

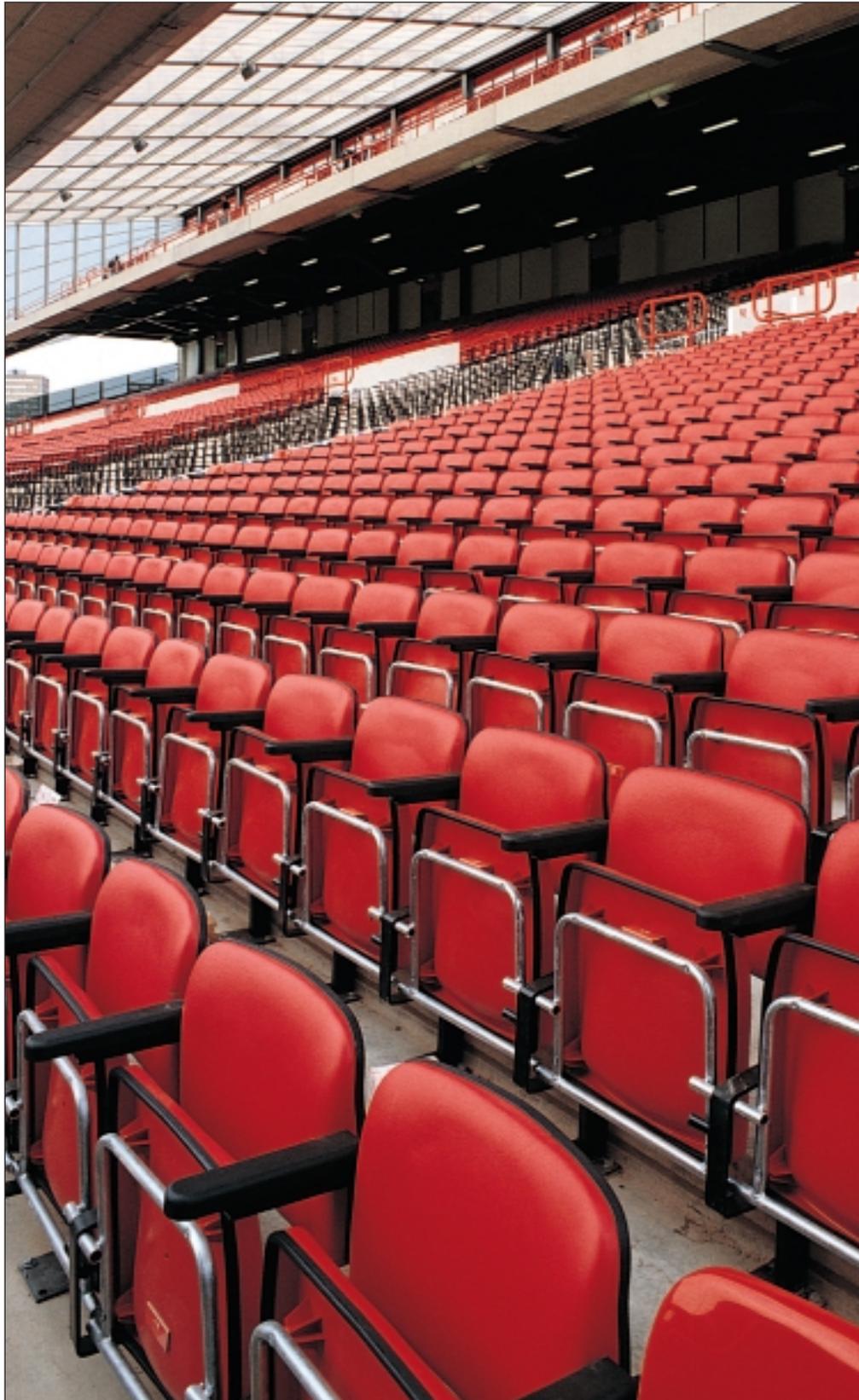


Home Office

BUILDING A SAFE, JUST
AND TOLERANT SOCIETY

Guidance Notes for the Procurement of CCTV

For Public Safety at Football Grounds



**POLICE
SCIENTIFIC
DEVELOPMENT
BRANCH**

Luke Sands

Publication No 9/01

**POLICING AND CRIME
REDUCTION GROUP**

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2nd EDITION

LUKE SANDS

FIRST PUBLISHED 2001

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Published by:

Home Office

Police Scientific Development Branch

Langhurst House

Langhurstwood Road

Horsham

West Sussex RH12 4WX

United Kingdom

Registered file : no: SCL/01 29/1002/1

Printed by:

Miter Press Ltd

Rosebery Avenue

Tottenham

London

Management Summary

This report, an update of the report first published in 1990 in support of the ACPO Sub-Committee on Hooliganism at Sports Events, highlights that effective CCTV systems are a combination of equipment, people and procedures. Neglect of any one part could result in poor performance.

The successful procurement of effective CCTV systems depends greatly on the definition of the overall Operational Requirement for the system. The overall OR may be sub-divided into different ORs for different areas, making it easier to define in terms of the performance specification needed to meet the OR.

With the OR and necessary performance specifications defined, the role of the Contractor and the contents of the Tender Documents may be closely defined and facilitate the awarding of contracts, commissioning and hand-over. The needs of System Documents are discussed.

Since 1990, new legislation and practices have arisen and so sections on requirements of the Data Protection Act 1998, Human Rights Act 1998 and Tape Handling have been included. The revised report is published in support of the aims of the Home Office Crime Reduction Programme Unit.

However, this report alone will not provide all the necessary guidance for lifetime use as it is essentially a procurement guidance document. While sections relating to issues other than procurement have been paraphrased from other PSDB publications, the documents highlighted in the Bibliography are strongly recommended for complete guidance. Several technical Appendices provide checklists for those involved in the procurement process.

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1 INTRODUCTION

The Right Hon Lord Justice Taylor conducted an inquiry into the events of the Hillsborough disaster, during which 95 football fans died and a further 400 were injured. One recommendation (Recommendation 35 in the final report) was: "Closed circuit television should be so installed as to enable crowd densities outside the ground, within concourse areas and in pens and other standing areas, to be monitored before and throughout a match."

In anticipation of the final report's recommendations the ACPO Sub Committee on Hooliganism at Sporting Events established a Working Party, under the chairmanship of ACC M George of Greater Manchester Police, to examine the role of CCTV as an aid to public safety. The working party included members from PSDB and took as its remit the above recommendation.

CCTV is an important tool towards public safety, although on its own it does not guarantee safety. It is one of 4 major factors in crowd safety which are:

- Good design of stadia;
- Good safety systems that meet requirements, CCTV, access control, etc.;
- Good procedures and documentation covering all relevant subjects of safety and procedures, e.g. code of practice, general safety certificate, etc.;
- Good crowd management.

Through a series of ground visits and from examination of video recordings the Working Party derived an image standard for CCTV systems being installed in line with the recommendation. PSDB devised test procedures to quantify this image, incorporating these into guidance notes covering the procurement of CCTV installations for crowd safety at football matches. These guidance notes covered assessing the risk, establishing the operational requirement, specifying the CCTV installation's performance including, tendering, selecting a contractor, commissioning, hand-over and maintenance. The guidance notes were refined by the Working Party.

Since the first Guidance Notes for the Procurement of CCTV for Public Safety at Football Grounds were published in 1990 technology, ground management, legislation and football itself have moved on resulting in an end product that involves many people and procedures. This document, an updated edition (2nd) of the original will help sporting venues procure CCTV systems that improve crowd safety by improving the effectiveness of safety team resources. It has been designed so Best Value is achieved and systems meet the needs.

Instead of producing a revision with only technical updates, it was decided to fully review and update the document, to include information on relevant legislation and best practice in the handling of videotape.

The views of people involved with football related matters and CCTV users at grounds were gathered. Meetings were held and comprised:

A. R. Hogg, Assistant Chief Constable, Durham Constabulary
A. Summerbell, Inspector, Durham Constabulary
G. Stafford, Match Commander (Newcastle United FC), Northumbria Police
R. Turnbull, Safety Officer, Middlesbrough Football Club
E. O. Sheridan, Inspector, Football Licensing Authority
N. Haynes, Chief Inspector, Police Scientific Development Branch, Police Advisor
K. M. Wickham, Police Scientific Development Branch
L. Sands, Police Scientific Development Branch

Following results of questionnaires to safety officers, several meetings and visits to clubs, a mechanism for specifying, procuring and initialising CCTV installations is set out below. There are several discrete steps to consider and implement where necessary:

- a) Establish an Operational Requirement with help from a Risk Assessment.
- b) Produce a Performance Specification for the installation.
- c) Specify what should be included in the Tender Documents.
- d) Decide the criteria to be met by the Contractor.
- e) Set up the procedure for awarding contracts.
- f) Carefully commission and accept the CCTV system.
- g) Acquire or produce documentation for the CCTV system.
- h) Comply with the Data Protection Act and Human Rights Act.
- i) Set out a Maintenance contract for installation.

Many of the above steps have been addressed in the past in the old document and in more recent PSDB documents (see Bibliography).

2 ESTABLISHING THE OPERATIONAL REQUIREMENT

Before contractual negotiations and procurement can proceed the nature of the problem to be tackled must be defined. The Operational Requirement (OR) is a statement of needs based on a thorough and systematic assessment of the problems to be solved and the hoped for solutions. The OR when completed should include information about:

- What is to be Observed
- The Response to the Activity
- The Observer Interfaces
- The Risk Analysis

An easy to use checklist, when writing an OR for existing or proposed CCTV safety systems, can be found in Appendix A. The OR process identifies key

factors which impact on the performance of a system and the way in which it will operate. The checklists should be completed in a practical and systematic manner, with the help of a map of the ground highlighting the different areas of interest and risk. Specific areas with high risk are likely to require CCTV coverage; whereas identified areas with low risk may not require CCTV. Risk analysis and OR should both be completed in consultation with the police who have regular contact with the safety staff at the club and have an understanding of the issues.

It is recommended to have a number of ORs, each relating to a different area of the ground because each area will have a different purpose and level of risk. Also the CCTV system may need ORs that cover not only the safety requirements for the public during football matches but also the safety of the public during other events that may take place in the stadium. These could include pop concerts, exhibitions, other sporting activities and any other events. It should also be taken into account that the system may be intended for 24hr ground security.

The OR procedure requires no technical knowledge of CCTV. Only understanding the performance guideline figures (see OR Manual), relating to the screen height and the Rotakin¹ is necessary.

More guidance to help complete your OR statements is available from the *CCTV Operational Requirements Manual publication No 17/94 by J. Aldridge, PSDB*.

3 THE INSTALLATION'S PERFORMANCE SPECIFICATION

The OR serves as the contract between the user of the system and the security professional whose task it is to translate the needs of the user into a set of criteria for the system designer. These criteria are known as the Performance Specification.

The installation does not just consist of cameras and monitors. It starts with the subject and finishes with the observer. The final image quality is dependent on:

- a) the subject and its illumination;
- b) the prevailing weather conditions;
- c) the camera, its lens, housing and mount;
- d) the signal transmission path which may be direct to the monitor or go via ancillary equipment, including recorders, time and date generators, and camera controllers; and
- e) the viewing monitor and its positioning.

For tendering purposes not all of these factors need to be specified. Specifying the subject, illumination levels and weather conditions is essential. Illumination levels can be measured following the procedures in Appendix B. With the above

¹ Rotakin is the test target used in the informative annex to the European test standard for CCTV installations, BS prEN 50132-7.

specified, the following overall performance figures for the installation are then required:

- a) The size of the subject in the final image:
 - 5% screen height for MONITORING
 - 10% screen height for DETECTION
 - 50% screen height for RECOGNITION
 - 120% screen height for IDENTIFICATION
- b) static resolution;
- c) colour reproduction; and
- d) grey scale reproduction (if using monochrome cameras).

These can all be specified through the club if the club CCTV representatives are confident they know what performance criteria will meet the OR. Otherwise a security professional/consultant should be invited to produce the Performance Specification to meet the ORs. Thought should be given to the flexibility of the installation so that, if sections of the installation or the ground (new stand) need upgrading, the CCTV system can be minimally affected.

The purpose of the Performance Specification is to state the measurables of an installation. A performance specification is based on the OR checklists and helps contractors select the correct equipment to meet the performances stated. Ideally methods of measuring these performance criteria should be specified. Typical values and suggested test procedures are contained within Appendices B-D.

The final area of performance is Operator Response Time (ORT) and the Overall System Response Time; these are both included in the OR checklist. These response times are influenced by the operator performance and control room design. Both can be easily measured, see Appendix D - Testing Operator Response Time.

The video signal, transmission system, control and display equipment will all require some degree of specification as will the positioning and installation of equipment. The items to be specified are summarised in Appendix E.

4 ITEMS FOR INCLUSION IN THE TENDER DOCUMENTS

The next step in the chain of procurement is to issue an Invitation To Tender to acquire a contractor to design and implement the CCTV system competitively. Note that if a government or public body is buying the system and the likely cost of implementation is over the EC biennially set threshold level, then it must be tendered through the Official Journal of the European Community (OJEC).

The items specified in Appendix E must all be included in the tender document. In addition the tender document will require:

- a) The tenderer to provide an itemised breakdown of the cost of the installation showing the cost of individual items, cabling, installation, commissioning, documentation and training.
- b) All items to be listed by manufacturer, by model number, and in the case of lenses focal length and maximum and minimum apertures; for cameras the sensor size, resolution, sensitivity and signal to noise ratio must be stated.
- c) Evidence of membership of any trade associations or professional bodies to be produced, including duration of membership, staff qualifications, compliance with appropriate British Standards and IEE regulations, and the Electricity at Work Regulations 1989. In addition quality standards achieved such as ISO9000 should be included.
- d) The tenderer to provide an on-site demonstration of any proposed equipment to show that it meets the performance criteria detailed in the tender document within reason. This can be a small mock demonstration but should be undertaken during day and night conditions.
- e) The names of customers to be provided, preferably in the immediate area, who can be used as referees.
- f) The date for completion of the work to be clearly stated, plus, any liquidated damages applicable and restrictions on access to the site which will be imposed on the contractor.
- g) Indemnity/liability conditions to be in place to cover risk likely to be incurred personal injury, damage, etc. It is important to set the cover to an appropriate level.
- h) The contractor to advise the customer of all areas of work for which the customer is responsible, e.g. structural repair at sites where cameras are to be mounted or the provision of suitable power supplies. The contractor must specify exactly what is required and by when. The contractor must sign for the satisfactory completion of this work.
- i) Details of the commissioning and hand-over procedure, levels of training required and offered, and the format of the documentation to be available.
- j) Details of warranties and maintenance agreements for the equipment to be available.

5 THE CONTRACTOR

The contractor should have properly trained staff and the appropriate facilities to allow compliance with relevant British Standards, IEE Regulations and any applicable trade association codes of practice.

The contractor should have staff capable of carrying out site surveys, system design, installation, commissioning and maintenance.

The contractor should have the following facilities:

- a) A secure storage area for all records.
- b) A communications system, accessible by telephone, through which staff can be contacted.
- c) Ladders to a safe working height of 10m and access to a scaffold tower for difficult circumstances.

- d) Reliable and secure transport for engineers.
- e) Appropriate test equipment including voltmeters and waveform monitors.
- f) Comprehensive tool kits.
- g) Electrical tools in good condition.
- h) Light meters.
- i) Spare components and equipment to provide any agreed level of support for the system.
- j) All appropriate safety equipment including goggles, site helmets and harnesses.

6 AWARDING THE CONTRACT

When awarding the contract the lowest quote should not simply be accepted. This may be a false economy. Check that the installation offered by the potential contractor fully meets the Operational Requirements and specification detailed in the tender documents. To procure an effective system the points detailed in the checklist below should be followed:

- a) An on site demonstration of the equipment proposed by the contractor should be demanded. This will allow its performance to be measured using the specified performance tests detailed in the Appendices.
- b) The demonstration should be undertaken during daylight and nighttime hours.
- c) A record of these demonstrations should be kept. This should be done using either a video printer or, preferably, by making a recording onto a suitable (VHS or SVHS) recorder.
- d) The tenderers' other customers should be contacted to see if they are satisfied.
- e) Other installations completed by the tenderers should be visited.
- f) Samples of documentation should be examined and the quality of training and support offered should be checked.
- g) The tenderers should be checked with any relevant trade association to ensure that they meet standards, regulations and trade codes of practice.

The tenders should be examined carefully for any exclusion clauses, e.g. the provision of appropriate power supplies and making good structures on which cameras are to be mounted. These can add considerably to the cost of an installation.

7 COMMISSIONING AND HAND-OVER

The completed installation should be checked electrically, mechanically, visually and using any agreed test procedures to ensure that:

- a) It conforms to the appropriate British Standards, current IEE Wiring Regulations, Electricity at Work Regulations 1989, conditions of the general safety certificate and any applicable codes of practice. Also that cabling in confined areas meets LSF (Low Smoke and Fume) standards.
- b) It meets any performance specifications agreed in the contract.

- c) It provides the agreed cover in all specified areas under the range of lighting conditions detailed in the contract. (Ideally checking performance under the full range of weather conditions to be encountered is desirable. Unfortunately this is usually impractical.)

Hand-over of the installation should not take place until it has been successfully commissioned. At hand-over the customer and any personnel who will operate the installation should be given a full demonstration of the system, including any user adjustments. Agreed tests of the installation's performance should be conducted, unless they were completed in the customer's presence during commissioning. The results of these should be compared with any recordings made when equipment was demonstrated at the tendering stage. Training should be provided for users and full documentation should be supplied. A procedure for calling assistance under the terms of the warranty, and any maintenance agreement in force should be explained. On completion of the hand-over, the customer should sign an acceptance certificate. This should only be done if the customer is totally satisfied with all aspects of the installation's performance.

8 DOCUMENTATION

The contractor should keep records detailing:

- a) The current specification of the installation including the type and location of each piece of equipment, its serial number and the manufacturer.
- b) A history of the installation recording the dates of routine servicing visits and emergency call-outs, the faults found and the actions taken on those occasions, as well as the date of any changes to the installation's configuration.
- c) The names, addresses and telephone numbers of representatives of the club and local police.

In addition the contractor should have copies of all the relevant equipment maintenance manuals.

The club should keep duplicate documentation provided by the contractor and maintain as fully as possible a record of the CCTV installation's current specification and maintenance history. The contractor should be obliged to provide this duplicate documentation which should be the property of the owner of the CCTV installation.

Ideally all documentation and records relating to CCTV could be held in one section or manual. This could be called a CCTV Information Folder; a checklist of what might be included can be found in Appendix F. Documenting each stage of the process is required to protect the commercial and contractual position of the parties concerned.

9 DATA PROTECTION ACT 1998²

The Data Protection Act (DPA) 1998 was introduced to protect further the individual rights of the public. CCTV systems are obliged to conform to the DPA and Human Rights Act. A brief checklist below has been written to relate to sports ground systems and help clubs initially think about what must be done before the installation begins to capture images of the public.

- a) Register system under DPA, on an annual basis, paying the current fee. Failure to register is a criminal offence.
- b) Appoint the Data Controller, this can be one person or the organisation (i.e. the club itself), and they will be legally responsible, although a personal contact name must be given.
- c) Appoint the Data Processors; people who have any input into the capture, evaluation or control of the data at any time over the cycle.
- d) Produce a code of practice for the system, should at least cover points summarised in Appendix G.
- e) Produce and display signage. These signs must state the correct information, be in the correct places (e.g. entrances to stadium) and of appropriate size.

For any CCTV system installed to monitor the public at stadium events and hence capture images, the Data Protection Act states that CCTV images must be:

- a) fairly and lawfully processed;
- b) processed for specific limited purposes and not in any manner incompatible with that purpose, (All purposes must be stated when registering the system, including 24hr security surveillance);
- c) adequate, relevant and not excessive;
- d) accurate;
- e) not kept longer than necessary (possibly a maximum of 28 days);
- f) processed in accordance with individual's rights;
- g) stored and locked away securely; and
- h) not transferred to countries without adequate protection.

The above is a summary of what is detailed in the DPA. It has been included to assist initial thought. Further information and guidance relating to the DPA can be found in Appendix G with the contact details for the Data Protection Office.

10 HUMAN RIGHTS ACT 1998³

In addition to the DPA the requirements of the Human Rights Act must be considered. The dominant issue of the Act, relating to CCTV, is in regard to

² NOTE: The DPA paraphrasing in this document is the view of the author. Precise guidance must be sought through either contact with the data protection registrar, the website or reading BS 7958: 1999.

³ The HRA contains the defining principles for the DPA. Hence if an installation complies with the DPA then the HRA need not be dealt with in detail.

Privacy zones. The Privacy zones should be identified at initial stages of the system design. These can then be dealt with by either terminating transmission or using physical stoppers attached to the camera housing so the camera cannot pan to positions that are irrelevant to public safety. This consideration is likely to be applicable to any installation close to residential property.

11 MONITOR VIEWING AND TAPE HANDLING

This section has relevance to effective monitoring and evidence handling. It provides an introduction to the issues and further guidance is strongly recommended.

What follows is a brief list of the ideal conditions for operators to monitor events. The points have been taken from the document by *E Wallace and C Diffley, CCTV: Making It Work, CCTV Control Room Ergonomics, 1998. PSDB Publication 14/98.*

- a) The maximum number of camera images per operator to work effectively should be 16 or fewer. Performance is reduced as the number of camera views is increased. Therefore 16 is the absolute maximum.
- b) Spot monitors should be positioned in front of the operator at approximately 0.5–1.5 metres and range in size from 9-16 inches across the diagonal.
- c) Monitors in a bank or array should be positioned at a greater distance from the operator and be larger in size, from 17-28 inches across the diagonal.

VHS or SVHS tapes should be in good condition in case they are be used for evidential purposes. However if the police can become end users of the tapes then they must be mentioned in the Code of Practice, along with procedures for handing over evidence. Listed below are the key points for handling videotape; these have been taken from the document by *D C Neil, P Mather and E C Brown, Guidance For The Handling Of Video Tape. 1998. PSDB Publication 21/98.*

The tapes should be:

- a) Used a maximum of 12 times;
- b) degaussed before every use;
- c) not left in the recorder;
- d) stored vertically in cases;
- e) not subject to large environmental changes or extreme conditions; and
- f) have a documented audit trail of who has handled the tapes.

12 MAINTENANCE

The overall maintenance of the system is the responsibility of the owners of the scheme, the football club. A recognised company must undertake the maintenance of the system; the company will have expertise in the field and have a contractual agreement with the club. The maintenance company is likely to be

the same company that installed the system. The company must adhere to the code of practice, and have a contract that is legally binding. The maintenance agreement must meet the conditions of the general safety certificate issued by the Local Authority. A certificate confirming that the system is in a satisfactory condition must be submitted to the Council at least once in every 12 months

Annual maintenance should guarantee the system meets the test and performance specifications. Also the CCTV coverage should within reason meet the original site plan and satisfy the Operation Requirement that went with it.

13 CONCLUSION

The steps detailed above should ensure that the requirement for the proposed CCTV system at any ground is well analysed, recorded and clearly stated. The process of producing an Operational Requirement with site plans and stating performance characteristics means that an effective tender document can be produced.

Following the steps up to tender stage and producing the required tender documents will allow potential contractors to submit tender offers on an equal footing and understand how their offer will be judged. Ideally, from a pool of tenders, the club is able to choose the contractor who offers best value and not necessarily the cheapest installation.

Setting the test and performance parameters not only allows fair competition for the contract but provides a mechanism for judging the completion of the work and monitoring the performance of the system over its lifetime. With an Operational Requirement, if the contractor fails to meet the realistic expectations of the club, then the contractor, under the contract, will need to undertake the necessary completion work until the expectations of the club are met.

If the procured system is to successfully monitor crowd densities at all times, then it is essential that planned and acceptable maintenance is undertaken. Good maintenance will maximise the lifetime and performance of the CCTV installation.

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15 CONTACT ORGANISATIONS

Local Authorities must be contacted, as planning permission must be approved for any installation. Local authorities have also had experience with or currently operate CCTV systems, therefore provide helpful advice. They will also need contacting when applying for a general safety certificate (if expected attendance is greater than 10,000). Current requirements should also be checked with Local Authorities.

Grant aid may be available for the installation and upgrade of CCTV equipment from the **Football Stadia Improvement Fund**.

The Football Stadia Improvement Fund
25 Soho Square
London
W1D 4FF
Telephone 020 7534 4210
Fax 020 7287 0459
Email enquiries@footballfoundation.org.uk

To request PSDB publications contact,
Police Scientific Development Branch (PSDB)
Information Desk
Sandridge
St Albans
Hertfordshire
AL4 9HQ
Telephone 01727 816400

Appendix A: OPERATIONAL REQUIREMENTS

<p>CCTV Operational Requirements</p>	<p>'Check List' version 1.0</p>		<p><i>Type of Area</i></p>
<p>Ref Code</p>			
<p>Describe the area of interest in relation to the marked Site Plan;</p>			
<p>1: Target to be observed:</p>	<p>6: Result of a successful response to the activity:</p>	<p>11: What will the observer do when the activity occurs:</p>	<p>16: Stake-holders:</p>
<p>2: What activity by the target is of concern:</p>	<p>7: Who makes the response:</p>	<p>12: How will observer know when and where to look:</p>	<p>17: What priority is assigned to this task:</p>
<p>3: Purpose of the observation:</p>	<p>8: Time scale of the response for it to be successful:</p>	<p>13: How quickly does the observer need to act:</p>	<p>18: Likelihood of an activity occurring and how often:</p>
<p>4: Picture quality/content factors needed to achieve success:</p>	<p>9: When is observation needed:</p>	<p>14: Who makes the observation on which the response is based:</p>	<p>19: How effectively does the task have to be done:</p>
<p>5: Spare</p>	<p>10: Conditions under which the system needs to be effective:</p>	<p>15: Where will the observations take place:</p>	<p>20: Benefits of doing the action over not doing it:</p>

Appendix B **ASSESSING LIGHTING LEVELS**

Poor lighting is a major factor contributing to poor quality images from cameras. It is not always the result of insufficient lighting, as poor images can be a result of large intensities of light in the scene. Therefore it is essential that lighting levels be recorded around the ground to establish where the cameras can be *suitably placed* so that similar images seen during the day are seen at night. The following procedures have been written to help whoever undertakes the light assessment to complete it correctly. Contractors may have their own procedures, although it is still important that the club representative knows what is involved.

1. Using a suitable illuminance meter giving readings in Lux; stand in the area where the light level is to be measured. Hold the light meter at head height facing the likely or known position of the CCTV camera. If there is uncertainty as to the position of the CCTV camera, take readings facing each likely position.
2. Using the meter according to the manufacturer's instruction, take a reading. Record the reading on a ground plan showing the direction the meter was facing.
3. Most areas of interest will be lit by a range of lighting going from full daylight down to a low level of artificial light. There is no need to measure the daylight. This type of lighting is well quantified.
4. Lux levels should be measured at suitable times so the values before and after flood lighting turn-on can be recorded.
5. In addition to the amount of light, the type of light must be defined. It will either be daylight, artificial light or a mixture of both. There are a variety of different types of artificial lighting and the exact type will have to be recorded, e.g. Tungsten Halogen, Low or High Pressure Sodium lighting or others.
6. The lighting assessment entry on the ground plan for any point should appear as below;

80 lux, with Tungsten Halogen

This text should appear next to a mark indicating the measuring point and there should be an arrow indicating the orientation of the meter.

The five main areas of lighting within and around a stadium are stand, concourse, pitch/field, entrance/exit and ground perimeter lighting. These should all provide a level of illumination, which is sufficient to allow the CCTV system to function satisfactorily. There are several problems that can arise from these lighting applications, therefore camera position and scene illumination are very important.

Appendix C TESTING AND AUDITING OF THE SYSTEM

Resolution Testing

1. A Rotakin⁴ test target is required to make measurements of resolution. In addition, a method of recording the results is required. This should be done by producing a written record of the test results using the record sheet and making a video recording using a SVHS format video recorder or better.

Record sheet:

Camera number and location:

Weather:

Lighting level and type:

Person conducting test:

Representing:

Date:

2. Set the Rotakin up in the area of interest so that it faces the relevant CCTV camera and is as near as practically possible at 90° to the optical axis (centre of the line-of-sight) of the camera.
3. Align the target vertically and zoom in so that from the tip of one head to the tip of the other occupies the full picture height (100% of picture height). With the target static and imaged in this way the resolution can be read from the scale printed on it. The lines up to resolution scale F should be discernible. **This corresponds to a resolution of 250 lines per picture height. This is the minimum acceptable resolution at the viewing monitor for any system to be used at a football ground.** A picture and accompanying resolution table of Rotakin follows on page 16.

Image Size and Coverage Tests

1. These tests should be conducted with a Rotakin, the results recorded on a ground plan and a video recording made with a SVHS recorder or better. Record the weather conditions, light levels and type. This coverage test should be completed for both the best and worst case lighting conditions and allowance made for the weather.
2. To perform the image size test follow part 2 of resolution testing.
3. Zoom in with the chosen camera. Note how much of the picture height the Rotakin Test target occupies. This should be measured from the tip of one head to the tip of the other and expressed as a percentage of the total picture height.
4. With the static resolution of the system meeting the minimum requirement of 250 lines per picture height, the Rotakin target will need to occupy 120% of picture height on a monitor with no overscan. This is the minimum image size requirement for all critical areas. An image of this size will allow facial expression to be discerned, and identification should be possible from the

⁴ Rotakins are supplied by: Beard & Fitch Ltd, Crammond Park, Lovet Road, Harlow, Essex CM19 5TF

monitor assuming all the other test criteria are met. If the recording system or equipment used to produce stills also meets the minimum static resolution criterion, then identifiable results should be achievable.

5. With the Rotakin test target reproduced down to 50% of picture height events will still be discernable and individuals should remain recognised assuming the CCTV system fully meets the other test criteria. At this level the movement of groups and individuals will still be discernible but expressions of distress will not. Incidents viewed at this level of magnification will generally require closer inspection.
6. The image size test can be conveniently conducted in conjunction with a coverage test. Indeed all the test procedures described in Appendix B-D could be combined.
7. The coverage test can be carried out by placing Rotakin anywhere within the defined area and confirming that it is clearly visible on the appropriate monitor in the control room. These tests should be carried out in as many locations as possible to ensure there are no unknown or unacceptable blind spots. The results should be marked on the ground plan.

Figure 1: The Rotakin CCTV Test Target Panel

Table 1: Principal dimensions

	Dimensions (mm)
Overall height	1600
Overall width	400
Body height	1000
Head height	300
Head width	200

Notes:

The shape of the neck-joining head to torso is arbitrary but must not exceed the maximum head width.

The torso corners are rounded for safety to users.

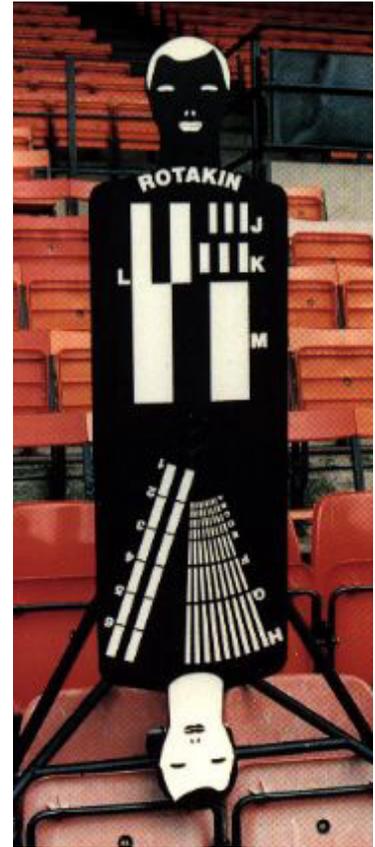


Table 2: Scale dimensions

Marking reference	Width of line pair (mm/cycle)	TV lines/picture height (625 line system) when the target occupies given % screen height			
		100%R	50%R	25%R	10%R
A	6.4	500	1000	2500	5000
B	7.1	450	900	1800	4500
C	8.0	400	800	1600	4000
D	9.1	350	700	1400	3500
E	10.1	300	600	1200	3000
F	12.8	250	500	1000	2500
G	16.0	200	400	800	2000
H	21.3	150	300	600	1500
I	32.0	100	200	400	1000
J	40.0	80	160	320	800
K	80.0	40	80	160	400
L	160.0	20	40	80	200

Note: The term ‘%R’ refers to the percentage screen height occupied by the target.

Appendix D TESTING OPERATOR RESPONSE TIME

1. This test can be combined with the other tests. A Rotakin and stopwatch are required. The test should be recorded on SVHS or better and notes taken. This test should be completed for the best and worst case lighting conditions and allowances made for the weather conditions.
2. This test is intended to measure the worst target acquisition time. This will generally occur when the camera under test has the greatest distance to travel. This will normally be a movement from the extreme right or left of the front of the area covered to the opposite right or left extreme at the rear of the area covered.
3. Set up a Rotakin at the front edge of the area covered on the extreme right or left. Zoom in and focus the camera to produce an image in which the Rotakin is as large as possible. Leave the Rotakin in this position and move the camera to the opposite rear extreme so that the distance travelled by the camera is maximised. Ask the camera operator to start looking for the Rotakin at a given start signal. Measure the time taken to acquire the target and produce an accurately focused image of it where the Rotakin occupies 120% of picture height or, where this not possible, the largest image that can be produced.
4. It should be clear when timing should start and stop. A response time less than the agreed figure is a pass; a greater one is a failure.
5. If the operator needs to carry out actions independently of the CCTV system under test, then the duration of these actions should be included in the Overall System Response Time.

The ORT is heavily dependent on the speed of the pan and tilt operations. These can vary from 1° - 180° per second and should be set according to the performance specification requirements.

Appendix E ITEMS FOR INCLUSION IN THE SPECIFICATION OF A CCTV INSTALLATION

1. Annotated map showing the areas to be covered by CCTV and indicating the type of image required in each area:
 - a) Colour or monochrome.
 - b) Size of the subject on the viewing screen, specified when lens is at maximum and minimum zoom (Note: what are the effects of maximum zoom and strong winds).
 - c) Maximum and minimum viewing angles of the cameras, these could be restricted if cameras are positioned high in stand (Note: Will the operator see what needs to be seen?).

2. Lighting in the areas to be covered by CCTV:
 - a) Type of lighting, e.g. daylight, tungsten or high-pressure sodium.
 - b) Existing lighting levels in lux.
 - c) Areas requiring additional lighting. (When tendering, contractors may wish to specify additional lighting in some areas. They should be given the freedom to do this.)

3. Performance parameters for the installation:
 - a) The minimum size of the subject in the final image as a percentage of picture height.
 - b) The minimum static resolution.
 - c) Grey scale or colour performance.
 - d) The maximum target acquisition time.

These should all be specified for each CCTV camera scene in the installation. The test procedures to be used when measuring these parameters should be stated.

4. The video signal, transmission, control, recording and display equipment:
 - a) The video signal should be CCIR specification.
 - b) The transmission method should provide the required data rate for the number of cameras communicating through it. The transmission path should have acceptable signal degradation and noise immunity. The transmission method might be hardwire or wireless (If wireless then licenses may apply).
 - c) Recording methods should be chosen to obtain the required amount of data. The question of how often a recording of an image from each camera per second is required must be answered. The transmission method, recording method, number of cameras per recorder and the intervals between recordings will dictate the answer to the question.
 - d) Digital or Analogue. Recording images onto a hard disc or recording onto a VHS/SVHS recorder respectively. For guidance on digital recording refer to document mentioned in Bibliography page 9.

- e) Overscanning with monitors should not exceed 10%. The operator viewing distance should determine the monitor size. Generally the distance from the monitor should be approximately 6 times that of the monitor diagonal.
- f) In addition monitors should be sited to avoid reflections from windows and other brightly lit objects, shielded from bright lighting and placed so operators are not distracted.

More information relating to stadium control room design, staff training, ergonomics and recruitment can be found from the documents mentioned in the Bibliography.

5. The range of weather conditions encountered by the installation and those in which it must operate:

- a) Air temperature, normally -10° to $+ 50^{\circ}\text{C}$ for externally sited equipment.
- b) In which seasons of the year should the system perform as originally specified.
- c) Wind speeds encountered.
- d) Where equipment is exposed it must meet IP65.
- e) Remember that a wash/wipe system may be required on camera housings (These can be difficult to obtain for Dome cameras).
- f) Also thermostatically controlled heaters are required in the camera housing to reduce condensation.

6. Constraints on the positioning and installation of equipment:

- a) Planning permission must be approved from the local authority through consultation.
- b) Adequate access should be provided to the equipment for maintenance purposes. Wherever towers are used they should be of a tilting or telescopic design, if possible.
- c) Before installing towers or brackets the effects of electrical interference and the possibility of lightning damage should be considered. BS 6651: 1999 refers.
- d) Cameras should be sited with regards for the privacy of local people, addressed as part of the Human Rights Act.
- e) All equipment should be installed in accordance with the manufacturer's instructions and with due regard for safety.
- f) All wiring must comply with IEE Regulations as stated in the Commissioning process.

Appendix F DOCUMENTATION

A CCTV Information Folder might include the following:

1. Operational Requirement.
2. Performance Specification.
3. CCTV Site Plan - map of stadium marked with the areas intended to be covered, camera locations, levels of monitoring and any other relevant information.
4. Camera Plans – details of individual cameras, e.g. horizontal and vertical fields of view.
5. System diagram – to show how the elements of the system are connected.
6. Equipment Inventory.
7. Literature – manufacturers’ literature and handbooks.
8. Test Results – results of any previous tests.
9. System Notes - -written record of points of interest.
10. Test Aids.
11. Installation Record – e.g. a record of changes made to the operational requirement, specification, etc.
12. Maintenance Log – a chronological record of maintenance activities which may affect system performance.
13. Code of Practice – to cover DPA, sees Appendix G.
14. Miscellaneous – any other relevant information.

The above list is taken from *‘Performance Testing of CCTV perimeter Surveillance Systems – J Aldridge and Sqn Ldr C Gilbert RAF’, PSDB publication No. 14/95*. This document details many of the points covered in this document and can be acquired through PSDB.

Appendix G DATA PROTECTION ACT AND CODE OF PRACTICE

All information relating to the Data Protection Act can be obtained through the contact details below:

Office of the Data Protection Registrar

Wycliffe House
Water Lane
Wilmslow
Cheshire
SK9 5AF
01625 545745

www.dataprotection.gov.uk/

Or call the Data Commissioner's Office on 01625 545700

Code of Practice

BS 7958:1999, Closed-circuit television (CCTV) – Management and operation – Code of practice is available from the British Standards Institute. It is designed to supplement the legislation (DPA and HRA) in a model code that ensures fairness, purpose and accountability.

The code of practice is part of the development of the system. It ensures that the system is operated in accordance with the owner's wishes and requirements. It aids operators to undertake tasks efficiently, effectively and lawfully, following a set of procedures. The code of practice should be introduced and implemented before any operational use. The checklist below details the information that should be included in any code of practice. NOTE: The list should not solely be used for implementing a code of practice and guidance should be sought from BS 7958: 1999, the data protection registrar or from the website.

1. Introduction of the system.
2. Key objectives of the system.
3. What the system consists of.
4. Use of the system and the purposes.
5. Management, stating the data controller, data processors and contact name.
6. System Evaluation.
7. Data Protection Act.
8. Procedures.
9. Ownership.

Appendix H KEY STAGES CHECKLIST FOR PROCUREMENT

The following are key stages in the procurement process (taken from the PSDB publication 14/95):

1. Develop the Operational Requirement (OR).
2. Define the System's Performance Specification.
3. Outline the test specification.
4. Issue an Invitation To Tender to design the system, against the operational requirement and performance specification.
5. Select and place a contract for the design that best meets the OR and the performance specification.
6. Agree the designer's technical specification.
7. Install the system.
8. Commission the system against the test specification.
9. Accept the system including test and analysis of results.
10. Operate and maintain the system.
11. Conduct routine auditing.

Appendix I REFERENCES

The following have been used as references in this document.

1. Data Protection Act 1984 and 1998.
2. Aldridge, J., CCTV Operational Requirements Manual, 1994. PSDB Publication 17/94, ISBN 185893 3358.
3. Aldridge, J. and Sqn Ldr C Gilbert RAF, Performance Testing of CCTV perimeter Surveillance Systems, 1995. PSDB Publication 14/95.
4. A. J. Ford, Guidance Notes For The Procurement Of CCTV For Public Safety At Football Grounds, 1990. PSDB Publication 4/90.
5. D C Neil, P Mather and E C Brown, Guidance For The Handling Of Video Tape. 1998. PSDB Publication 21/98.
6. E Wallace and C Diffley, CCTV: Making It Work, CCTV Control Room Ergonomics, 1998. PSDB Publication 14/98.

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