



BS 6701 : Part 1 : 1990

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British Standard Code of practice for
Installation of apparatus intended for
connection to certain
telecommunication systems
Part 1. General recommendations

Code de bonne pratique pour l'installation des appareils destinés à être reliés à certains
systèmes de télécommunications
Partie 1. Règles générales

Leitfaden für den Einbau von Geräten zum Anschluß an bestimmte Fernmeldeanlagen
Teil 1. Allgemeine Anforderungen

Foreword

This British Standard has been prepared under the direction of the Telecommunications Standards Policy Committee. It is complementary to a series of British Standards that is being produced following the commencement of liberalization in October 1981 of the supply of certain telecommunication apparatus within the United Kingdom. It supersedes BS 6701 : Part 1 : 1986 which is withdrawn.

The series of standards includes product specifications giving particular requirements for individual items of apparatus together with standards covering general requirements for the connection of apparatus to the various systems of network operators.

The Secretary of State may stipulate certain recommendations of this standard as mandatory requirements for installation of some products which are to be connected directly or indirectly to the public telecommunication system under Section 22(6) of the Telecommunications Act 1984 and the relevant mandatory requirements will be listed by the Secretary of State together with the designation of the appropriate product standard.

Information on regulatory matters may be obtained from the Office of Telecommunications (OFTEL).

A number of reserved rights with respect to connection of apparatus are retained by public telecommunication operators, details of which will be included in appropriate Parts of BS 6701.

Whilst every effort has been made to highlight certain specific aspects of safety in this standard, the Health and Safety at Work etc. Act 1974 imposes general duties on a wide range of persons including employers, the self-employed, manufacturers, suppliers and employees. In addition, other Acts and Regulations may specify particular requirements. Consequently it will be necessary to read this code of practice in conjunction with such legal requirements or guidance that may be relevant.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular, attention is drawn to the following:

- The Telecommunications Act 1984;
- Health and Safety at Work etc. Act 1974;
- The Companies Act 1948;
- The Electricity Supply Regulations, 1988 SI 1057.

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Code of practice

1 Scope

This British Standard makes recommendations for the installation (see note 1) of apparatus which is, or is to be, comprised in telecommunication systems other than public telecommunication systems. It does not cover those aspects of the installation of radio transmitters or receivers or antenna systems associated with them which are relevant to the emission or reception of radio frequency radiation by such apparatus. It does not cover the installation of apparatus which makes use of wiring serving to distribute electrical power for telecommunication purposes.

It makes recommendations for choice of accommodation and advises on structural design considerations.

Information and general recommendations for cabling and wiring are included in this Part of BS 6701 but it may be necessary to refer to other appropriate Parts of BS 6701 or other relevant British Standards for more detailed recommendations for cabling and wiring for installation of specific telecommunication apparatus.

The recommendations of this standard apply to the installation of apparatus for connection to telecommunication systems which may not be connected to any public telecommunication system, or which may be connected to one or more such systems including cases where there is connection to systems run by different telecommunication operators.

Appendix A gives recommendations for domestic and apparatus cleaning and appendix B gives details of accommodation redecoration, maintenance or alteration.

Appendix C gives general advice on certification of satisfactory installation but reference to other Parts of BS 6701 is necessary for appropriate specimen certificates.

Unless otherwise stated in this standard, voltages and currents are r.m.s. with a nominal frequency of 50 Hz.

NOTE 1. Although this standard is intended primarily for the installer of apparatus, it has been considered expedient to include, also, recommendations and advice directed towards the supplier of, user of and maintenance contractor for the apparatus and to designers and architects of buildings intended to house the apparatus.

NOTE 2. This code of practice does not in any way affect the BSI system for the registration of call routing apparatus maintainers.

NOTE 3. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Abbreviations and definitions

For the purposes of this Part of BS 6701 the following abbreviations and definitions apply.

2.1 Abbreviations

- 2.1.1 **BT.** British Telecommunications plc.
- 2.1.2 **FDP.** Floor distribution point.
- 2.1.3 **FE.** Functional earth.
- 2.1.4 **IDC.** Insulation displacement connection.
- 2.1.5 **NTP.** Network termination point.
- 2.1.6 **NTTA.** Network termination and test apparatus.

2.1.7 **PE.** Protective earth.

2.1.8 **ROEP.** Rise-of-earth-potential.

2.2 Definitions

NOTE. In other Parts of BS 6701 definitions may be added or amended to be more specific to those Parts.

2.2.1 aerial cable. A cable (2.2.3) suitable for use when suspended overhead in outdoor situations.

2.2.2 apparatus. One or more attachments that are, or are to be, connected to a telecommunication system (whether or not thereby comprised within that system).

2.2.3 cable. An assembly of insulated conductors contained within a common sheath or tube.

2.2.4 conductor. Substance or body that allows electric current to pass along it.

2.2.5 drop wire. A type of aerial cable used for the provision of overhead services to a building.

2.2.6 floor distribution point (FDP). A distribution point to serve telecommunications requirements of an area of floor space.

2.2.7 interconnection point. The point where a number of distribution cables are directly connected to one larger cable.

2.2.8 jointing chamber. A generic term for any structure giving access to any underground duct routes and/or cables (e.g. manhole, joint box).

2.2.9 line. Two or more conductors comprising an electrical circuit.

2.2.10 main earthing terminal. The terminal or bar provided for the connections of protective conductors, including equipotential bonding conductors and conductors for functional earthing, to the means of earthing, in accordance with the IEE Wiring Regulations (15th edition).

2.2.11 network. A means of providing telecommunications service by a system of interconnected elements.

NOTE. When the network is a public telecommunication system, the service is provided by a person other than a user.

2.2.12 network termination point (NTP). A point at which apparatus installed in accordance with this standard is to be connected to a network.

NOTE. Where the network is a public telecommunication system then the NTP is part of the network terminating and testing apparatus (NTTA) which is part of the public telecommunication system.

2.2.13 network termination and test apparatus (NTTA). Apparatus comprised in a public telecommunication system, providing means for the connection to that system of approved apparatus comprised in a non-public telecommunication system.

2.2.14 premises. Land or buildings (or part of a building) or both contained within a single continuous boundary, but excluding other premises contained therein, which is lawfully occupied by one legal person.

2.2.15 public telecommunication system. Any telecommunication system designated as a public telecommunication system by an order made under Section 9 of the Telecommunications Act 1984.



NOTE. For the purposes of this standard these systems may be run by British Telecommunications plc, Hull Telephone Department, Mercury Communications Limited and certain cable television distribution system operators.



2.2.16 second comer. The party whose plant when installed causes an intersection or proximity to come into being.

2.2.17 telecommunications. Branch of technology concerned with the communication of information over distances.

2.2.18 telecommunication system. One or more items of apparatus that together serve to convey information (such as sounds, visual images, text, or signals to actuate machinery) between points by means of cable, waveguide (including optical waveguide) or radio.

2.2.19 telecommunication distribution system. Assembly of conductors and associated connecting devices to allow interconnection (by electrical or other appropriate means) between any defined telecommunication terminal devices within the same premises, or between devices within the premises and any network(s).

2.2.20 user. The person by whom or on whose behalf apparatus is to be installed in accordance with this standard.

2.2.21 shared cabling. The use of a common cable in which circuits carry signals whose spectral characteristics may differ one from another necessarily and significantly, and which may be analogue, digital or low voltage in any mix.

3 Licence obligations

NOTE. Certain telecommunication systems are exempt from licensing by virtue of Section 6 of the Telecommunications Act 1984. All other systems may only be lawfully run in accordance with a licence granted under Section 7 of that Act. In many cases this will be a licence having general effect, such as the 'Class Licence for the Running of Branch Telecommunication Systems', but in other cases particular systems may be run under a licence granted specifically to the person running that system (an individual licence) or to a limited category of people described in the licence (a class licence).

3.1 Where the system to which installed apparatus is, or is to be, connected is not exempt from licensing under the Telecommunications Act 1984, the installer should ascertain from the user the licence under which the system is run, or is proposed to be run.

3.2 The installer and user should ensure that when installed apparatus is connected to the user's system there will be no breach of any condition or other requirement of the licence under which the system is, or is to be, run.

NOTE. The main conditions and requirements usually relate to the following:

- (a) the exclusive use of approved apparatus (where the system is connected to a public network);
- (b) location of apparatus on or close to certain premises;
- (c) provision of emergency telephones for the hearing-impaired;
- (d) arrangements for connection to public networks;
- (e) maintenance of call routing apparatus;
- (f) keeping of records (where the system includes call routing apparatus);

(g) limitations on interconnection between switched public networks and point-to-point circuits (private circuits) provided by public telecommunication operators;

(h) limitations on the use of private circuits to link systems run by people or bodies who are not part of the same group (in the sense of Section 154 of the Companies Act 1948);

(i) limitations on the services that may be provided to others by means of the system;

(j) fair competition and the rights of tenants etc.

4 Apparatus

4.1 System selection and design factors

Foreseeable telecommunications requirements over the planned life of the apparatus should be ascertained as accurately as possible by consultation between the user (or the user's agent) and the supplier.

Typically, the following factors should be considered:

- (a) types of apparatus, size and forecast growth;
- (b) date to be brought into service;
- (c) space and environmental factors specified by the supplier;
- (d) additional space and environmental requirements for maintenance purposes, personnel, or apparatus supplied by other contractors;
- (e) wiring and cabling facilities, including the capacity of ducts, conduits and trunking.

4.2 Network circuits

NOTE. Where the network is a public telecommunication system the NTP is within the NTTA.

4.2.1 The network operator(s) should be advised by the user (or the user's agent) of the foreseeable network circuit requirements.

4.2.2 It is essential that sufficient early notice of installation is given to network operator(s) by the user (or the user's agent). This should include the type of apparatus to be installed.

4.2.3 The user (or the user's agent) normally in consultation with the installer should agree with the network operator(s):

- (a) the precise physical location of the network termination point(s) (NTP(s));
- (b) the supply and capacity of the apparatus which provides the NTP(s);
- (c) the identification and numbering of individual circuits at each NTP;
- (d) any additional line facility required (e.g. night busy, meter pulses);
- (e) the technical and operational acceptability of the maintenance demarcation boundaries;
- (f) the liaison arrangements whereby the network operator, the user and, where appropriate, the maintainer, contact each other;
- (g) the procedures to be followed by the user in reporting all types of faults.

4.3 Maintenance

4.3.1 Level of service. It is recommended that the user should establish the level of maintenance service that will be provided by all maintainers under contract to the user.

4.3.2 Acceptance. Where the apparatus is to be maintained in situ, it is recommended that acceptance of the layout is obtained from the intended maintainer.

4.3.3 Records and plans. Explanatory documentation and any details of the location of the apparatus and the cable/duct/conduit marking schemes should be provided by the installer for retention on site.

4.4 Delivery and installation of apparatus

Delivery of apparatus to site should not be made, nor installation commence, before the accommodation has reached an acceptable and maintainable standard or suitable storage space is available for delivered apparatus.

4.5 Observance of installation dependent parameters

4.5.1 Parameters specified by the supplier and/or manufacturer. Failure to observe the installation dependent parameters, including environmental factors, specified by the supplier and/or manufacturer could lead to unsatisfactory performance of the apparatus.

NOTE. It is recommended that users should check the installation dependent parameters specified by the supplier and/or manufacturer in any maintenance or warranty agreement.

4.5.2 Approval conditions (Telecommunications Act 1984). Where the approval of the apparatus sets conditions relevant to its installation or connection these conditions should be observed. Failure to observe these conditions breaches the approval status of the installed apparatus.

NOTE. It is recommended that users should seek information about approval conditions from the supplier.

4.5.3 Power loading. Where a mains electricity supply is required it should be adequate to cater for the operation of the apparatus at all times, in some cases a three-phase supply may be necessary. Consideration should be given to the effect of a failure of the mains electricity supply and provision made for a stand-by power supply if required.

5 Accommodation

5.1 General

5.1.1 Allocation of accommodation. According to its size and type, an installation may share accommodation or may require the dedicated use of one or more rooms for:

- (a) apparatus;
- (b) operators' consoles;
- (c) power supplies or batteries;
- (d) maintenance/stores accommodation;
- (e) welfare accommodation.

5.1.2 Hazardous areas (see also 7.1 and 7.2)

5.1.2.1 During the planning of the location for apparatus, the user should consider and inform the supplier and installer whether or not the accommodation is adjacent to, accessed via or affected by hazardous areas. It is

recommended that advice should be sought from an authority on the type of hazard present.

5.1.2.2 Before installation commences, the installer should verify that due consideration has been given to the allocation of accommodation for telecommunications use, particularly with regard to proximity to or effects from hazardous areas.

5.1.2.3 It is essential that where risks of fire or explosion are involved, the recommendations of CP 1003 and BS 5345 should be observed.

5.1.3 Other services. Telecommunication apparatus may be endangered or adversely affected by other services or conditions which may be obvious or hidden within the fabric of the accommodation. The user should advise on the presence of, typically:

- (a) processes producing electricity, fumes, dusts, gases or radiation (e.g. contamination from photocopying and fire prevention equipment);
- (b) drainage or sewer pipes and access points;
- (c) electrical meters, switchgear or cables (non-telecommunication);
- (d) fire sprinkler systems (see 7.2.7 on fire extinguishing schemes);
- (e) water pipes;
- (f) gas meters, pipes or appliances;
- (g) dampness;
- (h) vibration;
- (i) risk of flooding;
- (j) ambient noise.

5.1.4 Lighting. Whilst natural lighting is desirable to provide suitable working conditions for maintenance staff, the level of illumination provided, when maintenance is required in situ, should not be lower than normal office level.

5.2 Access

5.2.1 The user should ensure that the means of access is safe and suitable for its purpose. Consideration should be given to access requirements for maintenance, in-house general repairs, domestic cleaning, and user's staff having specific duties within the accommodation in which the apparatus is located.

5.2.2 The location of accommodation should take into account the need to deliver and remove items of apparatus. It is essential that a safe route should be established with suitable access and adequate floor loading to allow the passage of apparatus together with any mechanical aid and personnel required to make the delivery or removal. The supplier should provide information on the size and weights of individual items of apparatus, and any special handling or delivery requirements.

5.3 Accommodation: technical details

5.3.1 The supplier should provide advice on the permissible distances (cable or linear) between items of apparatus.



5.3.2 When locating accommodation, consideration should be given to the method of providing building telecommunication cabling, or of linking to a telecommunication distribution system.

5.4 Security

5.4.1 Wiring. It should not be possible to alter or interfere with wiring without the use of tools except in locations to which access is restricted to maintenance staff or other authorized staff.

5.4.2 Power supply. Where the apparatus is supplied directly from the mains electricity supply, a means of disconnecting the supply should be provided in accordance with the requirements of the IEE Wiring Regulations (15th edition). Arrangements should be made to avoid the inadvertent disconnection of the mains electricity supply to the apparatus.

5.4.3 Apparatus. The user should consider whether for security or safety reasons, apparatus should be placed in a room (or other suitable area) where controlled access is restricted to authorized personnel only.

5.5 Floor loading

It is essential that floor loading should be calculated for each individual unit or combination of units of apparatus, based upon the weights of all apparatus which would be installed at maximum growth, in order that accommodation having adequate floor strength is chosen.

5.6 Provision for operating staff

5.6.1 Working areas should provide sufficient space for safe operation, supervision and maintenance.

5.6.2 Neither natural nor artificial light should interfere with the visibility of any lamps, visual displays or signals.

5.7 Batteries

5.7.1 It is essential that the accommodation of lead-acid stationary batteries other than those known as sealed batteries complies with BS 6133.

5.7.2 For other types of batteries and those lead-acid types known as sealed batteries the supplier should advise on containment and should provide information regarding any special conditions which could apply to their accommodation. Such special conditions should be met.

5.8 On-site maintenance and stores

5.8.1 Consideration should be given to providing secure accommodation for any spare parts retained on site.

5.8.2 Consideration should be given to the provision of suitable accommodation for maintenance and installation staff to enable them to carry out on-site tasks and the necessary associated administration duties (e.g. amend records, consult and amend appropriate manuals and documentation).

5.8.3 Space should be made available to accommodate any test equipment kept on site. Environmental and other conditions should take account of the need to avoid deterioration in this equipment and disturbance to its calibration.

6 Cabling, wiring, connections and ducting

6.1 General

6.1.1 Concealed wiring systems should be used wherever possible.

6.1.2 Distribution cables should be capable of being identified at termination boxes and at all points where they enter or emerge from concealment. Accurate records of the cables in the terminating boxes should be maintained such that the cables are easily identifiable.

NOTE. This recommendation does not apply to the apparatus wiring connecting a terminating station to a local FDP.

6.1.3 Where cables and conduits are installed in plaster or concrete liable to damp conditions, precautions should be taken against corrosive effects.

6.1.4 Where a number of cables need to be run on the surface in a common route, trunking or other suitable method should be considered for cable protection as well as for aesthetic appearance.

6.1.5 Cables should be installed in accordance with the cable manufacturer's recommendations for usage.

6.1.6 Agreement of the user or building owner should be obtained before running a cable on the external surface of a building. Externally routed cables should be protected against over-voltage surges where necessary.

6.2 Cables and wires within one building

6.2.1 In addition to types of internal wiring specified in BS 4808, types of internal wiring not at present included in any British Standard, but known to give reliable service and to be suitable for the signals to be carried, may be used.

6.2.2 Cables connecting the mains electricity supply to the apparatus should comply with IEE Wiring Regulations (15th edition).

6.2.3 The capacity of distribution cables should be chosen to be sufficient to allow for additions, modifications and for maintenance purposes.

6.2.4 Circuits should be installed in such a way as to minimize crosstalk and the pick-up of external interference, e.g. a two-wire extension circuit or any two-wire connection to an external network (Public Telecommunications System or private network) should be routed over the two wires of a twisted pair. The integrity and symmetry of the circuit should be maintained throughout its length, e.g. through joints and terminations with special attention to the avoidance of unbalances, splits and crosses. See 6.7.2 for recommendations for reducing electrical interference.

Sharing of cables by different services, where regulations permit, should be limited to those instances where the signal levels, frequency spectra and interference susceptibilities are known. A record of circuit usage should be kept.

NOTE 1. Balanced and unbalanced (e.g. earth return) circuits should be segregated unless appropriate precautions are taken.

NOTE 2. The needs of digital and analogue systems with respect to crosstalk will differ from one another. The characteristics of certain systems likely to be operated on internal cables are being studied with the aim of offering guidance on the planning of shared cabling so as to minimize the risk of interference.

NOTE 3. Where public network services are connected to a shared cable, the spectral characteristic requirements of apparatus also connected to the shared cabling, needs to have been identified in order to establish that no interference is caused.

NOTE 4. Some sharing of cables by different services which is technically possible might not be permitted by regulations.

6.2.5 Cables run on wall surfaces should be neatly laid and securely fixed along the run to prevent sag or accidental displacement, at least every 300 mm on unsupported horizontal runs, 400 mm on vertical runs and 1 m on supported runs. These spacings should be reduced on rough or uneven walls. Where a cable changes direction it should not be bent to a radius of less than four times its diameter, or six times if metal sheathed, unless otherwise specified by the cable manufacturer.

6.2.6 Where cables pass through voids in suspended ceilings or suspended ('computer') flooring, they should follow well defined routes and be fixed at regular intervals to ensure segregation of services. Cables should not be supported by suspended ceiling hangers (see also 6.11.2.3). When underfloor trunking is provided solely for the installation of telecommunication cabling, fixing may not be necessary.

6.3 External cabling and wiring

NOTE. Where telecommunication cabling, not forming part of a public network, leaves a set of premises and the system is not exempt from licensing under the Telecommunications Act 1984, attention is drawn to the need to observe relevant licence provisions (see clause 3).

6.3.1 *Permission to route.* Where telecommunication cabling crosses over or under land or premises not owned nor occupied by the user, appropriate way leaves and/or planning permission should be obtained.

6.3.2 *Underground cabling*

6.3.2.1 *General.* Underground cabling may be drawn into ducts (see 6.9.1.6), placed in trunking, troughing or laid directly in the ground; the type of cable to be used should be suitable for the method employed for the specific requirements of the site.

6.3.2.2 *Protection of buried cables.* Ground conditions should be carefully considered when a cable is buried direct in the ground. In general, a cable should be buried to a minimum depth of cover of 350 mm (450 mm in cultivated ground) and should be suitably armoured. However, if subsoil conditions are known to be corrosive, the cable may require additional protection and the cable manufacturers should be consulted.

6.3.2.3 *Crossing roadways and railway lines.* Ducts should be laid at a minimum depth of cover of 600 mm when cables are to be laid under roadways and railway lines.

6.3.2.4 *Underground ducts.* All underground ducts should be of non-porous durable material and should have smooth internal walls. Sections should be jointed to prevent the ingress of foreign material (see CP 413). All underground ducts should be sealed to prevent the ingress of gases or water at points of entry to buildings.

6.3.2.5 *Jointing chambers.* To facilitate cabling operations, jointing chambers should be built on duct routes where required.

6.3.2.6 *Ducts and jointing chambers.* Ducts and jointing chambers on users' premises should not be shared unless prior consent be obtained from the owner of the duct or jointing chamber.

6.3.3 *Overhead lines*

6.3.3.1 *Erection.* In general the line should be as straight as possible and should be designed to have a minimum clearance above ground to suit local conditions. The minimum clearance should be confirmed by the appropriate authority in each case, but as a general guide at road crossings and at other positions accessible to vehicular traffic the minimum clearance should be 5.5 m and under other conditions the minimum clearance should be 3.0 m.

6.3.3.2 *Span lengths.* The most economical layout will generally be obtained with an average span of 68 m. However, a span should not exceed 70 m without special staying.

6.3.4 *Poles*

6.3.4.1 *Erection.* The length of pole selected for each position should ensure that minimum clearances above the ground (see 6.3.3.1) are obtained having made due allowances for the sag of the lines under all conditions.

Poles should be strong enough to withstand the forces acting upon them including those caused by the lines and wind pressure.

In addition to the types of poles specified in BS 607 and BS 1990, poles of types not at present included in any British Standards but known to give reliable service may be used.

Poles up to 9.0 m in length should be set to a depth of between 1.2 m and 1.75 m and poles over 9.0 m in length to a depth of between 1.75 m and 2.25 m. A minimum of ground should be disturbed during excavation and it should be well punned during reinstatement.

6.3.4.2 *Stays and struts.* Stays or struts should be fitted at terminal and angle poles, at the pole on each side of road, rail, river, canal or power crossings and in locations likely to be exposed to strong winds. In addition 'in-line' stays should be provided on long routes at intervals of approximately 400 m.

Stays or struts should be attached to the pole at the resultant load points of the cables.

6.3.4.3 *Pole sharing.* The use of shared poles for telecommunications and low-voltage power distribution is not recommended. However, where it may be necessary to share poles, this should be subject to the observance of the following conditions:

- (a) an agreement is reached with the owner of the pole(s) for the joint use of the pole(s);
- (b) the telecommunication line is adequately insulated;
- (c) the telecommunication line is erected below the power wires and the vertical separation between the uppermost telecommunication wire and the lowermost power wire is not less than 1 m.

Poles may be shared by two or more telecommunication systems, but all parties should agree on the work practices etc. to be employed.

