

Code of practice for

Selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosives processing and manufacture) —

Part 1: General recommendations

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- Institution of Gas Engineers

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Foreword

This Part of BS 5345 has been prepared under the direction of the General Electrotechnical Engineering Standards Policy Committee and is a revision of BS 5345-1:1976, which is withdrawn. Before 1976, installations were made in accordance with CP 1003. However, CP 1003 has now been declared obsolescent and will eventually be withdrawn and should not be used for new installations.

Many industrial processes involve the generation, processing, handling and storage of flammable and potentially explosive gases, vapours and mists. Where such materials may be present appropriate precautions have to be taken to design or locate electrical apparatus so that electrical arcs, sparks, hot surfaces or frictional sparks produced by such apparatus do not cause ignition.

Several techniques are available for the protection of electrical apparatus situated in hazardous areas. These techniques are described in this Part of BS 5345, which takes into account the developments that have taken place in area classification and the design, manufacture and use of electrical apparatus for hazardous areas since its first edition.

This revision of BS 5345-1 has taken into account the requirements of apparatus specifications BS 5501 and BS 4683. Although written largely with BS 5501 in mind, it is recognized that apparatus in accordance with BS 4683 and some earlier standards¹⁾ is still manufactured and that such equipment will no doubt continue to be in use for a number of years to come.

BS 5345 is divided into nine Parts.²⁾ BS 5345-3 to BS 5345-9 deal with the selection, installation and maintenance recommendations appropriate to the types of protection that may be used to achieve safe operation of equipment in potentially explosive atmospheres. BS 5345-1 and BS 5345-2 provide basic recommendations applicable to all Parts. The list of Parts is as follows:

- *Part 1: General recommendations;*
- *Part 2: Classification of hazardous areas;*
- *Part 3: Installation and maintenance requirements for electrical apparatus with type of protection “d”. Flameproof enclosure;*
- *Part 4: Installation and maintenance requirements for electrical apparatus with type of protection “i”. Intrinsically safe electrical apparatus and systems;*
- *Part 5: Installation and maintenance requirements for electrical apparatus protected by pressurization “p” and by continuous dilution, and for pressurized rooms;*
- *Part 6: Installation and maintenance requirements for electrical apparatus with type of protection “e”. Increased safety;*
- *Part 7: Installation and maintenance requirements for electrical apparatus with type of protection N;*
- *Part 8: Installation and maintenance requirements for electrical apparatus with type of protection “s”. Special protection;*
- *Part 9: Installation and maintenance requirements for electrical apparatus with type of protection “o”. Oil-immersed apparatus, and with type of protection “q”. Sand-filled apparatus³⁾.*

¹⁾ These earlier specifications are listed in Appendix A.

²⁾ BS 5345 will not now contain a tenth Part dealing with the use of gas detectors. This will be the subject of a separate standard.

³⁾ In preparation.

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

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 42, an inside back cover and a back cover.

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

Section 1. General

1 Scope

This Part of BS 5345 gives recommendations for the selection, installation and maintenance of electrical apparatus for use in areas where flammable material(s) are generated, processed, handled, stored or otherwise encountered which could give rise to explosive atmospheres.

This standard relates to the precautions necessary to avoid ignition of an explosive atmosphere resulting from electrical arcs and sparks, hot surfaces or frictional sparks from electrical apparatus and installations.

This standard does not cover the following:

- a) inherently explosive situations, e.g. explosives manufacturing and processing;
- b) underground mining applications;
- c) dust atmospheres⁴⁾ or atmospheres containing a mixture of dusts and gases/vapours;
- d) areas where abnormal atmospheric conditions occur (see clause 34);
- e) precautions against the effects of static electricity (see BS 5958);
- f) precautions against the effects of lightning (but see 19.2.12 and BS 6651);
- g) precautions against the effects of high frequency electromagnetic radiation (see BS 6656);
- h) precautions against toxic hazards associated with flammable materials;

NOTE The toxic risks associated with flammable materials apply to concentrations that are usually very much less than the lower flammable limit.

- i) additional requirements for the installation of electric surface heating systems (see BS 6351).

This standard is applicable to all new permanent installations and, where reasonably practicable, to changes to installations complying with earlier standards. The recommendations for maintenance are applicable to all installations.

The recommendations of this standard are also applicable to those installations that are semi-permanent or temporary. However, in certain circumstances alternative safety measures and procedures may need to be adopted to achieve the same level of safety as that recommended in this standard.

Appendix A contains, for information, a list of relevant international, European and British Standards, together with details of the national certifying authority and its certification standards.

NOTE The titles of the publications referred to in this standard are listed on page 42 and the inside back cover.

2 Definitions

For the purposes of this Part of BS 5345, and of the other Parts of the standard generally, the following definitions apply.

NOTE Further definitions that are particularly relevant to the specific types of protection are included in the appropriate Parts of this British Standard.

2.1 explosive atmosphere

a mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour or mist in such proportions that it can be exploded by excessive temperatures, arcs or sparks (the danger is a real one)

2.2 potentially explosive atmosphere

an atmosphere that could become explosive (the danger is a potential one)

2.3 flammable mist

a free suspension in air of droplets of a liquid whose vapour is flammable

2.4 hazardous area

an area in which explosive atmospheres are, or may be expected to be, present in quantities such as to require special precautions for the construction and use of electrical apparatus

2.5 non-hazardous area

an area in which explosive atmospheres are not expected to be present in such quantities that special precautions for the construction and use of electrical apparatus are necessary

2.6 flash point

the minimum temperature at which a material gives off sufficient vapour to form an explosive atmosphere within the apparatus used for flash point determination (see 31.1)

2.7 ignition temperature

the lowest temperature of a flammable gas or vapour at which ignition occurs when tested as described in International Electrotechnical Commission (IEC) publication IEC 79-4⁵⁾

⁴⁾ BS 6467 contains a specification for electrical apparatus with protection by enclosure for use in the presence of combustible dusts, and a guide to its selection and use.

⁵⁾ BS 4056, now withdrawn, uses the same test method.

NOTE Ignition temperature was formerly known as auto-ignition or spontaneous ignition temperature.

2.8

flammable material

a gas, vapour, liquid or solid that can react continuously with atmospheric oxygen and that may therefore sustain fire or explosion when such reaction is initiated by a suitable spark, flame or hot surface

NOTE Many liquids and solids, though regarded as flammable, nevertheless do not normally burn. The application of heat to such materials serves to release vapour that may burn with atmospheric oxygen. The heat of the subsequent reaction serves to release further vapour for combustion. Flame may propagate through suspensions of dusts by this mechanism. Liquids can also give rise to flammable mists (see 38.3).

2.9

apparatus (or system) certification

a formal attestation by a recognized testing station that a prototype or sample of apparatus (or system), constructed to the certification documents, complies with a standard

NOTE Although strictly it is the apparatus design rather than the individual apparatus that is the subject of certification, the term “certified apparatus” and variants upon this have gained acceptance. This is reflected in the standard.

2.10

component certification

a formal attestation by a recognized testing station that a component, constructed to the certification documents, complies with a standard

NOTE The note to 2.9 applies here in respect of components.

2.11

maximum surface temperature

the highest temperature that is attained in service under the most adverse conditions (but within recognized tolerances) by any part or any surface of an electrical apparatus, which would be able to produce an ignition of the surrounding explosive atmosphere

NOTE The most adverse conditions include recognized overloads and any fault condition recognized in the standard for the type of protection concerned and those abnormal operating conditions recognized for the product concerned.

2.12

temperature class (T class)

one of six values of temperature allocated to electrical apparatus derived from a system of classification according to the maximum surface temperature of the apparatus

2.13

apparatus group

the group assigned to electrical apparatus to indicate its suitability for use in mines or surface industry

NOTE For surface industry applications the group may be subdivided for specific gases.

2.14

type of protection

the measures applied in the construction of electrical apparatus to prevent ignition of surrounding explosive atmosphere by such apparatus

NOTE Formerly it was common for an individual item of apparatus to employ one type of protection only; increasingly, apparatus may now employ two or more types of protection. Thus a rotating machine may incorporate a motor carcass in type of protection “d” (flameproof enclosure) and a terminal box in type of protection “e” (increased safety). It has become common usage to refer to “explosion-protected” apparatus rather than to any one type of protection. (See also section 2.)

2.15

degrees of protection provided by enclosures (of electrical apparatus)

the measures applied to the enclosures of electrical apparatus to provide:

- a) the protection of persons against contact with or approach to live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure and the protection of the apparatus against ingress of solid foreign bodies;
- b) the protection of the apparatus inside the enclosure against harmful ingress of water.

2.16

electrical protection

the measures applied to circuits to control the effects of overcurrent and earth fault

3 Statutory requirements

Electrical installations in hazardous areas have to comply with all relevant statutory requirements. Installations in Great Britain at places of work are subject to the requirements of the Health and Safety at Work etc. Act 1974. More specific requirements are imposed in certain classes of premises and legal advice should be sought. It should be noted that the Health and Safety at Work etc. Act 1974 applies to all offshore installations operating in controlled waters designated under the United Kingdom Continental Shelf Act 1964.

4 Classification of hazardous areas

This standard is based on the concept, which is accepted internationally, of dealing with the risk of fire and explosion by area classification. This concept recognizes the differing degrees of probability with which concentrations of flammable gas or vapour may arise in installations in terms of both the frequency of occurrence and the probable duration of existence on each occasion.

The detailed considerations that should be taken into account in area classification are described in BS 5345-2. For completeness, the definitions appropriate to area classification are repeated here.

- Zone 0 Zone in which an explosive atmosphere is continuously present, or present for long periods.
- Zone 1 Zone in which an explosive atmosphere is likely to occur in normal operation.
- Zone 2 Zone in which an explosive atmosphere is not likely to occur in normal operation, and if it occurs it will exist only for a short time.

NOTE Area classification in this standard deals only with risks due to flammable gases, vapours and mists.

When the hazardous areas of a plant have been classified, the remainder will be defined as non-hazardous. In a non-hazardous area normal electrical techniques apply (but see 7.1).

5 Types of protection

There are at present nine accepted types of protection for electrical apparatus for use in hazardous areas. A description of each type is given in Table 1. The relevant equipment specifications, where they exist, should be referred to for precise definitions of the type of protection.

Apparatus may be protected by one or more types of protection (see 42.4).

6 Light metals as construction materials

Particular consideration should be given to the location of an apparatus that incorporates light metals in the construction of its enclosure. The propensity of such materials to give rise to sparking that is incensive under conditions of frictional contact has been well established. Reference should be made to Appendix B for further detailed guidance.

Table 1 — Types of protection

Type of protection	Title	Description	Part of BS 5345
“d”	Flameproof enclosure	A method of protection where the enclosure for electrical apparatus will withstand an internal explosion of the flammable gas or vapour (for which it is designed) that may enter it, without suffering damage and without communicating the internal flammation to the explosive atmosphere for which it is designed, through any joints or structural openings in the enclosure.	3
“i”	Intrinsically-safe apparatus or system	A protection technique based upon the restriction of electrical energy within apparatus and in the interconnecting wiring, exposed to a potentially explosive atmosphere, to a level below that which can cause ignition by either sparking or heating effects. Because of the method by which intrinsic safety is achieved it is necessary that not only the electrical apparatus exposed to the potentially explosive atmosphere, but also other (associated) electrical apparatus with which it is interconnected, is suitably constructed.	4
“p”	Pressurization, continuous dilution and pressurized rooms	A method of protection using the pressure of a protective gas to prevent the ingress of an explosive atmosphere to a space that may contain a source of ignition and, where necessary, using continuous dilution of an atmosphere within a space that contains a source of emission of gas, which may form an explosive atmosphere.	5
“e”	Increased safety	A method of protection by which additional measures are applied to an electrical apparatus to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks during the service life of the apparatus. It applies only to an electrical apparatus, no parts of which produce sparks or arcs or exceed the limiting temperature ^a in normal service.	6
N	Type of protection N	A type of protection applied to an electrical apparatus such that, in normal operation, it is not capable of igniting a surrounding explosive atmosphere, and a fault capable of causing ignition is not likely to occur.	7
“s”	Special protection	A concept for those types of electrical apparatus that, by their nature, do not comply with the constructional or other requirements specified for apparatus with established types of protection, but that nevertheless can be shown, where necessary by test, to be suitable for use in hazardous areas in prescribed zones.	8
“o”	Oil-immersion	A method of protection where electrical apparatus is made safe by oil-immersion in the sense that an explosive atmosphere above the oil or outside the enclosure will not be ignited.	9 ^b
“q”	Powder/sand filling	A method of protection where the enclosure of electrical apparatus is filled with a mass of granular material such that, if an arc occurs, the arc will not be liable to ignite the outer flammable atmosphere.	9 ^b
“m”	Encapsulation	A type of protection in which parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited.	^c

NOTE 1 Other types of protection are under consideration internationally. These may include type of protection “h” hermetically sealed.

NOTE 2 Whereas in BS 6941 the type of protection is known as type N, in IEC publication 79-15 it is designated type “n”.

^a For definition of “limiting temperature” see 3.5 of BS 5345-6:1976.

^b In preparation.

^c Although the existence of type of protection “m” is acknowledged here and BS 5501-8 has been published containing the equipment specification, consideration has yet to be given to recommendations for its selection, installation and maintenance etc. for incorporation in BS 5345. The recommendations in this standard do not therefore necessarily cover type of protection “m”.

Section 2. Selection of apparatus

7 Procedure for selecting electrical apparatus

7.1 General

Apparatus for use in hazardous areas should be selected in accordance with each of the following criteria⁶⁾:

- a) classification of area;
- b) temperature classification;
- c) apparatus group;
- d) environmental conditions.

Selection procedures according to the above criteria are recommended in 7.2 to 7.5.

Special considerations may be required for non-hazardous area apparatus that is associated with hazardous area apparatus (see appropriate Parts of BS 5345, e.g. Parts 4 and 6 for intrinsic safety and increased safety apparatus, respectively).

7.2 Selection according to classification of area

Reference should be made to clause 4 and to BS 5345-2 for details of area classification that results in the division of the hazardous area into one or more zones.

Having established the zones, the types of protection to be applied to the electrical apparatus should be selected in accordance with Table 2.

7.3 Selection according to temperature classification

When selecting apparatus according to temperature classification, the maximum surface temperature of the T class of the apparatus (or, where the apparatus is marked with a particular maximum surface temperature, that temperature) should not exceed the ignition temperature of the gases or vapours involved.

NOTE However, BS 5501, subject to certain specified conditions, permits the surface temperature of certain small components of apparatus, e.g. transistors or resistors used in intrinsically-safe electrical circuits, to exceed the temperature class marked on the apparatus if there is no direct or indirect risk of ignition from these components.

Table 7 gives ignition temperatures for a range of flammable materials. Apparatus intended for use with materials not given in Table 7, or where this table does not list the ignition temperature, should be installed only when expert advice confirms its suitability for use with those materials.

The T class is normally assigned to apparatus on the basis of temperature rise tests assuming that the apparatus may be used in a local ambient temperature not exceeding 40 °C. In special cases, apparatus may be designed on request to operate in a local ambient temperature of more than 40 °C. In this case the maximum permitted local ambient temperature will be clearly marked on the apparatus. The T class will have been assigned on the basis of temperature rise tests and the assumption that the apparatus may operate at temperatures up to the maximum permitted local ambient temperature.

When apparatus which has had a T class assigned assuming a 40 °C maximum ambient temperature is to be used at a higher local ambient temperature, for example, because it is mounted on a hot surface, the maximum surface temperature of the apparatus should not exceed the ignition temperatures of the gases or vapours likely to be present. It is also important to check with the manufacturer on the suitability of the apparatus to operate at these higher temperatures. For example, when apparatus is to be mounted under pipe-lagging, it is virtually unaffected by the air temperature, but may fail due to heat from the pipe.

The permitted maximum surface temperatures classified according to BS 5501-1 and BS 4683-1 are given in Table 3.

An example can be given of the relationship between T class and ignition temperature. Cyclohexane has an ignition temperature (see also clauses 35 and 38) of 259 °C and, therefore, assuming a maximum environmental temperature of 40 °C, apparatus with a temperature class T2 (i.e. 300 °C) would not be suitable, whereas apparatus with a temperature class of T3 (i.e. 200 °C) would be suitable.

NOTE In special cases, apparatus can be marked with a particular temperature as well as one of the six T classes. For example, in the case cited above, if the apparatus were marked with a temperature of 259 °C, as well as the temperature class of T2, it would still be suitable for use in areas where a potentially explosive atmosphere of cyclohexane might form.

In the case of some items of apparatus with type of protection “e” (e.g. motors) the maximum temperature should not exceed the “limiting temperature”, which may be determined by the thermal stability of materials used in the apparatus (see BS 5345-6).

⁶⁾ Special conditions for safe use apply to any type of certified explosion-protected apparatus where the certification number has a suffix marking of “B” or “X”, and these conditions may affect the selection of such apparatus.

Table 2 — Selection of apparatus and systems according to zone of risk

Zone	Type of protection	Part of BS 5345
0	“ia” intrinsically-safe apparatus or system	4
	“s” special protection (specifically certified for use in Zone 0)	8
1	Any explosion protection suitable for Zone 0 and	
	“d” flammable enclosure	3
	“ib” intrinsically-safe apparatus or system	4
	“p” pressurization, continuous dilution and pressurized rooms	5
	“e” increased safety	6
	“s” special protection	8
2	Any explosion protection suitable for Zones 0 or 1 and	
	N ^a type of protection N ^b	7
	“o” oil-immersion	9 ^c
	“q” sand filling ^d	9 ^c
^a Alternatively, apparatus that in normal operation is not capable of producing ignition capable arcs, sparks or surface temperatures may also be acceptable for use in Zone 2 where it has been assessed by persons who should: a) be familiar with the requirements of any relevant standards and codes of practice and their current interpretations; b) have access to all information necessary to carry out the assessment; c) where necessary, utilize similar test apparatus and test procedures to those used by recognized testing stations. ^b Whereas in BS 6941 the type of protection is known as type N, in IEC publication 79-15 it is designated type “n”. ^c In preparation. ^d The use of apparatus with type of protection “q” in Zone 1 is under consideration.		

Table 3 — Relationship between T class and maximum surface temperature

T class	Maximum surface temperature
	°C
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

7.4 Selection according to apparatus group

7.4.1 Apparatus groups and subdivisions. BS 5501 divides electrical apparatus into two basic groups.

- a) Group I: electrical apparatus for mines susceptible to firedamp.
- b) Group II: electrical apparatus for places with a potentially explosive atmosphere, other than mines susceptible to firedamp.

Some types of Group II apparatus with, for example, types of protection “d”, “i” and “s”⁷⁾ may be further subdivided according to the nature of the potentially explosive atmosphere for which it is intended. These subdivisions are given in BS 5501 as A, B and C.

NOTE For brevity BS 5501 states apparatus group and subdivision collectively, e.g. Group IIA, dropping the word “subdivision”.

7.4.2 Use of apparatus in potentially explosive atmospheres. Apparatus that has no subdivision in its group may be used with any of the flammable materials listed in Table 7 subject to consideration of the recommendations of 7.3 and 7.5.

Apparatus that has a subdivision in its group should be used only with the materials allocated to that subdivision (see Table 7) subject to consideration of the recommendations of 7.3 and 7.5 and 7.4.2 c).

Apparatus with a particular subdivision may be used with flammable materials allocated to a lower subdivision subject to consideration of the recommendations of 7.3 and 7.5, e.g. Group IIB apparatus may be used with flammable materials allocated to Group IIA, and Group IIC apparatus may be used with flammable materials allocated to Group IIA and Group IIB.

Apparatus that has subdivisions in its group and which is intended for use with flammable materials not given in Table 7 should be installed only when expert advice confirms its suitability for use with those materials.

NOTE In BS 229 and BS 1259 flammable gases and vapours are grouped or classified, respectively, according to the experimental data for limiting safe gaps or igniting currents measured under precisely specified conditions. In the case of BS 1259, many materials are classified according to their chemical similarity with gases and vapours that are already classified on the basis of experimental data. Neither method of grouping takes into account the need for surface temperature classification, since ignition temperatures generally are not related to other combustion characteristics. It is therefore inaccurate to assume that any particular apparatus complying with the design requirements for a group of gases could be used safely with all flammable materials allocated to that group. For this reason, instead of grouping gases, an apparatus itself is now grouped according to design criteria specified in the appropriate Parts of BS 4683 and BS 5501.

The relationship between the apparatus group and the former gas group and apparatus class is given in Table 4.

⁷⁾ Apparatus with type of protection “s” may be subdivided as shown above where it uses either or both techniques of types of protection “d” or “i”.

Table 4 — Relationship between apparatus group, the former gas group and apparatus class

Representative gas	Apparatus group		Former gas group in BS 229	Former apparatus class in BS 1259
	BS 5501	BS 4683		
Methane	I ^a	I ^a	I ^a	I ^a
Propane	IIA	IIA	II	2c
Ethylene	IIB	IIB	III	2d
Hydrogen	IIC	IIC	IV	2e
Acetylene	IIC	Not allocated	IV ^b	2f
Carbon disulphide	IIC	Not allocated	IV ^b	2f

^a For underground mining applications.

^b Although a gas Group IV was allocated, the standard excluded construction requirements for apparatus to be used in this group.

7.5 Selection according to environmental conditions

Current standards for the types of protection listed in Table 1 require that apparatus is normally tested in air and under normal atmospheric conditions. However, oxygen enrichment or variations of pressure or temperature may adversely affect the type of protection afforded to the apparatus. In such cases care should be taken to ensure that the apparatus has been evaluated by a competent authority (see A.4) for the specific conditions of use.

Apparatus and its component parts should be constructed so as to guard against electrical and mechanical failure in the intended conditions of use. The integrity of some electrical apparatus may be affected when required to operate under temperature or pressure conditions outside those for which the apparatus has been constructed. In such conditions further advice should be sought.

Particular attention should be given to the need for protection against the weather, the ingress of liquids and particulate matter, corrosion, the effect of solvents and the effect of heat from adjacent plant (see also Appendix C and 27.3 to 27.5).

Attention is drawn to the risks that can arise with apparatus into which process fluids may be introduced, e.g. pressure switches or canned electric motor pumps. Under fault conditions, e.g. diaphragm or can failure, the fluid may be released inside the apparatus under considerable pressure which may cause any or all of the following:

- a) rupture of the apparatus enclosure;
- b) an immediate ignition risk;
- c) transmission of the fluid along the inside of the cable into a non-hazardous area.

Preferably such apparatus should be designed so that the process fluid containment is in a separate enclosure from the electrical apparatus, but where this is not possible apparatus designed to be vented is acceptable. Failing this a special sealing joint should be used or a length of mineral insulated metal sheathed cable should be introduced in the cable run.

8 Certification

8.1 General

Notwithstanding the statements in this clause concerning certification, apparatus should be selected with a type of protection as recommended in Table 2 for the appropriate zone.

NOTE 1 The term “apparatus” can be generally said to include “systems” also.

NOTE 2 See definitions in 2.9 and 2.10.

BS 5501 and BS 4683-2 and BS 4683-4 require apparatus to be certified. When conformity with EEC Directives is required, certification is to be carried out by an “approved body” listed by the Commission. (See A.4 for details of the “approved body” in the United Kingdom.)

In practice for Zone 0 and Zone 1 applications certified apparatus is generally used as an aid to satisfying the statutory requirements listed in clause 3 (but see 8.2).

For apparatus designed to BS 4683-3 certification is optional.

Apparatus certified to standards other than British Standards or CENELEC European Standards or BASEEFA Standards falls outside the scope of this standard. Such apparatus may, however, be used, but in order to ensure its correct application and installation reference should be made to the relevant national code of practice that deals with these aspects. In cases of doubt about the application or installation of such apparatus expert advice should be sought.

Certified apparatus normally bears the authority's certification mark in addition to all other marking required by the individual standard (see clause 42 for notes on marking to BS 5501).

NOTE 3 BASEEFA has issued certificates to BASEEFA standards when there was no acceptable published British Standard.

NOTE 4 For information on marking of apparatus see section 6 of this standard.

8.2 Uncertified apparatus for Zone 0 and Zone 1

In exceptional circumstances, e.g. research, development, pilot plant and other new projects work, where suitable certified apparatus is not obtainable, other apparatus may be used in Zone 0 and Zone 1. The users of such apparatus should obtain a "document of conformity" to show that the apparatus has been examined and, where necessary, tested by a competent body (using techniques and facilities similar to those normally used by a national certifying authority for the type of protection concerned) and has been found to comply with the requirements of the appropriate standard for the particular type of protection. Such apparatus would not, however, bear the mark of a national certifying authority.

8.3 Assessment of Ex components (see also 42.3)

A number of components have been assessed for use in potentially explosive atmospheres and may have been given a Component Certificate. Such components may be used with other apparatus where either the certificate for that apparatus identifies the relevant component or where the apparatus including the component has been assessed. Particular attention should always be given to the selection and use of components.

9 Interconnection of apparatus

The safety of individual pieces of apparatus may be influenced by any other apparatus with which it is interconnected. For such system considerations, reference should be made to the Parts of BS 5345 covering individual protection concepts.

Section 3. General installation recommendations

10 General

In addition to any recommendations there may be for installations in non-hazardous areas, further recommendations for installations in hazardous areas as a consequence of the nature of the environment and that are generally applicable to all types of protection are described in clauses 11 to 20.

The explosion protection of some installations, for example, those using electric surface heating, pressurization “p”, etc. is dependent on the overall design of the completed system. In such cases, the appropriate design codes or standards should be used for guidance to carry out the installation (see A.3 and/or other Parts of BS 5345).

Alterations to apparatus or systems may invalidate any certificate or other documentation relating to that apparatus or system. Such alterations should be made only with the agreement of the owner, occupier or other responsible persons who are in control of the premises, in consultation with the manufacturer where appropriate.

There may be special conditions for safe use listed in the certification documents (see 42.2) that will affect the method of installation and it is important to ensure that such conditions are properly met.

11 Access for inspection

Installations should be designed and the apparatus and materials installed with a view to providing ease of access for inspection and maintenance.

12 Plans and records

For each site a responsible person should maintain plans or records of the following items:

- a) the classification and extent of hazardous areas together with the other information as recommended in 7.4 of BS 5345-2:1983;
- b) records sufficient to enable the explosion-protected equipment to be maintained in accordance with its type of protection.

Clause 1.3 of BS 5501-1:1977 indicates that devices in which, according to the manufacturer's specifications, none of the values 1.2 V, 0.1 A, 20 μ J or 25 mW is exceeded need not be certified or marked. The most widespread use of such apparatus is in intrinsically-safe systems where the use of simple apparatus such as thermocouples and switches is usually covered by these rules. A comprehensive record of such apparatus and systems should be maintained so that it may be properly inspected for compliance with the relevant safety documentation.

13 Electrical ratings

Electrical apparatus and materials should be installed, used and maintained within their electrical ratings for power, voltage, current, frequency, duty and such other characteristics where non-compliance might jeopardize the safety of the installation.

In respect of electrical apparatus from non-UK suppliers, because of the differing nature of the supply networks, special care should be taken to ensure that:

- a) the voltage and frequency rating are appropriate to the supply system on which the apparatus is to be used;
- b) the temperature classification has been established for the correct voltage, frequency, etc.

14 Installation of apparatus

All apparatus should be installed with due regard to the possibility of external mechanical damage affecting the type of protection of the apparatus. Where equipment is to be installed in areas of high mechanical risk, additional measures such as the provision of guards for light transmitting parts may be necessary. However, additional measures should not impair the integrity of the type of protection (see, for example, BS 5345-3).

Special conditions for safe use apply to any type of explosion-protected apparatus where the certificate number has a suffix marking and these conditions may affect certain features of the installation. The certification documents should be studied to ascertain the conditions of installation. The manufacturers should also have provided clear installation instructions.

15 Integrity of insulation

Care should be taken during installation to maintain the degree of electrical insulation provided by the construction of the apparatus so that the possibility of accidental sparking or arcing is avoided.