BRITISH STANDARD

BS 5345-7: 1979

Code of practice for

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

Part 7: Installation and maintenance requirements for electrical apparatus with type of protection N

UDC 696.6:621.3 – 7:614.83

Cooperating organizations

The General Electrotechnical Engineering Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

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Rotating Electrical Machines Association (BEAMA)
Scientific Instrument Manufacturers' Association

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Contents

Foreword

Many gases, vapours, mists and dusts encountered in industry are flammable. When ignited, they may burn readily and with considerable explosive force if mixed with air in the appropriate proportions. It is often necessary to use electrical apparatus in locations where such flammable materials may be present, and appropriate precautions should therefore be taken to ensure that all such apparatus is adequately protected in order to reduce the likelihood of ignition of any external explosive atmosphere. When using electrical apparatus, potential ignition sources include electrical arcs and sparks, hot surfaces and, in certain circumstances, frictional sparks.

In general, electrical safety is ensured by implementing one of two procedures. Either the electrical apparatus should be located, whenever practicable, outside hazardous areas; or the electrical apparatus should be designed, installed and maintained in accordance with measures recommended for the area in which the apparatus is located.

Several techniques are available for the protection of electrical apparatus in hazardous areas. Some of these techniques (or "types of protection" as they are known) have been used for many years and have come to be regarded as traditional. Other types of protection have been introduced only recently.

This code of practice describes the basic safety features of these types of protection, full details of which are given in the relevant standards, and recommends the selection, installation and maintenance procedures that should be adopted to ensure the safe use of electrical apparatus in hazardous areas. This code therefore takes account of the significant developments that have taken place in area classification and in the design, manufacture and use of electrical apparatus for hazardous areas since the preparation of the earlier code of practice CP 1003.

It is important to note that this code of practice deals with *explosion* hazards due to the presence of flammable gas/air mixtures; it does not provide guidance on the extra precautions to be taken where such gases involve a *toxic* hazard.

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 and ii, pages 1 to 10, 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.

0 Introduction

This document is Part 7 of code of practice BS 5345. The code gives guidance in the selection, installation and maintenance of electrical apparatus for use in areas where flammable materials are generated, processed, handled or stored, and that are therefore potentially hazardous.

In common with the earlier code of practice for the use of electrical apparatus in hazardous areas (CP 1003-1:1964, CP 1003-2:1966 and CP 1003-3:1967), the present code is divided into a number of Parts. Each Part deals with the installation and maintenance requirements appropriate to one of the types of protection that may be used to achieve electrical safety, or with basic requirements and considerations that are fundamental to the use of electrical apparatus in hazardous areas, and that therefore provide the basis for the other Parts of this code.

The full list of Parts is as follows:

— *Part 1: Basic requirements for all Parts of the code;*

— *Part 2: Classification of hazardous areas*[1)];

— *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 apparatus and systems;*

— *Part 5: Installation and maintenance requirements for electrical apparatus with type of protection "p". Pressurization and continuous dilution*[1)];

— *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*[1)];

— *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 apparatus*[1)];

— *Part 10: Installation and maintenance requirements for electrical apparatus for use with combustible dusts*[1)];

— *Part 11: Specific industry applications*[1)];

— *Part 12: The use of gas detectors*[1)].

This Part of the code should be read in conjunction with the other Parts, particularly Parts 1 and 2 which, taken together, describe the fundamental considerations that affect the selection, installation and maintenance of all electrical apparatus used in hazardous areas.

BS 5345 is based on the concept of area classification which recognizes the differing degrees of probability with, which explosive (flammable) 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 deciding on an area classification are described in Part 2 of the code. For completeness, and for the convenience of readers, the definitions appropriate to area classification are repeated here. It should be noted that whereas, formerly, classified areas were known as Divisions, they are now called Zones. Three Zones are recognized viz.:

Zone 0 In which an explosive gas/air mixture is continuously present or present for long periods.

Zone 1 In which an explosive gas/air mixture is likely to occur in normal operation.

Zone 2 In which an explosive gas/air mixture is not likely to occur in normal operation, and if it occurs it will only exist for a short time.

It should be noted that this concept of area classification deals only with risks due to flammable gases and vapours and, by implication, mists. It does not deal with flammable dusts, which may lie quiescent for long periods of time until disturbed into suspension by a suitable mechanism. An area classification concept is being developed for dusts.

By implication, an area that is not classified as Zone 0, 1 or 2 is deemed to be a non-hazardous or safe area. If doubt exists as to the classification of an area that is judged to be hazardous or potentially hazardous, guidance should be sought at an early stage from the authority having jurisdiction in the industry or area concerned (see Parts 1 and 2 of the code).

[1)] In course of preparation

Electrical apparatus used in each of the classified Zones should be suitably protected by design and manufacture, and should also be installed and maintained in a manner to ensure its safe use.

BS 5345, in offering guidance in the selection, installation and maintenance of suitably protected apparatus, replaces CP 1003 and should be used for all new installations. It should also be used for changes to existing installations, though it is recognized that minor changes only to certain existing installations may need to be made in accordance with the recommendations of the earlier code. It is intended, however, that CP 1003-1, CP 1003-2 and CP 1003-3 will eventually be withdrawn from use.

Notwithstanding application of the installation recommendations of this code to existing installations, the recommendations for maintenance should be applied to all electrical apparatus and installations, irrespective of age and date of installation. It should also be noted that the installation and maintenance recommendations given in this code are supplementary to, and not alternative to, requirements which would apply to general industrial installations (see also Part 1 of this code).

Section 1. General principles

1 Scope

This Part of BS 5345 describes the concept of ensuring electrical safety in Zone 2 hazardous areas by means of type of protection N and gives guidance in the selection, installation and maintenance of this type of electrical apparatus. Reference should be made to Part 1 of this code for other types of protection which are suitable for use in Zone 2.

This code does not apply to the underground mining industry, where other precautions are necessary, though it is recognized that the code may be applied to the surface installations of mines.

Apparatus with type of protection N is designed for use in areas with flammable gas and vapour risks. For the use of this apparatus in areas with flammable dust risks see Part 10 of the code.

2 References

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

3 Definitions and explanation of terms

The definitions and terms which are generally applicable to hazardous areas and electrical apparatus used therein are included in Part 1 of this code, to which reference should be made. The definitions and terms which are particularly relevant to individual types of protection are indicated in the appropriate Parts of this code. For the purposes of this Part, the following definitions and terms apply.

3.1
type of protection N

a type of protection applied to 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

3.2
enclosure

the external casing protecting the electrical and mechanical parts of apparatus. The term excludes cables

3.3
restricted-breathing enclosure

an enclosure which is not hermetically sealed, but which is designed to prevent or restrict the entry of gases

3.4
enclosed-break device

a device incorporating an electrical contact that is made and broken, the enclosure of which will withstand an internal explosion of the flammable gas or vapour which may enter it without suffering damage and without communicating the internal flammation to the external flammable gas or vapour, the net volume of the enclosure being not greater than 20 cm^3

NOTE An enclosed-break device does not need to comply with the requirements of type of protection "d". (See Part 3 of this code.)

3.5
hermetically sealed device

a device in which an electrical contact is made and broken, which is so constructed that the external atmosphere cannot gain access to the contacts and in which the sealing does not depend on the use of O-rings or elastomeric materials

3.6
clearance

the shortest distance through air between two conducting parts

3.7
creepage distance

the shortest distance between two conducting parts along the surface of the insulating parts

4 Concept of Zone 2

The concept of Zone 2, as defined in the introduction and supplemented by considerations described in Part 2 of this code, has been developed on the basis of flammable gases, vapours or liquids, whether processed, handled or stored, being so well under conditions of control that an explosive gas/air mixture is not likely to occur, and if it occurs it will only exist for a short time.

As a consequence of this foreseeably low probability with which an explosive gas/air mixture can be expected to occur in Zone 2, a satisfactory level of safety can be achieved therein by using apparatus in accordance with the concept of type of protection N.

5 Description of technique

Electrical apparatus that is certified or assessed to be in accordance with the requirements of type of protection N is designed and constructed so that it is not capable under normal operating conditions of igniting a surrounding explosive atmosphere, and that any fault capable of causing ignition is not likely to occur.

It is, therefore, implicit in the design of apparatus complying with type of protection N that the apparatus *shall not in normal operation*:

a) produce an arc or spark, unless:

1) the operational arc or spark occurs in an enclosed-break device which, when subjected to tests for explosion transmission in specified hydrogen/oxygen/nitrogen gas mixtures, remains undamaged, shows no sign of excessive burning of the contacts, and prevents transmission of the internal ignition to the external atmosphere; *or*

2) the operational arc or spark has insufficient energy to cause ignition of a hydrogen/air gas mixture under specified test conditions; *or*

3) the operational arc or spark occurs in a hermetically sealed enclosure;

b) develop a surface temperature or hot spot capable of causing ignition of an external explosive atmosphere.

NOTE 1 Sliding contacts are considered to be sparking in normal operation.
NOTE 2 The type tests indicated in items a) 1) and a) 2) are specified in BS 4683-3.
NOTE 3 The requirement indicated under item b) applies to all surfaces, both internal and external, with the exception of surfaces which are protected by an enclosed-break device, a hermetically sealed enclosure or a restricted-breathing enclosure. Use of these protective techniques permits therefore unlimited temperature increase internally, subject only to satisfactory limitation of the external surface temperature of the enclosed-break device, the hermetically sealed enclosure or the restricted-breathing enclosure.
NOTE 4 The concept outlined in item a) 2) is intended for use only in Zone 2, and provided the sparking component can be shown to be non-incendive, fault conditions need not be considered, unlike the requirements for intrinsically safe apparatus used in Zone 1 systems.

6 Relevant specifications

6.1 BS 4683-3 applies generally to apparatus with type of protection N.

NOTE The preparation of an international recommendation for apparatus with type of protection N is under consideration.

BS 4683-3 supersedes an earlier guide, BS 4137, which will eventually be withdrawn from use.

6.2 Where standards for particular types of apparatus have been published, these should be used. BS 4533-2.1 and BS 5000-16 are currently available for luminaires and rotating machines respectively.

NOTE BS 4533-2.1 is a revision of an earlier specification with the same number which was entitled "Lighting fittings for Division 2 areas".

7 "Division 2 approved" apparatus

Although the Zone 2 concept has been developed over a period of several years (see for example CP 1003-3) the commensurate British Standards for electrical apparatus intended specifically for use in Zone 2 have not been available until comparatively recently. Prior to the issue of these standards, therefore, it was not possible to obtain certification for apparatus in accordance with type of protection N. Apparatus was authorized for use in Zone 2 on the basis of a "letter of no objection" issued by HM Factory Inspectorate.

A "letter of no objection" to the use of a specific type of apparatus was issued on the basis of assessment, with tests where necessary, against the specifications that were available at the time, either draft or published, and in particular against BS 4137 (see **6.1**). This form of authorization became known as "Division 2 approval", and many types of apparatus were marked accordingly (see Appendix A). With the introduction of specifications for apparatus with type of protection N, the certification of apparatus by BASEEFA superseded authorization by HM Factory Inspectorate, though the latter may still "approve" the use of apparatus in certain special cases.

Whilst apparatus approved under the earlier system was designed in accordance with principles which form the basis for the design of apparatus with type of protection N, and is considered equivalent, there are nevertheless certain detailed differences (see Appendix B).

NOTE Apparatus with type of protection N should be used in preference to "Division 2 approved" apparatus, except where no direct equivalent is available. The conditions of use of "Division 2 approved" apparatus, except that the apparatus is not normally marked with a symbol for the temperature classification, are generally similar to those for apparatus with type of protection N. The user should therefore determine the suitability of the apparatus for use with the particular combustible gas or vapour which may be present (see Appendix B).

Section 2. Selection of apparatus

8 General

The factors which affect the selection of electrical apparatus for hazardous areas are described in detail in section 2 of Part 1 of this code. The specific factors which should be considered when apparatus with type of protection N is used are described in the remaining clauses of this section.

9 Permissible Zone of use

Apparatus with type of protection N is suitable for use in Zone 2 only.

NOTE For portable apparatus see **26.1** of Part 1:1976 of this code.

10 Temperature classification

10.1 All apparatus with type of protection N is marked with a symbol indicating its temperature classification (see Appendix A). The maximum temperature appropriate to the temperature class should not exceed the ignition temperature of the flammable gas or vapour expected to be present in the hazardous area, or the lowest value of ignition temperature if more than one flammable gas or vapour are present. The temperature class of apparatus is determined according to the results of temperature measurements made under normal operating conditions, and with recognized overloads, if any. For certification purposes in the UK, normal operating conditions include the rated value of voltage of the apparatus, plus or minus 6 %, this being the permissible tolerance in the level of supply voltage.

10.2 Generally, an ambient temperature of 40 °C is assumed in the rating of electrical apparatus for use in hazardous areas. Higher temperatures should be, and in exceptional cases lower temperatures may be, taken into account in determining the rating of the apparatus. In that event, the value of the peak ambient temperature will be clearly marked on the apparatus.

NOTE The certification will be invalidated if the apparatus is used at an ambient temperature higher than that for which the certification applies.

10.3 Motors complying with the requirements of BS 5000-16 are designed so that the temperature of any external or internal surface to which the explosive atmosphere has access will, under normal conditions, excluding starting, not exceed 200 °C (temperature class T3).

Where the motors are intended for use in areas where gases or vapours having an ignition temperature below 200 °C may occur, temperature classes T4, T5 or T6 will apply and in such cases this should be advised to the motor manufacturer who should clearly indicate this fact on the rating plate.

In cases where a motor is intended to operate under duty cycle conditions the appropriate temperature class (T3, T4, T5 or T6) should not be exceeded for the whole of the duty cycle period, including starting, if this is part of the duty cycle. Where a motor is started frequently (say a number of times each day on a regular basis) account should be taken of the temperature reached during the starting period in assessing the temperature class. In making this assessment the number of starts in quick succession and the motor temperature before starting should be taken into account.

11 Apparatus subgrouping

11.1 Apparatus with type of protection N is not normally subject to apparatus subgrouping (see Part 1 of this code) and may therefore be used safely with all flammable gases and vapours subject to the factors described in clauses **10** and **12**.

11.2 Apparatus protected by two or more techniques which include type of protection N may however not necessarily be suitable for all gases and vapours. In such cases the apparatus should be selected according to the apparatus group to which the flammable materials which may be present are allocated (see Part 1 of this code).

11.3 There may be exceptional cases where apparatus does not comply fully with the requirements of type of protection N but which, subject to the limitation of the range of flammable gases and vapours with which it may be used, nevertheless can be shown to be safe for use in Zone 2. In such cases the certification or assessment documents will indicate the gases or vapours in which the apparatus may be used (see Appendix A).

12 Environmental conditions

When selecting apparatus, special care should be taken to ensure that the apparatus and its component parts are constructed so as to guard against electrical and mechanical failure in the intended conditions of use.

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 Part 1 of this code and the impact test requirements in the relevant apparatus specifications for type of protection N).

13 Requirements for certification of apparatus

See sections 6 and 7 of Part 1 of this code.

Section 3. Installation recommendations

14 General

Apparatus with type of protection N should be installed in accordance with the general installation requirements described in Part 1 of this code, and with the following clauses of this section which apply in particular to this apparatus.

15 Wiring systems

15.1 Choice of system. The types of wiring system recommended for installations of apparatus with type of protection N in Zone 2 are as follows.

a) Any of the types of wiring specified in Part 1 of this code.

b) Any other standard armoured or unarmoured industrial wiring system provided that the conductors are insulated and adequately protected throughout their length against mechanical damage. Mechanical protection of, for example, PVC insulated cable, can in some cases be adequately provided by plastics conduit or trunking. Where the risk of mechanical damage is negligible, the plastics sheath of a cable may in itself be sufficient.

NOTE Where it is required that a conduit or ducting system is used in conjunction with a restricted-breathing enclosure, it will be necessary to ensure that the complete system complies with the requirements for restricted breathing (see Appendix C). Alternatively, a suitable sealing device should be provided near the entry of the conductors to the apparatus, to ensure that the restricted-breathing properties of the enclosure are maintained.

15.2 Installation of conduit systems

NOTE For information on the use of conduit systems with restricted-breathing apparatus see the note to **15.1**.

15.2.1 Metallic conduit systems for apparatus with type of protection N should be installed in accordance with the recommendations described in Part 1 of this code.

15.2.2 Plastics conduit systems should be of adequate mechanical strength and be supported throughout their length.

15.2.3 For plastics conduit systems the plastics materials should be suitable for use in the particular environment concerned, account being taken of thermal, mechanical and chemical factors, particularly corrosive and solvent agents.

15.3 Installation of ducting and trunking systems

NOTE For information on the use of ducting or trunking systems with restricted-breathing apparatus see the note to **15.1**.

15.3.1 Ducting and trunking systems should be installed taking account of the precautions outlined in Part 1 of this code.

15.3.2 Metallic ducting and trunking should be adequately bonded throughout its length and earthed.

15.3.3 Ducting or trunking systems should be of adequate mechanical strength and be supported throughout their length.

15.3.4 For plastics ducting or trunking systems the plastics materials should be suitable for use in the particular environment concerned, account being taken of thermal and chemical factors, particularly corrosive and solvent agents.

15.4 Installation of cables. Cables should be installed in accordance with the recommendations in Part 1 of this code, account being taken of the following requirements concerning cable entries.

15.4.1 The arrangements given in this clause apply to the sealing between the gland and the cable. The seal between the gland body and the apparatus should be such as to maintain the recommended degrees of protection of the terminal enclosure, and soft sealing washers should be used where necessary.

Connections of cables to apparatus should be effected by means of cable glands suitable for the cable used and for the environment. For non-restricted-breathing enclosures in outdoor situations, or in indoor situations which are wet or dusty, the gland design should be such as to maintain IP54 degree of protection of the terminal enclosure; in other indoor situations the gland design should be such as to maintain a minimum of IP30 degree of protection of the enclosure. For all restricted-breathing enclosures the gland designs should be such as to maintain the restricted-breathing properties of the enclosure.

NOTE 1 A compressible washer sealing on to the taped bedding of a cable may not provide an acceptable seal for a restricted-breathing enclosure because of the non-circular nature of the bedding.

NOTE 2 For information on the coded classification for degrees of protection, see Appendix A of Part 1:1976 of this code.

15.4.2 Unused cable entries should be closed with plugs which maintain the degrees of protection of enclosure recommended in **15.4.1**.

15.5 Conductor terminations

15.5.1 Any special requirements given in the certification documents or by the manufacturer of the apparatus for the connection of conductors to the apparatus terminals should be followed.

Where the conductors are to be connected directly to terminals they should be clamped, without reducing their cross section; in such a manner so that they are secured from loosening or twisting, and so that the contact pressure is permanently maintained. Alternatively, they may be connected indirectly by means of cable lugs or closed spade terminations that incorporate mechanical means for securing the conductor.

15.5.2 The means adopted to ensure the non-sparking features of the terminations should be maintained during installation.

Care should be taken in the installation of conductors to ensure that stranded conductors have no loose strands in order that the specified creepage and clearance distances are maintained.

15.5.3 Where single-screw saddle clamps are used with a single conductor, the conductor should be U-shaped, around the screw, to allow for correct operation of the clamping device.

15.5.4 Certain terminals such as slot types may permit the entry of more than one conductor. Where more than one conductor is connected to the same terminal, care should be taken to ensure that each conductor is adequately clamped. Unless permitted by the certification documents, two conductors of different cross sections should not be connected into one terminal unless they are first secured within a single compression type ferrule.

15.5.5 To avoid the risk of short circuits between adjacent conductors in terminal blocks the insulation of each conductor should be maintained up to the metal of the terminal.

Section 4. Inspection, maintenance and testing

16 General

The safe and satisfactory operation of electrical apparatus with type of protection N is dependent on a high standard of inspection, maintenance and testing by trained and competent personnel.

The general recommendations for inspection, maintenance and testing are described in Part 1 of this code and apply equally to this Part. The requirements in the following clauses of this section apply particularly to apparatus with type of protection N.

17 Tests

Restricted-breathing enclosures should be tested after installation, and periodically thereafter, in accordance with the test requirements described in Appendix C.

NOTE This test need not be applied to installations of luminaires designed in accordance with BS 4533-2.1.

18 Initial and periodic inspections

All electrical apparatus, systems and installations should be inspected prior to commissioning and after replacement in accordance with the “Initial” column of the inspection schedule (see Table 1).

Following any repair, adjustment or modification, those parts of the installation which have been disturbed should be checked in accordance with the relevant items in the “Initial” column of the inspection schedule.

All apparatus, systems and installations should be inspected regularly in accordance with the “Periodic” column of the inspection schedule.

If at any time there is a change in the area classification, or in the characteristics of the flammable material used in the area, or if the apparatus is moved from one location to another, a check should be made to ensure that the apparatus has the correct apparatus group (see **A.3**) and temperature class (see **A.4**), and continues to comply with the area classification.

A system should be established to record the results of all inspections and the action taken to correct defects.

19 Maintenance

The requirements of clause **29** of Part 1 of this code dealing with isolation apply generally to apparatus with type of protection N.

19.1 No alteration which might invalidate the certificate or other document relating to the safety of the apparatus should be made to apparatus with type of protection N without appropriate approval.

19.2 Where dry cells are used in the protected apparatus, care should be taken to ensure that replacement cells are of the correct type and voltage.

19.3 If an enclosed-break device is known to be faulty, or is suspected of being faulty, the device should be discarded from further service in hazardous areas. It should be replaced by a new component of equivalent design and characteristics that is certified or assessed to be in accordance with BS 4683-3. On no account should an enclosed-break device be repaired or renovated for further service in hazardous areas.

19.4 Rotating machines should be maintained such that the requirements of BS 5000-16 are not violated.

19.5 Where there is a requirement for working on apparatus in the energized condition (e.g. for disconnecting, maintenance, adjustment or testing), as may be the case for certain low power instrumentation systems, such apparatus may be worked on when energized if one or more of the conditions described in **9.5.1** to **9.5.3** is satisfied.

19.5.1 The work consists of minor routine external adjustments which, by virtue of the design of the apparatus, do not cause the production of ignition capable sparks or ignition capable hot surfaces.

19.5.2 The work is undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapour being present while the work is being performed.

19.5.3 A safety assessment has shown that the proposed work on an energized apparatus or system of the design concerned does not lead to ignition capable sparks or ignition capable hot surfaces either within the apparatus itself or within any part of any circuit located in a hazardous area with which it is interconnected.

The results of the safety assessment should be recorded in documents which should contain:

a) the form(s) which the proposed work on energized apparatus may take;

b) the results of the assessment, including the results of any testing carried out during the assessment;

c) any conditions in association with the maintenance of energized apparatus which the assessment has shown to be necessary.

The assessors of the equipment should:

d) be familiar with the requirements of any relevant standards, the recommendations of any codes of practice and any current interpretations;

e) have access to all information necessary to carry out the assessment;

f) where necessary, utilize similar test apparatus and test procedures to those used by national authorities.

20 “Division 2 approved” apparatus

20.1 Existing installations of “Division 2 approved” apparatus should be maintained in accordance with the recommendations of this Part of this code.

20.2 Where reasonably practicable, replacement parts and fittings should be certified or approved in accordance with type of protection N.

20.3 Extensions and additions to existing installations of “Division 2 approved” apparatus should be made where possible using apparatus and associated equipment certified or assessed with type of protection N.

Table 1 — Inspection schedule for apparatus with type of protection N

Check that:	Inspection category[a]		Notes
	Initial	Periodic	
Apparatus is appropriate to area classification	A	B	
Surface temperature class is correct	A	B	
Apparatus group (if any) is correct	A	B	
Apparatus carries the correct circuit identification	A	B	Apparatus must be positively identified with its circuit to ensure that correct isolation can be carried out.
Enclosures are satisfactory and undamaged	A	A	
There are no unauthorized modifications	A	A	
Bolts, glands and stoppers are complete and tight	A	A	
There is no undue accumulation of dust or dirt	B	B	Accumulation of dust or dirt can interfere with heat dissipation and result in surface temperatures higher than those permitted in the hazardous area.
Earthing is satisfactory	A	A	
Condition of enclosure gaskets is satisfactory	A	B	
Enclosed-break and hermetically sealed devices are undamaged	A	B	
Electrical connections are tight	A	B	
Motor air gaps and other running clearances are satisfactory	B	B	
Lamp rating and type are correct	A	B	An “initial” inspection is necessary after re-lamping.
Electrical protection is satisfactory	A	A	
Stopper boxes and cable boxes are correctly filled	A	B	
There is no leakage of compound from stopper or cable boxes	B	B	
There is no obvious damage to cables	A	A	
Apparatus is adequately protected against corrosion, the weather, vibration and other adverse factors	A	A	
Guards, where used, are present and correctly located	A	B	

[a] Category A inspections should be carried out in all cases and, where “periodic”, at intervals not exceeding two years. More frequent and/or more detailed inspection will be necessary where there is a corrosive or other adverse atmosphere, a high risk of mechanical damage or vibration, or where there are other onerous circumstances. The need for more frequent inspection may also be determined by operating experience.

The need for, the method, and the frequency of category B inspections is at the discretion of the engineer responsible. It is not intended that periodic inspections should incur undue disturbance of apparatus unless considered necessary by the engineer responsible.

Appendix A Marking of apparatus

A.1 General

All electrical apparatus certified or assessed to be for use in hazardous areas will be marked with particulars which are prescribed in the specification for the type of protection used. The marking is intended to assist the rapid identification of the apparatus, so as to promote its safe use, both initially after installation and subsequently during service, on account of the appropriate maintenance procedures.

The marking requirements normally include general information relevant to the use of the apparatus, and such additional information as is necessary to ensure its safe use in hazardous areas. Typical marking requirements are discussed in Part 1 of this code. For completeness, the marking requirements are included here without discussion, except where detailed explanation is required on account of considerations which are particularly relevant to type of protection N.

A.2 Marking requirements

The marking requirements normally include general information relevant to the use of the apparatus and such additional information as:

a) identification of the manufacturer, trade agent's name or registered trade mark;

b) the name or type designation of the apparatus;

c) the number of the relevant British Standard, or other certification standard, e.g. BS 4683-3;

d) identification of the type of protection; apparatus certified or assessed in accordance with the concept of type of protection N will be marked "Ex N";

e) the apparatus group (see **A.3** and **A.5**);

f) the number of the certificate or assessment document and the name or the mark of the certifying or assessment authority;

g) the temperature class, or maximum surface temperature (see **A.4**);

h) the reference ambient temperature, if this is other than 40 °C;

i) any other relevant information; this will include rating data, etc.

A.3 Apparatus grouping

A.3.1 Apparatus with type of protection N will normally be marked with the symbol II, to indicate its suitability for use in surface industry with all combustible gases and vapours encountered therein.

The apparatus will not normally therefore be allocated to a subgroup of group II (see Part 1 of this code). However, the possibility of marking apparatus having type of protection N, in the future, with a subgroup symbol, should not be discounted.

A.3.2 There may be certain cases where apparatus is certified, or assessed as being in accordance with type of protection N, but only for certain flammable gases or vapours. In these circumstances the apparatus may be clearly marked accordingly.

Alternatively, the marking may refer specifically to the certification or assessment documents. A suffix /B or /X after the certificate number may be used for this purpose.

A.4 Temperature class

Apparatus with type of protection N will normally be marked with a symbol selected from the range T1 to T6 inclusive, to indicate its temperature class. (See **A.6**, and Part 1 of this code.)

This symbol is indicative of the maximum temperature reached by unprotected surfaces, measured where necessary under prescribed conditions, and must be taken into account when the suitability of the apparatus for use in Zone 2 with particular combustible gas or vapour is being considered.

A.5 Apparatus with multitypes of protection

Some types of apparatus may be protected by two or more types of protection, one of which is type of protection N. In such cases the marking should indicate the types of protection used. The mark "Ex" will be followed by the symbol or symbols of the other types of protection used.

e.g. Ex N, d; *or* Ex N (d).

This marking indicates certified electrical apparatus protected overall by type of protection N, which will determine the installation requirements for the apparatus, and incorporating a component part or parts that are protected in accordance with type of protection "d": flameproof enclosure.

A.5.1 Individual circuits and component parts which are protected other than by type of protection N should also be marked individually with the appropriate symbol to assist in their ready identification for inspection and maintenance purposes. They should be maintained in accordance with the recommendations of the Part of this code appropriate to the type of protection used.

A.5.2 It may be anticipated that increasingly in the future apparatus will incorporate multitypes of protection. This will increase the possibility of apparatus grouping.

A.6 Example of marking

Apparatus with type of protection N might be marked thus:

Ex N II T3

This indicates that the apparatus may be used in Zone 2 with all combustible gases and vapours whose ignition temperatures are not less than the maximum surface temperature of 200 °C, indicated by the symbol T3.

Appendix B Comparison between type of protection N and "Division 2 approved" apparatus

B.1 General

The development of specifications for apparatus with type of protection N in Zone 2 has led to certain divergencies from the earlier requirements for "Division 2 approved" apparatus. The main differences are indicated in the following clauses of this appendix.

B.2 Temperature class

Apparatus with type of protection N is classified according to its maximum surface temperature, as indicated in Appendix A. This is not the case with "Division 2 approved" apparatus, which is limited to a maximum surface temperature of 200 °C. Particular care should be taken, therefore, in areas where combustible gases or vapours having ignition temperatures less than 200 °C may be present (see BS 4137) and where "Division 2 approved" apparatus is installed.

NOTE The combustion characteristics, including ignition temperatures, are listed for a number of combustible gases and vapours in section 5 of Part 1 of this code.

B.3 Impact test

The impact test requirements for apparatus with type of protection N are more severe than those for "Division 2 approved" apparatus.

B.4 Enclosed-break device

Enclosed-break devices in accordance with type of protection N are tested in hydrogen/oxygen/nitrogen gas mixtures to demonstrate a factor of safety of 1.5 in respect of flame transmission through joints, to establish their suitability for use in all gases.

Enclosed-break switches in accordance with "Division 2 approved" apparatus, however, were tested for flame transmission in hydrogen/air gas mixtures only, with no safety factor, although there was no restriction on their subsequent use.

B.5 Restricted breathing

The test for restricted breathing is described in Appendix C. Whereas for "Division 2 approved" apparatus the time for the under-pressure or over-pressure to change between the prescribed limits was a minimum of 30 s, this has been increased to a minimum of 3 min for restricted-breathing enclosures in accordance with type of protection N.

Appendix C Test for restricted breathing

C.1 Restricted-breathing enclosures designed to the requirements of BS 4683-3 incorporate provision for checking that their restricted-breathing properties are maintained after installation.

Proof of compliance with the requirements for restricted breathing is established by demonstrating that, under constant temperature conditions, the time interval required for an internal pressure of 3 000 Pa[2)] below atmospheric pressure to change to 1 500 Pa below atmospheric pressure is not less than 3 min. Where the design of the enclosure is such that the rate of breathing is independent of whether the test pressure within the enclosure is above or below atmospheric pressure, then the required interval of 3 min can be taken as that required for a pressure of 3 000 Pa above atmospheric pressure to fall to 1 500 Pa above atmospheric pressure.

C.2 For luminaires in accordance with BS 4533-2.1, the test requirement is as specified in **C.1** except that only the first of the alternative tests (i.e. under-pressure test) is permitted.

[2)] 1 Pa = 1 N/m^2 ≈ 0.1 mm water gauge.

Publications referred to

BS 4137, *Guide to the selection of electrical equipment for use in Division 2 areas.*

BS 4533, *Electric luminaires (lighting fittings).*

BS 4533-2, *Detail requirements.*

BS 4533-2.1, *Luminaires with type of protection "N".*

BS 4683, *Electrical apparatus for explosive atmospheres.*

BS 4683-3, *Type of protection N.*

BS 5000, *Rotating electrical machines of particular types or for particular applications.*

BS 5000-16, *Type N electric motors.*

BS 5345, *Code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture).*

BS 5345-1, *Basic requirements for all Parts of the code.*

BS 5345-2, *Classification of hazardous areas*[3)].

BS 5345-3, *Installation and maintenance requirements for electrical apparatus with type of protection "d". Flameproof enclosure.*

BS 5345-4, *Installation and maintenance requirements for electrical apparatus with type of protection "i". Intrinsically safe apparatus and systems.*

BS 5345-5, *Installation and maintenance requirements for electrical apparatus with type of protection "p". Pressurization and continuous dilution*[3)4)].

BS 5345-6, *Installation and maintenance requirements for electrical apparatus with type of protection "e". Increased safety*[4)].

BS 5345-8, *Installation and maintenance requirements for electrical apparatus with type of protection "s". Special protection*[3)4)].

BS 5345-9, *Installation and maintenance requirements for electrical apparatus with type of protection "o". Oil-immersed apparatus, and with type of protection "q". Sand-filled apparatus*[3)4)].

BS 5345-10, *Installation and maintenance requirements for electrical apparatus for use with combustible dusts*[3)].

BS 5345-11, *Specific industry applications*[3)4)].

BS 5345-12, *The use of gas detectors*[3)4)].

CP 1003, *Electrical apparatus and associated equipment for use in explosive atmospheres of gas or vapour other than mining applications.*

CP 1003-1, *Choice, installation and maintenance of flameproof and intrinsically safe equipment.*

CP 1003-2, *Methods of meeting the explosion hazard other than by the use of flameproof or intrinsically safe electrical equipment.*

CP 1003-3, *Division 2 areas.*

[3)] In course of preparation.
[4)] Referred to in Introduction only.

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