BS 8590:2014

BSI Standards Publication

Code of practice for the installation of audio visual equipment

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 12, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 January 2014. It was prepared by Technical Committee EPL/100, *Audio, video and multimedia systems and equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes PAS 122:2009, which is withdrawn.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- the scope of the document has been broadened to cover all audio visual installations in all market sectors;
- the scope has been refined to focus on installation;
- the text has been updated to take account of current market conditions and changes in technology.

This British Standard provides recommendations for the installation of audio visual (AV) equipment. It is intended for AV and electrical installers to enable them to ensure the quality and standard of installations.

Use of this document

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This British Standard gives recommendations for the installation of audio visual (AV) systems and equipment at site survey, design, installation and commissioning stages.

NOTE Information on installing sound systems can be found in BS 6259. Information on installing induction loop systems can be found in BS 7594.

It does not give recommendations for the training of installation technicians. It does not cover the specification of individual components nor their performance as an installed system.

It is applicable to installations including a significant AV component, such as, but not limited to, computers, projectors, whiteboards, large format displays, monitors, loudspeakers (both wall and ceiling mounted) and light arrays.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS 1129, *Specification for portable timber ladders, steps, trestles and lightweight stagings*

BS 2037, *Specification for portable aluminium ladders, steps, trestles and lightweight stagings*

BS 5499-10, *Safety signs, including fire safety signs – Part 10: Code of practice for the use of safety signs, including fire safety signs*

BS 7594, *Code of practice for audio-frequency induction-loop systems (AFILS)*

BS 7671, *Requirements for electrical installations. IET Wiring Regulations*

BS 8437, *Code of practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace*

BS EN 131-1, *Ladders – Part 1: Terms, types, functional sizes*

BS EN 60065, *Audio, video and similar electronic apparatus – Safety requirements*

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

PAS 250, *Low-level work platform with one working platform with side protection for use by one person with a maximum working platform height of less than 2.5 m – Specification*

Other publications

[N1] THE INSTITUTION OF ENGINEERING AND TECHNOLOGY. *Code of Practice for In-service Inspection and Testing of Electrical Equipment (4th edition)*. London: The IET, 2012

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 audio
pertaining to delivery of sound, or equipment for the delivery or processing of sound

3.2 ceiling mounted equipment
equipment mounted on the ceiling structure using an adapter bracket, or on beams or other load bearing structures using appropriate bracketry

NOTE In high ceiling installations a suspension column is normally employed to suspend the equipment at the correct height.

3.3 dutyholder
person responsible for the operational management of a building

3.4 equipment
all components to be installed which make up the audio visual system

3.5 floor mounted equipment
equipment mounted on a wheeled trolley (cart) or static stand, which might be fixed to the floor structure

NOTE There are circumstances where floor and ceiling/floor and wall mounting is used in combination, i.e. fixed to the floor and fixed to the ceiling or a wall as a continuous mounting assembly. AV equipment can also be mounted on desks or tables.

3.6 method statement
document prepared by an organization that describes in a logical sequence exactly how a work activity is to be carried out in a manner which is safe and without risks to health

3.7 risk assessment
process of hazard identification and evaluation to enable steps to be taken to control the risks that might arise from such hazards

3.8 site manufactured
structure, mounting system or other assembly designed and constructed from materials or components available to the installer on the job site

3.9 wall mounted equipment
equipment mounted directly on a wall or via an adapter bracket or a bracket designed to stand the equipment off the wall

4 Health and safety

4.1 General

The installer should work in close co-operation with the dutyholder, other contractors and any visitors to the site to ensure the health and safety of all personnel and visitors.

NOTE 1 Attention is drawn to Regulation 3 of the Management of Health and Safety at Work Regulations 1999 [1].

The installation company should have a documented health and safety policy which is the core document from which safe systems of work should be developed.

NOTE 2 Attention is drawn to the following regulations and guidance:

- *The Management of Health and Safety at Work Regulations 1999 [1];*
- *The Personal Protective Equipment at Work Regulations 1992 (as amended) [2];*
- *The Provision and Use of Work Equipment Regulations 1998 [3];*
- *HSG 65 Successful Health and Safety Management 1997 [4].*

4.2 Working at height

4.2.1 When working at height, personnel should operate in accordance with BS 8437.

NOTE Attention is drawn to the Work at Height Regulations 2005, as amended [5].

4.2.2 Where ladders are used, the ladders should conform to BS 2037, BS 1129 or BS EN 131-1.

4.2.3 Where platforms are used, HSE guidelines should be adhered to.

NOTE Guidance on working at height is available from the HSE website. [1)]

4.2.4 Where low level platforms are used, the platforms should conform to PAS 250.

4.3 Asbestos

Any parts of the building or site likely to be disturbed by the installation work should be checked for asbestos prior to any works being carried out. This should be carried out by the installer and the dutyholder of the building.

NOTE 1 Attention is drawn to the Control of Asbestos at Work Regulations 2012 [6].

NOTE 2 Guidance on managing asbestos is available from the HSE website. [2)]

4.4 Electrical safety

All electrical installations should conform to BS 7671.

4.5 Hazards

Where a hazardous area is created during the installation, a risk assessment should be carried out to ascertain whether the area should be sectioned off and identified with signage. Safety signs should be used in accordance with BS 5499-10.

5 Pre-installation

5.1 General

The AV system specifier should have early and fully inclusive involvement with the construction and/or fit-out design team.

1) Available from <http://www.hse.gov.uk/falls/index.htm> [last viewed 16 January 2014].
2) Available from <http://www.hse.gov.uk/asbestos/index.htm> [last viewed 16 January 2014].

5.2 Site survey

A pre-installation site survey should be carried out to collect and record information for the design and planning of the installation. The site survey should be carried out by a person or persons experienced in the siting and installation of audio visual devices. During the survey, a review of the product selection should be carried out in relation to the environment where the equipment is to be installed. Detailed measurements, dimensions and angles should be recorded and any existing cabling (where applicable) should be noted and any recommendations for alteration to aid the installation of the equipment made. The survey should also identify any areas of concern, any hazards or where specialist tools or techniques might be needed to complete the installation.

NOTE A sample site survey form is given in Annex A.

5.3 Risk assessment of works to be carried out

A risk assessment should be carried out prior to any work commencing. All risk assessments should be completed in accordance with the HSE risk assessment guidelines.

NOTE 1 Guidance on risk assessments is available from the HSE website. [3)]

NOTE 2 See the HSE Five Steps to Risk Assessment *leaflet [7] which includes the following instructions:*

- *identify the hazards;*
- *decide who might be harmed and how;*
- *evaluate the risks and decide on precaution;*
- *record your findings and implement them;*
- *review your assessment and update if necessary.*

During the risk assessment, observations should be made to define the PPE (personal protective equipment) requirements.

NOTE 3 Attention is drawn to the Personal Protective Equipment at Work Regulations 1992 (as amended) [2].

The intended location for the AV equipment should be checked for its suitability to deal with any peak loading that could occur, focusing on the wall and ceiling fixings and brackets to be used (see **6.4**).

NOTE 4 Attention is drawn to the Health and Safety at Work etc. Act 1974 [8].

5.4 Information for other parties

The installer should formally notify the customer(s) of any actions that need to be carried out by others prior to the AV system installation being carried out.

6 Installation

6.1 General

All equipment should be installed plumb and level unless otherwise specified by the customer.

Equipment should be installed in such a way as to allow reasonable access for future maintenance and servicing.

3) Available from <http://www.hse.gov.uk/risk/risk-assessment.htm> [last viewed 16 January 2014].

NOTE Attention is drawn to the Building Regulations [9] [10] [11], with respect to any equipment installed in a space used for airflow as part of a building ventilation system (plenum space).

6.2 Cabling and containment

The cabling used should conform to the manufacturer's specification of the devices the cabling is intended to connect.

NOTE Such specifications might include conductor size, crosstalk or bandwidth requirements or specific shielding capabilies.

The cabling should be in appropriate containment, ensuring electrical segregation, isolation from EMF or RFI elements, and mechanical protection where appropriate. Where closed containment is used, sufficient space should be allowed for cable replacement or for additional cable to be installed.

Cabling should not be loose laid above ceilings. Cabling in these areas should be restrained using clips or traywork.

Cabling under raised floors should be laid in such a way to avoid damage from rough surfaces.

Cabling should be installed in accordance with the manufacturer's specification, including bend radii, manner of termination and method of restraint and suspension.

Provision should be made for cable management for cable connected to equipment which will be moved either during normal operation or for servicing and maintenance.

Installers who are specifically installing structured cabling should be competent to do so.

The cable installation should conform to ISO/IEC 11801.

6.3 Cable identification

All cables should be clearly identifiable.

Where multiple cables of the same type are used, both ends should be clearly labelled with a unique identifier, referenced by the project documentation.

Labels should be clearly visible with minimal disturbance of surrounding cables and apparatus.

6.4 Fixings and brackets

6.4.1 General

Where possible, the fixings used to attach the equipment to the means of mounting should be that provided with the equipment, or should be as specified in the equipment manufacturer's instructions.

Where site manufactured mounting structures (e.g. metal framing and cable management assemblies) are employed, structural integrity and loading of equipment should be taken into account.

All fixings utilized should be appropriate for the location of fixing and should support the load, including the safety factor (see **6.4.2**).

A structural engineer or architect should be consulted where clarification is needed.

6.4.2 Safety factor

All mounting systems and fixings should be capable of supporting the combined mass of the complete mounting assembly and all equipment attached. Any extraneous loads identified in the risk assessment (peak loads) should also be taken into account and this value should be agreed with the client.

When calculating perpendicular loads a safety factor of 5 should be applied (the 5:1 rule). Peak loads identified in the risk assessment might be considerably more than the values calculated using the 5:1 rule and should be taken into account when choosing the mounting system and fixings.

NOTE Attention is drawn to the Construction (Design and Management) Regulations 2007 [12].

6.4.3 Floor mounted equipment

Freestanding equipment should be stable when in use. The possibility of extra loading due to individuals applying force to the equipment should be taken into account. Equipment that can be relocated should be stable during relocation.

Freestanding trolleys and stands should have been subjected to and passed a recognized static load balance test by the manufacturer in accordance with BS EN 60065.

The equipment supplied by the installer should have been tested by the manufacturer to ensure it is fit for purpose.

Where information regarding testing is not available (for example where the customer has provided an existing legacy trolley or stand), the installer should notify the customer that the installation has not been subjected to a static load test. If the installer is of the opinion that the installation might be unsafe, the installation should not be completed. The installation should be made safe and the customer notified.

Specified limits stated on equipment (such as size and weight) should not be exceeded, and only equipment or fixing methods approved by the manufacturer should be used to secure any part of the equipment being installed.

Where equipment is installed on a generic trolley or stand that is not supplied with fixings for that equipment, the equipment should be secured in place to prevent it from toppling or falling in the event the equipment is moved/knocked or any leads/cables are pulled.

NOTE This could be accomplished through the use of bespoke mounting brackets, tethers, cable clamps, etc.

6.4.4 Wall mounted equipment

The wall structure should be strong enough to support the load. If the wall structure is deemed incapable of supporting the load imposed upon it, either the wall should be strengthened and/or stabilized or an alternative method of mounting should be adopted, i.e. floor or ceiling suspension.

If the equipment is mounted away from the wall on an arm or extended bracket, the increased forces imposed on the fixings and wall and the potential need to provide secondary support or bracing should be taken into account.

The installer should inform the customer in writing of any concerns about the structure that the equipment is to be mounted on. If the installer thinks that the structure might become unsafe, the work should not be attempted.

6.4.5 Ceiling mounted equipment

Any structure, i.e. concrete ceilings, beams, purlins, should be capable of supporting the load with any safety factors applied.

Where equipment is ceiling suspended in a public area, the minimum height should be 2.1 m to the underside of the equipment.

NOTE Where suspension columns or other means are employed to bring the equipment to the required installation height there are circumstances, especially with large screens, where airflow or other forces can impose horizontal loads on suspended equipment to the detriment of the fixings into the ceiling structure.

The correct choice of ceiling mount and/or use of secondary bracing should be implemented.

6.4.6 Wall and ceiling mount safety requirements

The mounting means should be capable of supporting the load and should satisfy the safety requirements of BS EN 60065.

6.5 Structural considerations

*COMMENTARY ON **6.5***

Attention is drawn to the Building Regulations [9] [10] [11].

Any equipment should be affixed to the fabric of the building and not to any false or suspended ceilings unless the product has been specifically designed for that application or a secondary mechanism has been installed to take the load.

Any alteration to the fabric of the building which creates an aperture in a fire break should be made good to maintain the fire rating of the structure.

The installer should not drill into structural beams. A specific clamping mount should be used.

Advice should be sought from a structural engineer or architect where a non-standard mounting is required.

6.6 Electrical considerations

Any alteration or addition to the fixed electrical wiring of a building should be carried out in accordance with BS 7671 by a suitably qualified and experienced person.

If extension leads are required, proprietary manufactured extension leads should be used. If these are unavailable, site manufactured leads should be constructed. Any site manufactured extension lead should receive, prior to its initial use, an inspection and test for a Class 1 piece of equipment in accordance with the *IET Code of Practice for In-service Inspection and Testing of Electrical Equipment* [N1].

NOTE Attention is drawn to the Electricity at Work Regulations 1989 [13].

Any cable(s) carrying a data signal should be segregated from any power cable(s) unless it can be clearly demonstrated that there is no interference between them.

An isolation switch should be installed to stop the power flow to any device not reachable without the need for steps, etc. The isolation switch should be easily accessible and clearly labelled.

6.7 Ventilation considerations

Sufficient ventilation for heat dissipation should be provided for all installed equipment that generates heat, in accordance with manufacturers' specifications.

The need for thermal management of multiple items of equipment which generate heat installed in close proximity to one another should be taken into account to ensure that under maximum load conditions no individual item of equipment exceeds the maximum operating temperature defined by the manufacturer.

The total heat output of all equipment within an enclosed space in relation to the heat management system provided for the space should be taken into account.

7 Post installation

7.1 General

The installer should carry out a full test and commissioning of the systems installed.

7.2 Commissioning

A full visual inspection of the installation should be carried out. All documented functions of the system should be tested to check for correct performance in accordance with the design specification; this includes checks that the accessible inputs and outputs of the system, on wall plates and elsewhere, function correctly.

7.3 Sign off

The customer should be given a full set of product instruction manuals, a record of any specific device settings (such as IP addresses), a full set of accurate "As Built" drawings for the system, and electronic copies of any software files, such as those for control systems, DSP configuration, etc.

NOTE A sample post-installation document is given in Annex B.

7.4 Audit trail

An archive of site works and documentation should be kept by the installation company. All serial numbers should be recorded by the installation team and a copy of this made available to the customer on completion of installation.

Annex A (informative) Site survey sample documentation

*COMMENTARY ON **ANNEX A***

The documentation shown in this Annex is a sample only and is given for illustrative purposes.

An example of a site survey document is given in Table A.1.

Table A.1 **Example of a site survey document**

Site details	
Customer:	Site:
Tel:	Tel:
Fax:	Fax:
Email:	Email:
Contact:	Contact:
Survey date:	Install date:
General	
Is the equipment to be installed available?	
Is asbestos present/register checked?	
Parking available/space allocated?	
Access times, any restrictions (noise, etc.)	
Agreed height to underside of projector/large format display/monitor, etc.	
Agreed height to top of whiteboard/large format display/monitor, etc.	
Room ceiling height details	
Finished floor to ceiling, m	
Finished floor to girder joist, m	
Finished floor to false ceiling, m	
False ceiling void, m	
Slab to finished floor, m	
Room/area details	
Height, m	
Width, m	
Length, m	
Type of ceiling (e.g. concrete slab suspended)	
Possible obstructions (e.g. ducts, pipes, cables)	
Type of floor (e.g. concrete slab or wood)	
Possible obstructions (e.g. ducts, pipes, cables)	
Type of wall (e.g. solid brick, plastered, dry lined)	
Type of bracket required	
Power required and supplied by others?	
Note any jobs required to be carried out by the customer prior to installation.	
NOTE This can include relocation or protection of furniture or fixed items in the room as well as works by other trades (Electrical, building, IT and Datacoms, etc.)	
Sketch of floor plan showing location of projector, interactive board, face plate, large format display, monitor, etc. and any cabling	

Annex B (informative) Post-installation sample documentation

*COMMENTARY ON **ANNEX B***

The documentation shown in this Annex is a sample only and is given for illustrative purposes.

An example of a post-installation document is given in Table B.1.

Table B.1 **Example of a post-installation document**

Room sign off and completion report

Address of installation
Room
Date

Audio visual equipment installation	**Yes**	**n/a**
Device installed securely		
Use of appropriate brackets and fixings		
Device at correct height, in accordance with customer requirements		
Appropriate mains power supply provided and connected in accordance with BS 7671		
Additional equipment – control, signal and distribution		
Appropriate power supply		
Ventilation		
Access		
Cable installation		
Cables segregated correctly		
Cables clearly identifiable		
Testing		
All brackets and fixings secure		
System powers up correctly		
Image clear and in sync		
Audio clean and free of any interference/distortion		
Controls and switching function as required		
All interactive displays operating correctly		
Radio systems functioning correctly		
System shuts down correctly		

Serial numbers of key equipment

Room sign off and completion report	**Yes**	**n/a**
Area of installation clean and tidy and left as found		
All maintainable/serviceable equipment installed with adequate access		
Screen surface and image free from defects		
Device software/documentation/remote control/accessories/cables (if any) handed over to customer		
Faceplate inputs correctly labelled and terminated		
System demonstrated in full to customer		

Technician comments **Customer comments**

Signature:	Signature:
Print name:	Print name:
Position:	Position:
Date:	Date:

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 6259, *Code of practice for the design, planning, installation, testing and maintenance of sound systems*

Other publications

[1] GREAT BRITAIN. The Management of Health and Safety at Work Regulations 1999. London: The Stationery Office.

[2] GREAT BRITAIN. The Personal Protective Equipment at Work Regulations 1992 (as amended). London: The Stationery Office.

[3] GREAT BRITAIN. The Provision and Use of Work Equipment Regulations 1998. London: The Stationery Office.

[4] HEALTH AND SAFETY EXECUTIVE. *Successful Health and Safety Management.* HSG 65. London: HSE Books, 1997.

[5] GREAT BRITAIN. The Work at Height Regulations 2005 (as amended). London: The Stationery Office.

[6] GREAT BRITAIN. The Control of Asbestos at Work Regulations 2012. London: The Stationery Office.

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[9] GREAT BRITAIN. The Building Regulations 2010 (England and Wales), as amended. London: The Stationery Office.

[10] SCOTLAND. The Building (Scotland) Regulations 2004, as amended. Edinburgh: The Stationery Office.

[11] GREAT BRITAIN. The Building Regulations (Northern Ireland) 2012, as amended. Belfast: The Stationery Office.

[12] GREAT BRITAIN. The Construction (Design and Management) Regulations 2007. London: The Stationery Office.

[13] GREAT BRITAIN. The Electricity at Work Regulations 1989. London: The Stationery Office.

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