BS 5502-23:2004

Buildings and structures for agriculture —

Part 23: Fire precautions — Code of practice

ICS 13.220.20; 65.040.01

BSI British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Committee B/549, Agricultural buildings and structures, upon which the following bodies were represented:

British Commercial Glasshouse Manufacturers' Association

British Precast Concrete Federation Ltd.

British Veterinary Association

Cold Rolled Sections Association

DEFRA — Department of the Environment, Food and Rural Affairs

Environmental Agency

Fibre Cement Manufacturers' Association Ltd.

Galvanizers' Association

HSE — Health and Safety Executive

Institution of Structural Engineers

Northern Ireland Department of Agriculture and Rural Development

Royal Institute of British Architects

Royal Institution of Chartered Surveyors

Rural Design and Building Association

Silsoe Research Institute

Steel Construction Institute

The Scottish Executive — Environment and Rural Affairs Department

Water UK

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Contents

Foreword

This British Standard has been prepared by Technical Committee B/549. It supersedes BS 5502-23:1990 which is withdrawn.

This code of practice is primarily concerned with the safety of persons and livestock, but also includes recommendations for the protection of property. It is intended for use for buildings not covered by UK Building Regulations [1], [2], [3]. Compliance with this British Standard may demand technical/constructional provisions of a higher standard than are generally considered satisfactory.

This revision incorporates changes introduced as a result of the new series of European Standards covering methods of test for determining fire performance and fire detection, and fighting equipment specifications (see Clause **2**). These European Standards have been mandated to support the Construction Products Directive (CPD) [4], an EU Directive which seeks to remove technical barriers to trade within the European Economic Area (EEA) and which is supported by the use of CE marking. CE marking confirms that products meet the technical requirements of European Standards. In the UK, the CPD was implemented by the Construction Products Regulations [5], which came into force on 27 January 1991 and were amended on 1 January 1995 by the Construction Products (amendment) Regulations 1994.

Products conforming to the new European Standards will have their fire performance classified in accordance with the new European methods of test. For most products covered by the new European Standards a transition or overlap period will exist between the publication of the new European Standard (BS EN) and the withdrawal of the existing national standard (BS). This transition period exists in order to allow equivalence of performance to be determined, national regulations to be changed, where necessary, and manufacturers to bring their products into line with the new standards. During the transition period existing national fire performance requirements for materials and products will run in parallel with the new provisions. Where possible, these new provisions have been introduced into the revision of this code of practice. Annex A gives further background information about this process.

BS 5502 is issued in the following broad parts:

— *Part 0: Introduction and consolidated index*;
— *Parts 10 to 19: Reference information and legislation*;
— *Parts 20 to 39: General design*;
— *Parts 40 to 59: Livestock buildings*;
— *Parts 60 to 79: Crop buildings*;
— *Parts 80 to 99: Ancillary buildings*.

More specifically, the general design series comprises:

— *Part 20: Code of practice for general design considerations*;
— *Part 21: Code of practice for selection and use of construction materials*;
— *Part 22: Code of practice for design, construction and loading*;
— *Part 23: Code of practice for fire precautions*;
— *Part 24: Code of practice for energy management*;
— *Part 25: Code of practice for design and installation of services and facilities*;
— *Part 30: Code of practice for control of infestation*;
— *Part 31: Guide to waste management*;
— *Part 32: Guide to noise attenuation*;
— *Part 33: Guide to control of odour pollution*;
— *Part 34: Guide to control of dust*;
— *Part 35: Guide to control of gases and vapours*.

It has been assumed in the drafting of this part of BS 5502 that the execution of its provisions is entrusted to appropriately qualified and experienced people.

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

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

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

Attention is drawn to the following statutory regulations: Building Regulations England and Wales [1], Scotland [2], Northern Ireland [3], Construction Products Regulations [5], Fire Precautions Act [6].

NOTE The Fire Safety Order [7], to be implemented in 2004, could influence the recommendations given in this code.

Summary of pages

This document comprises a front cover, an inside front cover pages i to iv, pages 1 to 17 and a back cover.

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1 Scope

This part of BS 5502 gives recommendations for the fire precautions for single storey agricultural buildings and structures which are not covered by building regulations, and which are used for the purposes of horticulture, crop and livestock farming. This part of BS 5502 is not applicable to those buildings used for the storage of explosives or commercial quantities of chemicals.

2 Normative references

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

BS 476-3:2004, *Fire tests on building materials and structures — Part 3: Classification and method of test for external fire exposure to roofs.*

BS 476-6, *Fire tests on building materials and structures — Part 6: Method of test for fire propagation for products.*

BS 476-7, *Fire tests on building materials and structures — Part 7: Method of test to determine the classification of the surface spread of flame of products.*

BS 476-20, *Fire tests on building materials and structures — Part 20: Method for determination of the fire resistance of elements of construction (general principles).*

BS 476-21, *Fire tests on building materials and structures — Part 21: Methods for determination of the fire resistance of loadbearing elements of construction.*

BS 476-22, *Fire tests on building materials and structures — Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction.*

BS 476-23, *Fire tests on building materials and structures — Part 23: Methods for determination of the contribution of components to the fire resistance of a structure.*

BS 750, *Specification for underground fire hydrants and surface box frames and covers.*

BS 2782-1:Method 140D, *Methods of testing plastics — Part 1: Thermal properties — Method 140D: Flammability of a test piece 550 mm × 35 mm of thin polyvinyl chloride sheeting (laboratory method).*

BS 2782-1:Method 140E, *Methods of testing plastics — Part 1: Thermal properties — Method 140E: Flammability of a small, inclined test piece exposed to an alcohol flame (laboratory method).*

BS 3251, *Specification — Indicator plates for fire hydrants and emergency water supplies.*

BS 5266 (all parts), *Emergency lighting.*

BS 5306-0, *Fire extinguishing installations and equipment on premises — Part 0: Guide for the selection of installed systems and other fire equipment.*

BS 5306-1, *Fire extinguishing installations and equipment on premises — Part 1: Hydrant systems, hose reels and foam inlets.*

BS 5306-2, *Fire extinguishing installations and equipment on premises — Part 2: Specification for sprinkler systems.*

BS 5306-3, *Fire extinguishing installations and equipment on premises — Part 3: Maintenance of portable fire extinguishers — Code of practice.*

BS 5499-1, *Graphical symbols and signs — Part 1: Safety signs, including fire safety signs. Specification for geometric shapes, colours and layout.*

BS 5502-25, *Buildings and structures for agriculture — Part 25: Code of practice for design and installation of services and facilities.*

BS 5502-52, *Buildings and structures for agriculture — Part 52: Code of practice for design of alarm systems, emergency ventilation and smoke ventilation for livestock housing.*

BS 5502-81, *Buildings and structures for agriculture — Part 81: Code of practice for design and construction of chemical stores. Code of practice for design and construction of chemical stores.*

BS 5839-1, *Fire detection and alarm systems for buildings — Part 1: Code of practice for system design, installation and servicing.*

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition.*

BS 7807, *Code of practice for design, installation and servicing of integrated systems incorporating fire detection and alarm systems and/or other security systems for buildings other than dwellings.*

BS 7974, *Application of fire safety engineering principles to the design of buildings — Code of practice.*

BS EN 3 (all parts), *Portable fire extinguishers.*

BS EN 671-1, *Fixed fire fighting systems — Hose systems — Part 1: Hose reels with semi-rigid hose.*

BS EN 1365-1, *Fire resistance tests for loadbearing elements — Part 1: Walls.*

BS EN 1365-2, *Fire resistance tests for loadbearing elements — Part 2: Floors and roofs.*

BS EN 1365-3, *Fire resistance tests for loadbearing elements — Part 3: Beams.*

BS EN 1365-4, *Fire resistance tests for loadbearing elements — Part 4: Columns.*

BS EN 1634 (all parts), *Fire resistance tests for door and shutter assemblies.*

BS EN 1869, *Fire blankets.*

BS EN 12845, *Fixed firefighting systems — Automatic sprinkler systems — Design, installation and maintenance.*

BS EN 13501-1:2002, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests.*

BS EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item.*

BS EN ISO 1182, *Reaction to fire tests for building products — Non-combustibility test.*

3 Terms and definitions

For the purposes of this part of BS 5502, the following terms and definitions apply.

3.1
area
<any part of a roof> area normal to the slope

3.2
area
<storey of a building> total area bounded by the inner finished surfaces of the enclosing wall or, on any side where there is no enclosing wall, by the outermost edge of the floor on that side

3.3
boundary
border between land under the same occupation as the building and land under a different occupation

NOTE Where a building faces a farm dwelling a notional boundary is assumed to pass between them, so situated as to enable adjacent sides and external walls of both buildings to conform to the recommendations of this code of practice or the Building Regulations [1], [2], [3], as applicable.

3.4
cavity
any concealed space or hidden void within a building which could provide a ready route for smoke or fire spread, e.g. spaces in roof construction and cavities in walls

3.5
cavity barrier
physical barrier or seal designed to restrict the passage of smoke and/or the spread of fire

3.6
compartment wall
wall constructed between compartments to achieve a stated period of fire resistance and which is imperforate, except for openings fitted with self-closing doors or shutters having the same period of fire resistance as the wall

3.7
element of structure
any member of a structural frame, external wall, separating wall, compartment wall, loadbearing wall, or gallery

3.8
fire hazard
physical situation with a potential for harm to persons and livestock, or damage to property, or both, from the effects of fire

3.9
fire risk
probability that a damaging fire will occur as the result of the existence of a fire hazard

3.10
fire stop
seal that closes an imperfection of fit between elements, components or construction in a building, or any joint, so as to restrict penetration of smoke and flame through the imperfection or joint

3.11
height
<of a building, for the purpose of fire considerations> vertical height from ground level to half the height of the roof in a pitched roof building, or to the top of the roof or parapet (whichever is the higher) in a flat roof building

3.12
protected area
part of the external walls constructed to achieve the required period of fire resistance

4 Fire hazard

4.1 General

Fire hazard and means of escape should be assessed during the early stages of the building design process (see BS 5588-0), as remedial action can be difficult to achieve. In order to protect persons and livestock in or about agricultural buildings, to limit the extent of fire spread both within a building and to adjacent buildings, and to preserve buildings and their contents, the factors that should be considered in relation to fire hazard are:

a) general design of the building;

b) type and quantity of materials used in the construction;

EXAMPLE When selecting insulating materials for farm buildings and structures, a balance should be achieved between cost savings and the fire hazards involved. This balance can be particularly difficult to attain because of the following:

— in uninsulated buildings there is an increased tendency to house livestock under straw covered kennels with a corresponding increase in fire hazard;

— if insulating foams are used in a building, increased quality of electrical installation may be required.

c) the level of workmanship achieved;

d) the intended uses and contents of the building;

e) the activities likely to take place in the building;

f) any fire precautions that may have been taken;

g) the perceived risk of arson (fire setting).

It is important to consider that an alteration in the use of a building may change its potential fire hazard.

NOTE For further information on fire hazard see BS 6336.

4.2 Fire safety engineering

Fire safety engineering takes into account the total fire safety package and can provide a more fundamental and economic solution to fire safety design than the more prescriptive approaches to fire safety. At present the fire safety engineering approach is mainly applicable to large and complex building structures in which high levels of engineering design are required. However, one of the principle advantages of the fire safety engineering approach is that it allows passive fire performance requirements to be offset against the use of active fire protection systems such as fire detection, alarm and extinguishing systems.

If the fire safety engineering approach is used for agricultural buildings and structures, the framework for developing a rational methodology for design of buildings in BS 7974 should be applied. Further guidance and information on how to undertake detailed analysis of specific aspects of fire safety engineering can be obtained in the PD 7974 series of documents.

4.3 Hay and straw storage

It is essential that the fire hazard posed by hay and straw, highly combustible materials when dry, should not be ignored or forgotten when assessing fire hazards and means of escape for agricultural buildings and structures. The heat radiation from burning hay or straw in bulk is intense and can ignite combustible materials some distance away.

5 General fire precautions

5.1 Access for fire fighting

Clear access should be provided for fire fighting appliances to all hydrants and other water sources on farms, and hard standings should be provided. The name board of the farm should be clearly displayed beside the nearest public road access.

5.2 Separation and compartmentation

Consideration should be given to the siting of new farm buildings at suitable distances from other buildings and, where appropriate, to the compartmentation of new, or existing buildings, for which a change of use is being considered, so as to limit the spread of fire from one building or compartment to another, in particular where livestock accommodation is concerned. Guidance for some special purpose buildings is given in Table 4.

The compartment floor area of any farm building or structure should not exceed 1 800 m^2. Where practicable, the floor area of any mechanically ventilated compartment intended to house livestock on combustible bedding should not exceed 500 m^2. Where larger compartments are planned, the possible consequences of a fire should be fully considered and the appropriate fire authority and insurance company should be consulted at an early stage in the planning.

5.3 Emergency escape routes for livestock

Emergency escape routes should be provided for all housed livestock. Acute turns, obstructions and ramps in the escape routes should be avoided. As far as possible without compromising security, all doors on escape routes should be fitted with quick release mechanisms that allow rapid opening in emergency. Where animals are tethered, the tethers should also be fitted with quick release mechanisms that allow rapid opening in emergency. Pen doors should be arranged so that livestock can be evacuated quickly.

The total length of the escape route for any animal in the building should not exceed:

— 30 m in length where the building is wholly constructed of non combustable materials; or

— 15 m in length where any part of the building is constructed of combustable materials or where constructed of non combustable materials but readily combustable materials such as hay and bedding are also stored within it.

Buildings housing considerable numbers of stock should have a minimum of two exits as far apart as possible conforming with the distances of travel set out above.

5.4 Emergency lighting

Adequate emergency lighting should be provided to illuminate escape routes in the event of the main supply failure (see also **8.1**).

5.5 Smoke venting

As smoke is a major hazard during fire, both to humans and animals seeking escape, and to fire fighters, consideration should be given at the design stage to providing smoke venting for all large farm buildings over 500 m^2. Intensive livestock buildings should be equipped with a smoke venting system designed in accordance with BS 5502-52.

NOTE Advice on the design and siting of smoke ventilators may be obtained from the appropriate fire authority.

5.6 Use of flammable building materials

Building materials which are highly flammable or which produce dense smoke or toxic fumes during combustion should not be used Chemical stores should be designed in accordance with BS 5502-81.

5.7 Bedding and other flammable materials

Storage of bedding materials within a livestock building is desirable from a farm management standpoint, but it creates a fire hazard. When bedding is to be stored, increased quality of electrical installation may be required.

5.8 Electrical installations

5.8.1 *General*

All electrical installations should be carried out in accordance with BS 5502-25 and BS 7671. Electrical installations, including lamps, should be cleaned regularly to avoid the build-up of dust.

5.8.2 *Quartz halogen discharge filament lamps*

Quartz halogen discharge filament lamps should be securely fitted at a minimum height of 4 200 mm above the floor level, correctly positioned and adjusted so as to avoid subjecting the operator to blinding from direct light.

WARNING Quartz halogen discharge filament lamps are also a fire and explosion hazard, particularly in atmospheres containing dust and floating particles (e.g. from straw storage or feeding).

5.9 Heating installations

All gas fired heating installations should be carried out in accordance with BS 5502-25.

Heaters should be positioned and secured so that they are kept at a safe distance from flammable bedding material.

NOTE Heaters are the most common cause of piggery fires and additional consideration may need to be given to reducing this hazard.

6 Structural fire protection of low risk single storey buildings

6.1 General

The structural fire protection of high risk buildings should be in accordance with the recommendations of Clause **7**.

6.2 Fire performance

The fire performance of building materials, components and elements of low risk single storey buildings should be determined by either of the two approaches, described in Table 1: the BS method (BS 476-21 and BS 476-22) or the BS EN method (BS EN 1365).

PD 6520 provides a summary of the BS 476 series of methods of test.

Table 1 — Methods of measuring fire performance of building materials, components and structures

Component/element	BS method	BS EN method
Loadbearing elements, external and compartment walls	BS 476-20, -21, -22 and -23 Fire resistance; load bearing capacity, integrity, and insulation	BS EN 1365-1, 2, 3, and 4, prEN 1365-5 and -6[a] Fire resistance; load bearing capacity, integrity, and insulation. ES FR Class REI[b]
External cladding (excluding roofs)	BS 476-21, -22 Limited combustibility Class 0 or fire propagation	BS EN ISO 1182 BS EN 13823 (SBI)[c] ES Class A1, A2-s3,d2 or B-s3, d2[d]
External roof covering	BS 476-3 BS 2782-1: Method 140D or 140E Fire penetration and surface ignition	Not yet determined
Fire doors	BS 476-20, -21, -22 or -23 Fire resistance Integrity	BS EN 1634-1, -2[e] ES FR Class E[b]
Internal lining surfaces	BS 476-7 Surface spread of flame	BS EN 13823 (SBI)[c] No ES class determined

[a] prEN 1365-5 and -6, draft European Standards, are in preparation.
[b] The European methods classify load bearing capacity, integrity and insulation as R, E, I respectively. Initial comparison tests between the existing national method for determining fire resistance and that of the European methods, indicates that the European harmonized methods give approximately 10 % to 15 % shorter times for fire resistance compared with results from the existing BS methods.
[c] SBI = Single Burn Item.
[d] As the European harmonized reaction to fire methods do not mirror the existing national standards, direct comparisons are not possible. (See Annex A.)
[e] prEN 1634-2 is in preparation.

NOTE European classifications for reaction to fire are set out in BS EN 13501-1. European classifications for fire resistance are set out in BS EN 13501-2.

6.3 Components and elements

6.3.1 *External walls, compartment walls and load bearing elements of structure*

6.3.1.1 The fire resistance of load bearing elements and any part of the external wall of an agricultural building which because of its proximity to a boundary would be required to have a protected area if building regulations were applied, should be as given in Table 2 when tested in accordance with BS 476-21 or BS 476-22, or the appropriate part of BS EN 1365. Special purpose buildings may demand longer fire resistance (see **7.2**).

NOTE Permitted limits of unprotected areas for external walls are covered by the Building Regulations [1], [2], [3], purpose group industrial.

Table 2 — Fire resistance of load bearing elements, compartment walls and external walls

Maximum floor area m^2	Minimum period of fire resistance min
500	30
1 000	60
3 000	120
No limit	240

6.3.1.2 Except for single storey uncompartmented buildings not exceeding 15 m in height and 500 m^2 floor area, any external wall which:

a) is within 1 m from a boundary; or

b) exceeds 15 m in height

should be constructed of materials of limited combustibility (see Annex A), except for any cladding (see **6.3.2**). The external wall should be constructed so that its fire resistance is attained by the non-combustible part alone.

6.3.1.3 The floor areas in Table 2 may be doubled for buildings fitted throughout with an automatic sprinkler system meeting the recommendations of BS 5306-2 or BS EN 12845. [See also Approved Document B (Fire Safety) [8] to the Building Regulations as amended 2002]. Further advice should also be sought.

6.3.2 ***External cladding***

Any external cladding which is within 1 m from a boundary or on a building which exceeds 15 m in height should be class 0. Where a building exceeds 15 m in height and is 1 m or more from a boundary, any cladding below 15 m in height may consist of timber not less than 9 mm thick or of a surface which, when tested in accordance with BS 476-6, has an index of performance not exceeding 20 or Euroclass A1.

6.3.3 ***Roofs***

6.3.3.1 No part of the roof of an agricultural building should be constructed so as to have a designation inferior to AA, AB, AC, AD, BA, BB or BC, when tested in accordance with BS 476-3:2004, or be covered with thatch or shingles, unless special additional fire precautions are provided, e.g. external sprinkler system of drenching, underlining with 30 min materials, smoke alarms in the roof space, etc.

6.3.3.2 The area of any part of a roof which is designated BA, BB or BC when tested in accordance with BS 476-3:2004 should be at least 6 m from any point on a boundary.

6.3.3.3 Any part of a roof which is designated AD, or covered with thatch or shingles, should be at least 12 m from any point on a boundary unless such part is:

a) of an area not exceeding 3 m^2; and

b) separated from any other part so designated by an area of roof at least 1.5 m wide and covered by material of limited combustibility, when it should be at least 6 m from any point on a boundary.

6.3.3.4 If any part of a roof cannot be designated in accordance with BS 476-3:2004 on account of the low softening temperature of its covering material, that part should be at least 12 m or twice the height of the building (whichever is the greater) from any point on a boundary unless that part is:

a) of an area not exceeding 3 m^2; and

b) separated from any other such part by an area of roof at least 1.5 m wide and covered by material of limited combustibility, when it should be at least 6 m from any point on a boundary.

6.3.3.5 None of the information given in **6.3.3.1** to **6.3.3.4** is intended to prevent any part of a roof being constructed of glass or rigid PVC sheeting that cannot be designated under BS 476-3:2004. If used, such PVC sheeting should be tested in accordance with:

a) BS 2782-1:Method 140D when the distance of travel of the flame should not be more than 75 mm; or

b) BS 2782-1:Method 140E when:

1) the specimen should not flame or glow for more than 5 s;

2) any material dropped from the specimen should not continue to burn after reaching the base of the test apparatus;

3) charting or scorching should not extend over more than 20 % of the area of the underside of the specimen; and

4) the length of the charred or scorched edge on the underside of the specimen should not be more than 50 mm.

Any part of such a roof should:

— be at least 6 m from any point on a boundary; or

— from any point on a boundary, be the roof of a building not exceeding 40 m^2 floor area.

6.3.3.6 Any roof structure, other than the roof of a glasshouse or of a building not exceeding 40 m^2 floor area, with an area exceeding 1 000 m^2 should be constructed so as to have a designation of AA, AB or AC when tested in accordance with BS 476-3:2004.

Any roof structure, other than the roof of a glasshouse, with an area not exceeding 1 000 m^2 and constructed so as to have a designation lower than AA, AB or AC when tested in accordance with BS 476-3:2004 should be separated from other roof structures with similar designations by a clear distance of at least 3 m, or by a strip of roofing at least 3 m wide and designated AA.

6.3.4 *Cavity barriers*

Any cavity should be subdivided by a barrier so that there is no continuous cavity which in any one plane exceeds 20 m.

6.3.5 *Fire stopping*

All openings for pipes, ducts, conduits or cables to pass through any part of an element of structure (except if required to be fire-resisting only because it is load bearing) or cavity barrier should be kept as few and small as practicable and should be fire stopped. Any fire stops should allow for thermal movement (e.g. of pipes and ducts).

6.3.6 *Internal surfaces*

Internal surfaces of circulation spaces or restricted escape spaces should be class 0 (see Annex A and Building Regulations, Approved Document B, appendix A, Clause 12 [8]) or Euroclass A2-s3, d2. Any building, other than a livestock or high fire risk building (see Clause **7**), which has been categorized as design class 1 in BS 5502-22, due to the human occupancy factor, should have internal surfaces of at least a class 1 spread of flame rating when tested in accordance with BS 476-7 or Euroclass C-s3, d2 when classified in accordance with BS EN 13501-1. Rooflights in rooms and circulation spaces may have a lower fire performance but not lower than class 3.

NOTE The application of a thin film to the face of some thermoplastic or similar materials to achieve class 1 spread of flame rating may under certain fire conditions add to the fire hazard.

7 Livestock and special purpose buildings

7.1 Livestock buildings

7.1.1 Any part of an external wall of a building with livestock accommodation which is within 3 m from any other building on the farm, and that other building is greater than 7.5 m in height to the eaves, or 150 m^2 floor area, should be constructed so that, except for suitable ventilation openings extending for not more than 300 mm below eaves level or 900 mm where no forced ventilation system is used, it has a period of fire resistance of at least 30 min.

NOTE Attention is drawn to the exempted buildings under the Building Regulations for England and Wales, 1985, Schedule 2 "Exempt buildings and work" [1], and in particular to class III, and The Building Standards (Scotland) Regulations 1990 (as amended), Part A, Schedule 1 "Exempted classes of buildings" [2].

7.1.2 Livestock buildings should be constructed according to the classifications given in Table 3 or Euroclass F in BS EN 13501-1:2002.

NOTE The classifications are based on the type of stock, form of housing, and chances of escape or rescue in a fire situation.

Rooflights in rooms and circulation spaces may have a lower fire performance than those given in Table 3 but not worse than class 3. Confined escape routes should have internal surfaces of class 0 (see Annex A) or Euroclass F in accordance with BS EN 13823.

7.2 Special purpose single storey buildings and compartments

Any building or compartment which is designed for the storage of flammable materials, except hay or straw (see **7.3**), or for the operation of equipment likely to cause a special fire hazard to surrounding structures should be separated from any other building or compartment or from a boundary by the distances listed in Table 4, or by the provision of a compartment wall of such fire resistances, as listed in Table 4. Roofs of high fire risk buildings or compartments should be constructed so as to have a designation of AA when tested in accordance with BS 476-3:2004 and no internal wall or ceiling surface should have a spread of flame rating inferior to class 1 when tested in accordance with BS 476-7.

7.3 Hay and straw stores

Where possible hay or straw stores should be 6 m from other buildings or boundaries. Roofs of these stores should have a designation of AA when tested in accordance with BS 476-3:2004 Where necessary electric cable should be protected against possible damage during stacking and unstacking of the crop, and any light fittings should be positioned clear of the likely stacking height of the crop.

Any hay or straw storage in livestock housing should be the minimum necessary for efficient management. Any storage arranged above the livestock should be on a solid platform, with minimum 30 min fire resistance.

"NO SMOKING" notices should be displayed in the vicinity of all hay and straw stores (see BS 5588 and BS 5499), and where practicable, precautions should be taken against unauthorized entry, especially by children.

7.4 Workplaces

All working areas in agricultural buildings should be provided with adequate means of escape consisting of escape routes and exits of sufficient number and design as to enable occupants to reach a safe area in the event of fire.

Travel distance should be considered relative to layout, plant and machinery, working conditions (e.g. vehicle pits) and other factors. As a guide, travel distance should be limited to 18 m to a single exit and 30 m where there are two or more exits in direction 45° or more apart.

Consideration should be given to the internal surfaces of walls and ceilings in order to limit the spread of flame in the event of fire.

Table 3 — Fire performance of roof coverings and internal linings of livestock buildings

Livestock accommodation	Designation of roof covering (BS 476-3:2004)	Spread of flame rating (BS 476-7)	
		Wall	Ceiling
Group 1			
Animals closely confined, and difficult to rescue, e.g. poultry, pigs and calves			
a) Layout permits use of bedding or litter close to wall	AA, AB, AC	Class 1	Class 1
b) Layout precludes use of bedding or litter closer than 1 m to wall	AA, AB, AC	Class 3	Class 1
c) Layout designed specifically to obviate the use of bedding or litter	AA, AB, AC	Class 3	Class 3
Group 2			
Animals confined but in larger areas with exits so arranged that animals have a reasonable chance of rescue, e.g. loose-housed cattle and sheep	AA, AB, AC	Class 3	Class 3
Group 3			
Animal shelters with free access to safe area	Any permitted designation in accordance with this standard	Class 3	No requirement

Table 4 — Special purpose buildings and compartments

Type of building or compartment	Fire resistance of compartment wall (internal or external) min	Alternatively, minimum separation from other buildings or boundary m
Liquid or gaseous fuel storage[a]	120	12
Chemical stores	60	6
Mechanical crop drying	60	6
Furnace or boiler room	60	6
Maintenance workshops	60	6
Feed grinding and preparation	30	3
Brooders and incubators	30	3

[a] Above ground fuel storage tanks should have a bund capable of holding the contents of the tank(s) plus 10 %.

Internal surfaces to workplaces of floor areas less than 30 m^2 should be at least class 3 and for areas greater than 30 m^2 should be at least class 1, provided that where rooflights are class 3 they should be limited to 20 % of the floor areas and evenly distributed with a maximum area of 5 m^2 for any rooflight with a minimum of 1.8 m separation of materials of limited combustibility and at least 6 m from any point on the boundary.

The advice of insurers and/or the local Fire Prevention Officer should be sought at an early stage in the design of buildings or their proposed alteration or adaptation.

8 Fire detection and extinguishing systems

8.1 General

The selection and use of fire detection and extinguishing systems should be considered in the context of a complete building and in accordance with BS 5306-0, taking account of its use and other measures taken to reduce fire hazard.

Most types of fire and smoke detection equipment and systems are designed for use in controlled environments, such as dwellings, shops and offices, and may not be suitable for agricultural applications, particularly in livestock environments.

NOTE As fire and smoke detection systems specific to farming use are not currently available, the advice of the appropriate fire authority and/or insurance company should be sought before installing a system.

All fire detection and alarm systems should be installed and maintained in accordance with BS 5839-1. Emergency lighting, when required, should be installed in accordance with BS 5266.

8.2 Portable equipment

8.2.1 *Fire blankets*

Fire blankets may be of particular use in confined spaces and for containing small fires particularly when oil or fat is burning. Fire blankets should conform to BS EN 1869 and should be located near to any potential source of fire hazard and by a convenient exit.

8.2.2 *Fire extinguishers*

Suitable portable fire extinguishers, conforming to BS EN 3 should be installed and maintained according to the recommendations given in BS 5306-3.

The type, fire rating and size of portable fire extinguisher should be carefully selected according to the likely hazard (see BS 5603-0). It may be necessary to have more than one type available for different sources of fire. It should be remembered that although portable fire extinguishers can be effective in extinguishing small fires they are generally ineffective in fully developed fire situations.

NOTE The bodies of all extinguishers are coloured red but have a colour coding on the front to indicate their type, e.g. water: all red, foam: pale cream, powder: blue, carbon dioxide: black and vapourizing liquid: green. The later type (green) also includes halon type extinguishers which are now being removed from use.

8.3 Fire hose reels

Where mains water at adequate pressures is available (see also **8.5**) consideration should be given to the provision of hose reel equipment. Hose reels should conform to BS EN 671-1 and be installed and maintained in accordance with BS 5306-1.

Underground fire hydrants and surface box frames and covers should conform to BS 750 and should be installed in accordance with BS 5306-1. Hydrants and water sources should be clearly marked by indicator plates conforming to BS 3251.

The provision of an efficient hydrant system and hose reels should not obviate the installation of portable fire extinguishers as the latter can provide the best means of rapidly extinguishing a small fire before it has taken hold and before a hose reel can be brought into action.

8.4 Sprinkler and fixed extinguishing systems

Consideration should be given to the benefits offered by the use of automatic fire suppressions systems; the most probable choice being a system using water, such as a sprinkler system designed and installed in accordance with BS 5306-2 or BS EN 12845 (see **6.3.1.3**).

Modern sprinkler systems use less water than those used in the past and provide significant levels of protection to both livestock and buildings. Large indoor riding schools are particularly suited for sprinkler protection especially if they contain significant quantities of exposed timber.

Fixed system installed sprinklers using extended coverage, fast response heads should be used to provide rapid detection and quick suppression or control.

NOTE 1 Such systems can assist in countering the serious increase in deliberately set fires in agricultural and equine premises which have occurred in the last 10 years (in 2000, half of all fires in such premises were deliberately set).

NOTE 2 It should be noted that sprinklers not only detect, warn about and control or extinguish a fire but also enable an alert to be sent to the fire service. Properly designed sprinklers may also minimize the resultant water damage from a fire and can significantly reduce contamination of watercourses, etc. by fire run-off.

8.5 Static water tanks

Where the mains water supply is inadequate and suitable natural sources of water are not available, consideration should be given to the provision of a static water tank or tanks. These should have a capacity of at least 20 000 l, and be sited not less than 6 m and not more than 100 m from the farm buildings they are intended to protect. The overall height of the tank should be not more than 1.2 m above ground level to enable the suction hose from the pump to be easily dropped into the tank. Tanks should be fenced or covered for safety.

8.6 Fire detection equipment

8.6.1 *General*

Intensive livestock buildings should be equipped with fire detection which should be installed in accordance with BS 5839-1 and BS 7807. Most types of fire and smoke detection equipment and systems are designed for use in buildings such as dwellings, shops and offices and may not be suitable in livestock environments unless adequate precautionary measures are taken. Flame detectors, detectors based on sensing carbon monoxide (CO) together with heat, and low sensitivity aspirating smoke detection systems may be suitable for installation in livestock buildings. In certain livestock buildings, a diversified fire risk may point towards the use of a mix of detection technologies.

Equipment, including detectors, their mounting bases, junction boxes and cabling, installed in livestock buildings is likely to suffer a more rapid degradation due to environmental conditions, e.g. corrosive and humid atmospheres, or mechanical damage than when used in commercial or residential buildings. It is, therefore, important that regular maintenance schedules taking this into account should be implemented for fire detection and alarm systems in livestock buildings.

8.6.2 *Flame detectors*

Flame detectors are capable of responding quickly to small flaming fires and are suited to livestock environment as they can be supplied in a housing with a high degree of protection for outdoor use. As they rely on receiving electromagnetic radiation, flame detectors should be positioned such that they have an unmasked view of the protected risk.

Ultraviolet flame detectors can be used in some livestock buildings. However, they are prone to giving false alarms from lighting as well as heating equipment that are often use in such buildings. Furthermore, the ability of ultraviolet detectors to see a flame can be significantly degraded by the presence of atmospheric contaminants in the air, e.g. smoke, as well as by contaminants deposited on the viewing window.

Infrared flame detectors offer good detection range. They can be affected by false alarms due to electric heating equipment and direct or reflected sunlight. Solar blind multi-wavelength detectors that are capable of analysing electromagnetic radiations in more than one waveband and, hence, effectively discriminate between flame and non-flame radiation should be used as they can greatly reduce, and potentially eliminate, this false alarm risk.

Flame detectors that combine both ultraviolet and infrared sensing offer a compromise between detection sensitivity and false alarm risk and should only be used in accordance with their manufacturer's recommendations.

As unwanted alarms can occur due to the detection of real flames from direct-fired gas or oil heaters, flame detectors should be sited appropriately and heaters should be masked.

NOTE The need for masking will vary depending on the sensitivity of the detectors used and the type and size of the heaters.

On-site tests in individual installations may be necessary. Wherever possible the heater should be positioned in such a way that its flame is not in the direct line of sight of the flame detector. Where this cannot be achieved, masking should be used when the heaters are closer to the detectors than 6 m. Masking can be provided by means of suitably sized shields placed between the heater and the flame detector. The shields should be placed at least 2 m from the heaters.

8.6.3 *CO and heat detectors*

CO fire detectors are capable of sensing the development of incipient fires in situations where fires may develop very slowly due to a restricted source of oxygen. CO fire detectors can give a very early warning of fires and enable livestock to be evacuated before the concentration of poisonous CO gas becomes life threatening.

NOTE An example of such a situation is fires started by self-combustion in densely packed bales of hay.

CO fire detectors combined with heat detection also provide the ability to respond to faster developing fires.

The performance of CO fire detectors can be affected by contamination due to the presence of substances other than CO. The presence of ammonia can saturate the filters used in CO fire detectors based on electrochemical cells, thus presenting a reduction in their service life. Hydrocarbon gases such as methane can contaminate CO detectors based on catalytic principles. The frequency of routine maintenance visits and replacement of detector heads should be increased to take into account potential contamination of the detectors.

As CO fire detectors can signal the presence of the early development of fire before human beings can sense it through other fire indicators such as smoke or smell from other gases, this should be taken into account when investigating an alarm signal from CO fire detectors before a suitable response is enacted.

8.6.4 *Aspirating detection systems*

Aspirating detection systems can be used in certain livestock buildings as an effective means of detecting smoke emanating from smouldering fires or fire involving the pyrolysis of electrical cables.

Aspirating detection systems use small diameter pipes with suitably spaced holes for drawing samples of air from the protected space. The air sample is analysed by an aerosol-sensing unit that determines whether a pre-determined alarm threshold has been reached. One advantage of such systems is that the sensitive electronic unit can be installed in a suitable control room, leaving only mechanical components in the protected livestock area.

Aspirating systems can be set to be very sensitive. However, it is recommended that, for livestock buildings, only low sensitivity systems be used to minimize the risk of false alarms from dust and other aerosols that may normally be present in the environment. Aspirating systems incorporate a filter assembly to prevent the larger dust particulates reaching the aerosol-sensing unit. Filters should be cleaned regularly or replaced, the frequency of which should be assessed against each specific livestock environment.

Whenever smoke detection is used there is a risk of false alarm from occasional bonfires. Where bonfires near the protected livestock buildings cannot be avoided, it is recommended that the detection system be temporarily inhibited, ensuring that it is re-instated when safe to do so.

9 Warning and safety signs

All high risk areas should display a safety warning notice to this effect. All safety and fire safety signs should be in accordance with BS 5499-1.

"NO SMOKING" notices should be displayed in the vicinity of all hay and straw stores, chemicals (see BS 5502-80) and fuel (see BS 5502-25) stores. Where practicable, precautions should be taken against unauthorized entry, especially by children.

Annex A (informative)
European classification of fire performance of construction materials and products

The Construction Products Directive (CPD) was introduced into UK legislation in 1991. The aim of the Directive is to allow CE marked products, namely those conforming to the mandated performance requirements listed in annex ZA of new European standards, to be placed freely on the market throughout the EEA.

NOTE 1 Guidance information issued by the Commission can be accessed through either the Commission's website or through the ODPM site on www.odpm.gov.uk/bregs/cpd/index.htm.

As the fire performance of materials and products is one of the major considerations under the CPD, a new series of European methods of test for determining the fire resistance of structures and reaction to fire performance of materials and products has been developed. These European Standards are in the process of being issued as national standards throughout the EEA. In the case of the UK, a transition/overlap period (period of co-existence) exists before equivalent existing national standards are withdrawn. This period provides time for a change over to the requirements of the CPD and the European Standards or technical approvals supporting them. The transition period should enable producers, importers, and distributors of construction products to phase the change over to products meeting the new specifications. The period of co-existence in relation to the European fire tests has not yet been definitively defined.

NOTE 2 The first set of fire tests were introduced through Amendments 2002 to Approved Document B (Fire safety) to the Building Regulations 2000 for England and Wales and the 6th Amendment to Part D (Structural Fire Precautions) of The Building Standards (Scotland) Regulations 1990 (as amended).

The new fire performance classifications for the reaction to fire performance of construction materials and products and the fire resistance of construction components and elements are given in the EN 13501 series of standards described in Table A.1.

Table A.1 — European fire classification test methods

Standard identifier	Title
BS EN 13501-1:2002	Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests
BS EN 13501-2:2003	Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests (excluding products for use in ventilation systems)
EN 13501-3[a]	Fire classification of construction products and building elements — Part 3: Classification using data from fire resistance tests systems and services
EN 13501-4[a]	Fire classification of construction products and building elements — Part 4: Fire resistance of smoke control systems
EN 13501-5[a]	Fire classification of construction products and building elements — Part 5: External fire exposure to roofs

[a] In preparation.

The recommended transpositions between the existing reaction to fire methods and the new European classification for reaction to fire are:

British Standard	Euroclass
Non-combustibility	A1
Limited combustibility	A2-s3, d2
Class 0	B-s3, d2
Class 1 spread of flame	C-s3, d2
Class 3 spread of flame	D-s3, d2
Unclassifiable and/or no performance determined	F

NOTE 3 When a classification includes "s3, d2", there is no limit set for smoke production and/or flaming droplets/particles.

These recommendations are in line with those in the Building Regulations Approved Document B (Fire safety) as amended 2002 [8], and reference should be made to Table 10 (Classification of linings) of this Approved Document.

It should also be noted that as the Euro classification methods of test vary considerably from the existing BS tests, it should not be assumed that products perform in an equivalent way unless they have been tested accordingly.

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Standards publications

BS 5502-22:2003, *Buildings and structures for agriculture — Part 22: Code of practice for design, construction and loading.*

BS 5502-80:1990, *Buildings and structures for agriculture — Part 80: Code of practice for design and construction of workshops, maintenance and inspection facilities.*

BS 5588 (all parts), *Fire precautions in the design, construction and use of buildings.*

BS 6336:1998, *Guide to development and presentation of fire tests and their use in hazard assessment.*

EN 1365-5[1)], *Fire resistance tests for loadbearing elements — Part 5: Balconies and walkways.*

EN 1365-6[1)], *Fire resistance tests for loadbearing elements — Part 6: Stairs.*

BS EN 13501 (all parts), *Fire classification of construction products and building elements.*

PD 6520:1988, *Guide to fire test methods for building materials and elements of construction.*

PD 7974 (all parts), *Application of fire safety engineering principles to the design of buildings.*

Other documents

[1] GREAT BRITAIN. Building Regulations (England and Wales) 2000. London: The Stationery Office. www.tso.co.uk/bookshop

[2] GREAT BRITAIN. Building Standards (Scotland) Regulations 1990. Edinburgh: The Stationery Office. www.tso.co.uk/bookshop

[3] NORTHERN IRELAND. Building Regulations (Northern Ireland) 2000. Belfast: The Stationery Office. www.tso.co.uk/bookshop

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[6] GREAT BRITAIN. Fire Precautions Act 1971. London: The Stationery Office. www.tso.co.uk/bookshop

[7] GREAT BRITAIN. (Proposal for the) Regulatory Reform (Fire Safety) Order 2004. London: The Stationery Office. www.tso.co.uk/bookshop

[8] GREAT BRITAIN. Building Regulations, Approved Document B. Fire Safety. London: The Stationery Office. www.tso.co.uk/bookshop

[1)] Currently still a draft but will be published soon.

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