location remote from the premises.

Monitors should be sited so that their screens are shielded from bright lighting and so that windows or other brightly lit objects are not reflected from the face of the monitor tube.

Multiple monitors shall be mounted so that adequate ventilation is available to avoid the possibility of overheating. Contrast, brightness and, if applicable, colour controls shall be readily accessible and provision shall be made for the removal of dust attracted to the face of the picture tube. There shall be minimal change in picture size with change in brightness and highlights in the picture shall not cause defocussing. Colour monitors shall have a fixed black level although in monochrome systems a slight increase in black level for low contrast scenes may be advantageous.

Monitors shall be positioned appropriately, considering viewing conditions for scenes including sources of reflection or creating highlights or excessive contrast.

7.11 System design specification

The System Design Specification shall provide for a CCTV system meeting the Operational Requirement (see 5 above) and / or other specifications provided by the customer (or a person acting for the customer), except where altered in consultation with, and with the agreement of, the customer.

Where an Operational Requirement is not available, as may be the case for less complex CCTV systems, the System Design Specification, drawn up as part of the process of ascertaining the customer's needs, expectations, and patterns of usage of the premises, forms the basis of the agreement between the installing company and the customer as regards the CCTV system to be supplied.

The System Design Specification for a CCTV system shall draw the customer's attention to:

- (i) The Data Protection Act (except in clear cases where the DPA does not apply) and the CCTV Code of Practice published by the Information Commissioner's Office.
- (ii) The requirement to provide signs under the Data Protection Act (except where the DPA does not apply).
- (iii) British Standard Code of Practice BS 7958 for the management and operation of CCTV (which is applicable to CCTV used in public spaces and also provides good practice for all other CCTV) and indicate where the document can be obtained (e.g. from British Standards Institution or National Security Inspectorate).

The System Design Specification shall include all the main equipment, including power supplies, and components to be supplied and detail the proposed locations.

The specification shall give details of the:

- (a) Kind of camera to be used; and
- (b) Focal length of lens and area of coverage (for example, in terms of the field of view, maximum and minimum range) to be used; and
- (c) Location of the camera (for example, height above ground); and
- (d) Intended purpose of surveillance (for example, identification, recognition, detection or monitoring); and
- (e) Minimum light level limits (e.g. lux) within which each camera / lens combination is intended to operate; and
- (f) Ancillary lighting (if needed) to achieve the intended light level operation; and
- (g) Pan, tilt or zoom functions; and
- (h) Any other automatic and / or remote control functions; and
- (i) Mounting arrangements.

Where zoom lenses are used, the minimum and maximum focal length and zoom ratio should be stated.

It may be helpful to give the customer a plan of the site showing intended locations of cameras and their areas of coverage as part of the documentation forming the System Design Specification.

Where the field of view of a camera necessarily includes the horizon, consideration should be given to locating the camera such that its field of view is directed towards the North, rather than towards the South, to minimise possible effects of sunlight.

The System Design Specification shall include details of the system operational criteria (see **6** above) and, where applicable, the control centre configuration (see **7.10** above).

For each detector that is capable of providing inputs to a CCTV system, the system design specification shall give details of the:

- a) Location of the detector, including height
- b) Purpose / function of the inputs
- c) Detector range and coverage.

7.12 System test specification

A system test specification shall be agreed and the tests shall be selected to demonstrate, during handover (see **9.3** below) that the CCTV system meets the specifications agreed, including those given in the operational requirement.

The test method described in Annex A of BS EN 50132-7: 1996 (or similar) should be used wherever an objective evaluation is required to confirm that the required performance can be obtained.

The use of the test method described in Annex A of BS EN 50132-7: 1996 (or similar) is a matter for agreement between customer and installer and is not a requirement for every installation. Other test methods are permissible.

8. INSTALLATION

Refer to Clause 8 of BS EN 50132-7: 1996.

8.1 Planning the installation

Power supplies shall be capable of meeting the largest load likely to be placed upon them under normal operating conditions.

Where safety and security considerations do not require continued operation of the CCTV system during a mains supply failure, the public mains supply may be the sole supply for the system.

Some CCTV systems running from a 230 V mains supply require the equipment to be connected to the same electrical phase.

Power supplies shall be located within a secure area, in a position safe from tampering, and shall be ventilated in accordance with manufacturers' requirements for safe operation.

All equipment housings shall be clearly marked with the operating, or supplied, voltage.

The voltage drop in cables shall be considered to ensure that in worst case conditions the voltage drop does not cause the operation of any devices connected by the cables to be impaired.

8.2 Cable installation

All wiring and connections shall be installed in accordance with good safety installation practice.

Attention is drawn to the Regulations for Electrical Installations, BS 7671, also known as the IEE/IET Wiring Regulations.

Extra-low voltage and signalling cable shall not be installed in ducting / trunking which is carrying mains cable, or parallel to mains cables, unless suitably screened, insulated and/or segregated.

Wherever possible, extra-low voltage cables shall not be brought into any item of equipment through the same entry point as mains cables.

Interconnecting wiring to a camera should, wherever practicable, be concealed. Where this is not practicable, mechanical protection should be used, such as metal conduit, or flexible conduit for moveable cameras.

All fixed interconnection cables shall be supported and the installation shall conform to good working practice.

Suitable fixing methods include:

- (a) *Conduit: when metal is used, suitable bushes or grommets should be fixed to each end to prevent damage to the cable. Conduit used to carry cable should terminate as close as possible to the unit being connected.*
- (b) *PVC or metal trunking: where trunking is used to carry cable it should terminate as close as possible to the unit being connected.*

- (c) *Insulated clips.*
- (d) *Cable ties.*
- (e) *Overhead catenary wires with loop holders or plastic buckles. Where this method is utilised the catenary wire should be securely attached to the building. Self-supporting catenary cables may be used provided they are correctly designed.*

Any plastic or PVC component used as part of the installation of cables shall be suitable for the environment in which it is installed.

Cables shall be mechanically protected against accidental damage.

In public areas, cables installed below a level of three metres above ground level should normally be mechanically protected.

Excessive cable at the end of large runs should be coiled to prevent damage during installation.

Manufacturer's recommendations for minimum bend radius of cables should be observed.

The jointing and termination of coaxial or fibre optic cables shall always use the correct video or fibre optic connectors or junction boxes.

Equipment should be installed to the manufacturer's recommendations and in accordance with good working practice.

Cables carrying data and other level signals / voltages shall be of a type and size compatible with the rate of data transfer, anticipated levels of electrical interference and any voltage drop.

All cables and cores should incorporate a means for their identification e.g., by colour coding or suitable labelling.

Environmental conditions such as dampness, excessive heat, risk of corrosion, mechanical or chemical damage, shall be taken into account in determining the degree of protection required for cable runs.

Any cables which are used underground shall be suitable for that purpose and shall have adequate protection from mechanical damage.

Underground cables should provide a high level of resistance to dampness, chemical reactions, corrosion and rodents.

8.3 Hardware mounting

Sufficient access to equipment shall be provided to enable necessary service and maintenance.

8.4 Documentation

Cabling shall be clearly and unobtrusively labelled at the distribution and control panels to facilitate future maintenance and servicing, and a cross-reference chart showing the relationship between cables and devices shall be held by the installing company and a copy given to the customer.

9. COMMISSIONING, HANDOVER AND DOCUMENTATION

9.1 General

Commissioning shall consist of the inspection and testing of the installed system(s) by the installation technician; handover requires the demonstration of the system(s) to the user(s) and the subsequent acceptance of the installation by the customer.

9.2 Commissioning

Commissioning shall include visual and functional testing to ensure that:

- a) The system is installed in strict accordance with the agreed specification and that the standard of workmanship is high, and
- b) The commissioning requirements of this Code of Practice and BS EN 50132-7: 1996 are met.

This will include testing of the following aspects of the system(s):

- All wiring is correctly terminated.
- Supply voltage is correct to all appropriate parts of system.
Where low voltage cameras are used, the voltage at each camera should be recorded.
- Operation of all monitoring, switching, multiplexing and recording equipment is satisfactory, including playback equipment.
- Interfaces with alarms (e.g. movement alarms, fences) are satisfactory and triggering of alarms is correct.
- Beam interruption detectors are aligned correctly, where used for triggering the CCTV system.
- *[Text deleted]*
- All indicator lamps are working.
- If a standby power supply is specified, ensuring that the system continues to operate correctly to specification when the mains supply is disconnected.

This will also include testing of the following aspects for each camera:

- Camera type and lens fitted is correct for each position.
- Operation of all automatic and / or remotely controlled camera functions (e.g. pan, tilt, zoom, focus, electronic iris, wiper) is satisfactory.
- Correct setting of all pan and / or tilt limits.
- Camera movement, and field(s) of view seen through the appropriate monitor(s), is correct and free from obstruction.
- Operation of electronic irises and focus is satisfactory under the range of intended light levels (night conditions may be simulated though use of suitable neutral density filters).
- Satisfactory operation of supplementary lighting.
- Warning labels are in place in respect of possible sudden movement of camera positioning equipment and in respect of any devices that could cause damage to the eye.

An example Commissioning Checklist is given as Attachment 1.

9.3 Handover

At handover the installing company shall:

- (a) Ensure all system documentation is correct (see 9.4 below).
- (b) Train the designated user(s) in the correct operation and adjustable features of the system;
The customer should be requested to make available the designated user(s) to receive training.
- (c) Provide a system log book to the customer and explain how to record / report events;
- (d) Demonstrate all aspects of the operation of the system(s) and compliance with the agreed requirements; where required using the test method referred to in Annex A of BS EN 50132-7: 1996 to confirm that the performance of the installed system is satisfactory for the customer's purposes and recording the result(s) obtained.

Consideration shall be given to making a recording of video information obtained during the demonstration for the purpose of creating a benchmark against which to check future system performance.

The installer should keep a copy of the video recording, which may be used, for example, as part of the periodic test scheme (see 7.12 of BS EN 50132-7:1996) and a copy may be given to the customer if so requested.

Where an installing company enters into a contract with the customer to provide a monitoring service using another company as sub-contractor, arrangements with the other company shall ensure that the demonstration can be performed and completed.

- (e) Ensure that the correct documentation is given to the end user to enable the system to be operated;
- (f) Ensure that the user(s) are aware of the procedure for summoning assistance in the event of system malfunction.

An example Handover Checklist is given as Attachment 2.

Following handover the customer shall be asked to sign an acceptance document and to enter any confidential information (e.g. passwords which restrict user access to engineer and other reserved functions) required to make the system perform to the agreed specification.

An example Acceptance Document is given as Attachment 3.

9.4 Documentation

Upon completion of a CCTV installation there shall be a record for each system making up the installation, which shall include the following information where appropriate:

- (a) The name and address of the protected site;
- (b) The name and address of the customer;
- (c) The location of each control unit and the type and location of each camera and its associated hardware;

- (d) An indication of the camera view(s) defining the protected area(s) and the identification of any specific areas that cannot be successfully or consistently protected by the system;
The camera view(s) may be provided in the form of a drawing, a hard copy printout or a video recording.
- (e) The type and location of power supplies;
- (f) Details of those cameras that the customer has the facility to manoeuvre or isolate;
- (g) The type and location of monitors and indicating and / or warning devices;
- (h) Manufacturer's documentation relating to equipment and its operational settings/controls;
- (i) Full instructions for the correct use of system, including details of routine testing procedures and any necessary maintenance requirements (see 10); possible sources of interference with the system and equipment with which the system itself will interfere shall be identified.
- (j) The operation, storage and cycling of recording media such as videocassette tapes and digital audiotape.

The make and model number of all items of equipment shall be stated in the system record (or alternatively the installing company's own identifying reference such that using its own records the installing company can identify the make and model number).

The system record (i.e. for the as installed system) shall be agreed with the customer and a copy provided to the customer.

The customer should be offered drawing(s) of the CCTV installation. Where symbols are used in drawings, a key to these symbols should always be provided to enable customers to understand the content of the drawings.

The customer shall be provided with the record of the results of the objective test (see 7.12 above), where this was agreed to be a requirement.

All documentation referring to a security system should be kept in a place to which access is restricted to authorised persons.

10. MAINTENANCE

For the purposes of this section, the following definitions apply:

10.1 Definitions

- 10.1.1 Preventive Maintenance:** Routine servicing of a system, carried out on a scheduled basis.
- 10.1.2 Corrective Maintenance:** Emergency servicing of a system, or part thereof, carried out in response to the development of a fault.
- 10.1.3 CCTV Technician:** A person who is trained and competent in the installation, maintenance, servicing and fault-finding of CCTV systems.

- 10.1.4 Preventive Maintenance Report:** A document that records the preventive maintenance carried out in accordance with this Code of Practice or other applicable technical standard. An example Preventative Maintenance Report Form is given as Attachment 5.
- 10.1.5 Corrective Maintenance Report:** A document that details the requirement for normal or emergency corrective maintenance and indicates the corrective action taken, as required by this Code of Practice or other applicable technical standard. An example Corrective Maintenance Report Form is given as Attachment 4.
- 10.1.6 Customer:** Any person or organisation utilising the services of an approved company for the maintenance and servicing of a CCTV system. It includes the customer's agent.

10.2 Maintenance Service Agreements

Where preventive and/or corrective maintenance service is provided, it shall be delivered in accordance with this Code of Practice.

Installing companies should be able to offer support to the system for a period of five years from handover date.

10.3 Staff

Every approved company shall have sufficient CCTV technicians to maintain and service all its CCTV maintenance contracts in accordance with this Code of Practice (or other applicable technical standards including manufacturers' instructions).

10.4 Corrective Maintenance

- 10.4.1** The emergency service (corrective maintenance) facility shall be so located and organised that, under normal circumstances, the approved company's CCTV technician attends the premises within the time agreed in the contract with the customer.
- 10.4.2** A reliable system of communication between the controlling office, the customer and all CCTV technicians shall be maintained at all times.
- 10.4.3** There shall be one or more stand-by CCTV technicians. If there is only one CCTV technician on call-out there shall be a support facility to meet the requirements of paragraph **10.4.1** above.
- 10.4.4** CCTV technicians and other duty engineering staff shall be available and shall keep in regular and frequent contact with their operational base.
- 10.4.5** The CCTV technician shall determine the cause of any fault and then carry out one or more of the following:
- (a) Repair and leave the CCTV system fully operational.
 - (b) Temporarily repair the CCTV system subject to approval of the customer.
 - (c) With the customer's approval, disconnect part of the system and obtain the customer's signature.

- (d) In the case of a fault in a video transmission system, to confirm the condition and change the system to alternative transmission (if installed) and obtain the customer's signature.

If the fault on the CCTV system cannot be located or positively confirmed, the CCTV technician shall contact service control for instruction.

10.4.6 A report of all action taken shall be made on the corrective maintenance report and the customer's signature obtained. A copy is to be made available to the customer. (An example Corrective Maintenance Report Form is given as Attachment 4).

10.4.7 Any parts of the CCTV system disconnected or temporarily repaired shall be recorded, obtaining the customer's signature as authority, and must be reported for further action. The approved company shall ensure that action is taken as soon as possible and, in any case, in accordance with the contract for maintenance.

10.5 Preventive Maintenance

10.5.1 Where a maintenance service agreement has been entered into, it is essential that approved companies have the capability to operate a planned programme of preventive maintenance visits.

It is recommended that a preventive maintenance visit should be made during or before the twelfth calendar month following the month of handover.

Thereafter, preventive maintenance visits (if agreed) shall be made at the frequency agreed in the contract with the customer.

10.5.2 When carrying out a preventive maintenance visit the CCTV technician shall first establish with the customer whether there have been any problems with the CCTV system since the last preceding preventive maintenance visit.

The CCTV technician shall examine the system documentation, or that kept by the customer, to see whether there have been any service calls or incidents since the last preceding routine visit. Where possible, the CCTV technician shall also enquire whether there has been, or is likely to be, a change of use of the premises, a change of working procedures, or a change of tenure.

The CCTV technician shall ensure that the customer (or the customer's representative) is still fully conversant with the operation of the CCTV system.

10.5.3 The CCTV system shall then be visually inspected, checking the following items:

- (a) The number and type of cameras, including lenses, are in accordance with that stated in the specification and any amendment. Draw the customer's attention to any deviations found.
- (b) Indicator lamps are working correctly. Replace faulty indicator lamps as required.
- (c) Warning labels are still in place. Replace missing labels as required.

- (d) All cables and conduit (including those that are flexible) are properly supported, undamaged and showing no signs of wear. Lower towers where necessary in order to inspect cables.
- (e) Ensure sound physical fixings of all equipment including examinations for loosening or corrosion of supports and fixings, including towers and brackets. Lubricate tower mechanisms, where applicable, in accordance with manufacturers' instructions and repair or replace brackets as necessary.
- (f) All glands and seals on external equipment. Repair or replace glands and seals as necessary to maintain the agreed specification.

10.5.4 The CCTV system shall then be functionally inspected, checking the following items:

- (i) The picture quality of each camera and correct monitor selection. Look for signs of condensation on windows of camera housings and limiting of picture highlights.
- (ii) Where necessary, remove covers and housings and clean interiors.
- (iii) All automatic and remote control camera functions comply with specification (e.g. pan, tilt, zoom, electronic iris, focus, wipers, washers, heaters) and that camera movement and fields of view are free from obstruction.
- (iv) Operation of all monitoring, switching, multiplexing and recording equipment (including time and date generators) is satisfactory.
All equipment, in particular video recording equipment, should be maintained and serviced in accordance with manufacturers' recommendations and instructions.
- (v) Function of all interfaces with alarms is satisfactory including correct triggering of alarms.
- (vi) Operation of supplementary lighting is satisfactory.

Lamps should be replaced at frequencies recommended by manufacturers so as to minimise the possibility of failure between preventive maintenance visits. As the life of a particular lamp cannot be known with certainty, avoidance of such failure cannot be guaranteed.

Items requiring attention shall be rectified and / or reported as necessary, recording all such work on the preventive maintenance report. (An example Preventive Maintenance Report Form is given as Attachment 5).

10.5.5 Check that the performance of the system(s) continues to meet the agreed Specification / Operational Requirement according to the periodic test scheme agreed with the customer.

APPENDIX 1

CHECKLIST FOR ESTABLISHING PERFORMANCE

- 1.1 **Operational Criteria**
 - Procedures*
 - System response*

- 1.2 **Surveillance**
 - Fixed, movable or moving view*
 - Number and location of cameras*
 - Coverage*
 - Complexity (cost implications)*

- 1.3 **Camera and Lens Selection**
 - Compatibility*
 - Suitability*
 - Camera type e.g. standard / low-light, monochrome / colour*
 - Required angles of view*

- 1.4 **Recommended Object Sizes**
 - Identification*
 - Recognition*
 - Detection e.g. alarm event coverage*
 - Monitoring e.g. general surveillance.*

- 1.5 **Camera mounting system**
 - Pan / tilt / zoom*
 - Poles / towers / wall brackets*
 - Aesthetics*
 - Planning regulations*
 - Camera housing*

- 1.6 **Scene and Illumination**
 - Levels of illumination*
 - Supplementary lighting*
 - Visible or discreet*
 - Local or general*
 - Lighting efficiency e.g. bulb life, lumens / watt*
 - Uniformity*
 - Colour rendering (or wavelength)*

- 1.7 **Video transmission**
 - Coaxial cable*
 - Twisted pair cable*
 - Fibre-optic cable*
 - Microwave*
 - Free-space optical*
 - Slow-scan*

- 1.8 **Telemetry**
 - Hard-wired parallel*
 - Coaxial cable*
 - Separate twisted-pair*
 - Integration with the video transmission medium*
 - Compatibility between systems*
 - Facilities to be provided*
 - System expansion capability*
 - Preset positioning*
 - Priority assignment*

APPENDIX 1

CHECKLIST FOR ESTABLISHING PERFORMANCE (CONTINUED)

- 1.9 **Monitors**
 - Number required to provide the required level of surveillance*
 - Monitor size and operational requirements*
 - Monitor resolution (see Appendix 2)*
 - Positioning for minimization of on-screen reflections or use of mesh filters*
 - Acceptable video signal level at monitor input*
 - Radiation output*
 - Facilities*
 - Acceptable picture quality e.g. for extended or 24 hr surveillance*

- 1.10 **Control and Recording Equipment**
 - Type of recording e.g. time-lapse or real-time*
 - Number of VCRs and/or DVRs required for general surveillance or alarm-only*
 - Multiplexers*
 - Time-lapse interval*
 - Alarm handling*
 - Tape and/or digital image management*
 - Frame rates and storage capacity*

- 1.11 **Play-back**
 - Location, in relation to system operator*
 - Tape format compatibility*
 - Requirement for specific play-back equipment e.g. additional multiplexer*
 - Maintenance considerations e.g. head life and tape quality*

- 1.12 **Switching**
 - Auto-sequencer or switcher*
 - Matrix system*
 - Spare outputs / test points*
 - Assignment of priorities*

- 1.13 **Video channel performance**
 - Bandwidth*
 - Cross-talk*
 - Isolation Signal / noise ratio*

- 1.14 **Expansion capabilities**
 - Further camera inputs*
 - Further monitor / VCR outputs*
 - Further operator positions*
 - Integration with alarm detection and monitoring systems*
 - Integration with camera telemetry system*

- 1.15 **Ancillary equipment**
 - Video buffer, compensation amplifiers*
 - Video distribution amplifiers*
 - Signal monitoring devices*
 - Solid state and magnetic disc storage systems*
 - Video printers*
 - Video motion detectors*

- 1.16 **Telecommunications networks**
 - Image quality*
 - System reliability*
 - Protection of data*
 - Quantity and speed of data transmission*

APPENDIX 2

EFFECTIVE OBSERVED ANGLES OF VIEW FOR A TYPICAL RANGE OF FOCAL LENGTHS

Figures given in the table below assume 10% monitor overscan.

Figures given in the table below are approximate and will vary according to the source of manufacture.

Table: Observed angles of view

Focal length of lens	$\frac{1}{2}$ " Image sensor (Image 6.4 mm x 4.8 mm)		$\frac{1}{3}$ " Image sensor (Image 4.8 mm x 3.6 mm)		$\frac{1}{4}$ " Image sensor (Image 3.6 mm x 2.7 mm)	
	mm	Horizontal	Vertical	Horizontal	Vertical	Horizontal
3.5	79.5°	63.9°	63.9°	50.1°	50.1°	38.6°
4.8	62.4°	48.9°	48.9°	37.6°	37.6°	28.7°
6.0	51.7°	40.0°	40.0°	30.5°	30.5°	23.1°
8.5	37.8°	28.8°	28.8°	21.8°	21.8°	16.4°
12.0	27.3°	20.6°	20.6°	15.5°	15.5°	11.7°
12.5	26.2°	19.8°	19.8°	14.9°	14.9°	11.2°
16.0	20.6°	15.5°	15.5°	11.7°	11.7°	8.8°
25.0	13.3°	10.0°	10.0°	7.5°	7.5°	5.6°
28.0	11.9°	8.9°	8.9°	6.7°	6.7°	5.0°
50.0	6.7°	5.0°	5.0°	3.7°	3.7°	2.8°
75.0	4.4°	3.3°	3.3°	2.5°	2.5°	1.9°
100.0	3.3°	2.5°	2.5°	1.9°	1.9°	1.4°
160.0	2.1°	1.6°	1.6°	1.2°	1.2°	0.9°
200.0	1.7°	1.3°	1.3°	0.9°	0.9°	0.7°

NOTE: Lenses designed for a particular image size may also be used with sensors of a smaller image size. This will have the effect of reducing the angle of view.

COMMISSIONING CHECKLIST FOR CCTV SYSTEMS

Company Name: Company Address:.....

..... Telephone No:.....

Customer:

Address:

Job No:..... Date:.....

	Tick When Checked	Remarks
1. Check that the installation is in strict accordance with the agreed specification and is to acceptable workmanship.		
2. Check that the requirements of NCP 104 and BS EN 50132-7:1996 and all other relevant requirements are met.		
3. Check all wiring is correctly terminated.		
4. Check supply voltage is correct to all appropriate parts of system.		
5. Check that operation of all monitoring, switching, multiplexing and recording equipment is satisfactory.		
6. Check interfaces with alarms (e.g. movement alarms, fences) and correct triggering of alarms.		
7. Check beam interruption detectors for correct alignment if used for triggering the CCTV system.		
8. Check that appropriate notices have been provided.		
9. Check that all indicator lamps are working.		
10. Check that system continues to operate correctly to specification when mains supply is disconnected (if standby power supply specified).		

FOR EACH CAMERA (1 to 8) TICK WHEN CHECKED	1	2	3	4	5	6	7	8
A. Check camera type and lens fitted is correct for each position.								
B. Check correct operation of all automatic and / or remotely controlled camera functions (e.g. pan, tilt, zoom, focus, electronic iris, wiper).								
C. Check correct setting of all pan and/or tilt limits.								
D. Check that camera movement and field(s) of view seen through the appropriate monitor(s) is correct and free from obstruction.								
E. Check operation of electronic irises and focus is satisfactory under the range of intended light levels.								
F. Check satisfactory operation of supplementary lighting.								
G. Check that warning labels are in place in respect of possible sudden movement of camera positioning equipment.								

Outstanding work required if any of the above is not ticked:

CCTV Technician's Signature:..... Date:.....

NCP 104 Attachment 1

HANDOVER CHECKLIST FOR CCTV SYSTEMS

Company Name: Company Address:.....

..... Telephone No:.....

Customer:

Address:

Job No:..... Date:.....

	Tick When Checked	Remarks
1. All system documentation is correct.		
2. Designated user(s) have been trained in the correct operation and adjustable features of the system.		
3. A system log book has been provided to the customer and an explanation has been given on how to record / report events.		
4. All aspects of the operation of the system(s) and compliance with the agreed requirements have been demonstrated to the customer in accordance with the agreed system test specification.		
5. A recording of the information obtained during the demonstration has been made.		
6. Correct documentation has been given to the end user to enable the system to be correctly operated.		
7. User(s) have been made aware of the procedure for summoning assistance in the event of system malfunction.		
8. Check that all documentation in accordance with NCP 104 is correct. (It is Recognised that some check under this heading may be subsequent).		
9. Record the number of the Certificate issued in accordance with the Council's Rules.		
10. Obtain client's signature acknowledging acceptance of the system(s) - see Attachment 3 of this Code of Practice.		
11. Check that all surplus materials and equipment are cleared from the site and that premises are left clean and tidy.		

Outstanding work required if any of the above is negative:

.....

.....

.....

.....

CCTV Technician's Signature:..... Date:.....

ACCEPTANCE CERTIFICATE

Customer: Ref:

Address:
.....
.....

System Record Reference:Dated:

I confirm that the CCTV system has been installed to my satisfaction and that the premises have been left in a tidy condition and that I have received:

- 1. training in the operation and adjustable features of the CCTV system
- 2. a record book (system log book) for the CCTV system
- 3. a demonstration showing compliance of the CCTV system with the requirements using the agreed system test specification
- 4. full and comprehensive written operating instructions for the CCTV system
- 5. details of the procedure for summoning assistance in the event of system malfunction.

Customer's Signature:
.....

Signature on behalf of Installing Company:
.....

Date:

PREVENTIVE MAINTENANCE REPORT

Customer:

Address:.....

.....

Item	Check	Tick when complete	Remarks
1.	Check the number and type of cameras, including lenses, are in accordance with the specification and any amendment.		
2.	Check indicator lamps are working correctly.		
3.	Check warning labels are still in place.		
4.	Check all cables and conduit are properly supported, undamaged and showing no signs of wear.		
5.	Check for sound physical fixings of all equipment including loosening or corrosion of supports and fixings including towers and brackets.		
6.	Check all glands and seals on external equipment.		
7.	Check the picture quality of each camera and correct monitor selection.		
8.	Covers and housings have been removed and interiors cleaned where necessary.		
9.	Check all automatic and remote control camera functions are satisfactory and that camera movement and fields of view are free from obstruction.		
10.	Operation of all monitoring, switching, multiplexing and recording equipment (including time and date generators) is satisfactory.		
11.	Function of all interfaces with alarms is satisfactory including correct triggering of alarms.		
12.	Operation of supplementary lighting is satisfactory.		
13.	Check that the performance of the system(s) continues to meet the agreed specification / operational requirement according to the periodic test scheme agreed with the customer.		

The system has been left in full working order apart from the items listed below:

Items not completed at the time of the check will be completed within days of the date shown below.

Time arrived Time left.....

Technician's Signature..... Date.....

Customer's / Customer Representative's Signature

National Security Inspectorate
Sentinel House
5 Reform Road
MAIDENHEAD
SL6 8BY

Tel: 01628 637512 or 0845 006 3003
Fax: 01628 773367
Website: www.nsi.org.uk