British Standard

BRITISH STANDARD

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Packaging code —

Section 6: Protection of metal surfaces against corrosion during transport and storage —

Subsection 6.2 Temporary protectives and their application

Committees responsible for this British Standard

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Engineering Equipment and Materials Users' Association
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Foreword

This Subsection of BS 1133 was prepared under the direction of the Packaging and Freight Containers Standards Policy Committee. It constitutes a revision of sections C and D of the 1966 version of BS 1133-6 and brings information on temporary protectives and their application up-to-date.

Information regarding the cleaning and drying of metal surfaces in preparation for the application of a temporary protective is published as Subsection 6.1 and constitutes a revision of sections A and B of the 1966 version of BS 1133-6. It is envisaged that performance standards for temporary protectives contained in section E of the 1966 version of BS 1133-6 will be revised and published as a separate British Standard specification for temporary protectives; with its publication, BS 1133-6:1966 will be superseded and therefore withdrawn.

BS 7195 gives information regarding a source of corrosion not covered by BS 1133-6.

The information given in this Subsection is intended as a general guide and does not cover specific requirements for which specialist advice should be sought.

BS 1133 now consists of the following sections all of which are published separately, with the exception of Sections 1 to 3, which are published in one volume.

— *Sections 1 to 3: Introduction to packaging*;

— *Section 4: Mechanical aids in package handling*;

— *Section 5: Protection against spoilage of packages and their contents by micro-organisms, insects, mites and rodents*;

— *Section 6: Protection of metal surfaces against corrosion during transport and storage*;

— *Subsection 6.1: Cleaning and drying of metal surfaces*;

— *Subsection 6.2: Temporary protectives and their application*;

— *Section 7: Paper and board wrappers, bags and containers*;

— *Subsection 7.1: Wrapping papers*;

— *Subsection 7.2: Bags and envelopes*;

— *Subsection 7.3: Cartons and boxes;*

— *Subsection 7.4: Fibreboard drums*;

— *Subsection 7.5: Fibreboard cases*;

— *Subsection 7.6: Moulded pulp packaging;*

— *Subsection 7.7: Composite containers;*

— *Section 8: Wooden containers*;

— *Section 10: Metal containers*;

— *Section 12: Methods of protection against shock (excluding cushioning devices);*

— *Section 13: Twines and cords for packaging*;

— *Section 14: Adhesive closing and sealing tapes;*

— *Section 15: Tensional strapping*;

— *Section 16: Adhesives for packaging*;

— *Section 18: Glass containers and closures;*

— *Subsection 18.1: Terminology;*

— *Section 19: Use of desiccants in packaging*;

— *Section 21: Regenerated cellulose film, plastics films, aluminium foil and flexible laminates;*

— *Section 22: Packaging in plastics containers;*

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, 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.

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0 Introduction

Many metal articles have to be transported and stored, sometimes for long periods, and are then used with their working surfaces in the bare state. Unless these surfaces are protected between manufacture and use, most of them will rust and corrode owing to the effect of humidity or polluted atmospheres. The materials used for such protection are called temporary protectives as they provide protection primarily for the transportation and storage period; the significance of the term "temporary" lies not in the duration of the efficacy of the protective but in the fact that it can easily be removed so that the protected surfaces can if necessary be restored to their original state. Desiccants, which provide protection which is temporary in this sense and is also of limited duration, are dealt with in BS 1133-19.

Non-working surfaces that might corrode and need to be safeguarded against corrosion during use, should be covered with more durable materials like paints and varnishes. This Subsection of BS 1133 deals only with temporary protection against corrosion.

NOTE Coatings should be applied only to clean and moisture-free surfaces, otherwise their effectiveness may be reduced or even nullified. Information on cleaning is given in BS 1133-6.1 and CP 3012.

Corrosion prevention and subsequent packaging should be considered together. The policy advocated in this guide is to choose the protective to suit the article and provide an adequate standard of protection. Sometimes by the nature of the article the required standard of protection cannot be obtained with any of the listed materials and the subsequent packaging should then be specially chosen to supplement the protective. Apart from these instances, however, the purpose of a package is to prevent mechanical disturbance of the protective coating and to exclude abnormal influences (such as free water and salt spray) in addition to the general functions of preventing mechanical damage, facilitating handling, etc. It is bad practice to choose a package and then use temporary protectives to correct its deficiencies.

If severe conditions are expected, in transport or in storage, either at home or overseas, it may be necessary to use coatings of increased thickness and to provide extra packaging.

New and improved temporary protectives are continually being developed and it has been necessary to restrict the descriptions herein to established and proved methods and materials.

1 Scope

This Subsection of BS 1133 gives guidance on the selection, application and removal of a range of temporary protectives which may be used to protect metal surfaces against corrosion during transport and storage.

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

2 Definitions

For the purposes of this Subsection of BS 1133 the following definitions apply.

2.1
temporary protectives

materials used to protect metallic surfaces during transportation and storage and which are applied to the metallic surfaces or included in the package in proximity to those surfaces. They function by forming protective barriers or by some other appropriate action at the surface. They are readily removable by simple means such as wiping or stripping

NOTE 1 The significance of the term "temporary" lies in the ready removability of the protective and not in the duration of its efficacy. There is an important distinction between temporary protectives and the more permanent protectives such as paint, metallic coatings, etc. The latter are intended to remain on surfaces and to continue their function while the article is in use, whilst the former are intended for use during storage and transportation or during periods of inactivity. It is essential that temporary protective films should be readily removable from metal surfaces by the cold application of common solvents unless other simple methods can be used such as wiping (for grease) or stripping (for strippable coatings). Most of them can equally well be removed by the processes described in BS 1133-6.1.

NOTE 2 Certain protectives of the solvent-deposited types are so designed that they are not easily removable by common solvents. These materials are so formulated that the protective coatings which they deposit will be compatible with paint coatings subsequently applied, or may be removed by special solvents if necessary. Such protective materials will not strictly comply with the requirements for TP 1 or TP 2 and it is, therefore, important that when such materials are offered their characteristics are clearly stated, the manner in which they differ from bona fide temporary protectives is understood and the process for removal is explained.

NOTE 3 Desiccants (drying agents) are often used as a temporary corrosion-preventive device, but they are not included in these definitions. Their properties and uses are described in BS 1133-19.

2.2
film-forming temporary protectives

the protection that film-forming temporary protectives provide depends on the effectiveness of the corrosion inhibitor system present and the water resistance of the deposited film. Protection may be augmented by the provision of a suitable primary wrap

2.3
vapour phase corrosion inhibitors for atmospheric environments

materials placed on, against, or in suitably close proximity to metallic surfaces, so that by chemical processes they prevent or substantially reduce the rate of corrosion caused by access of moisture to the metallic surface. Their performance is strongly dependent on the ways and conditions in which they are used

WARNING. Specialist advice should be sought regarding the suitability of using vapour phase corrosion inhibitors for the protection of non-ferrous metals or materials of composite construction.

3 Classification of temporary protectives

3.1 General

Temporary protectives can be classified into the well-defined types summarized below. Further information on these types is given in Appendix A to Appendix L.

3.2 Type TP 1

Hard film, solvent-deposited, consisting of solutions of protectives, such as suitably plasticized resins, in volatile solvent and generally applied by dipping or spraying. On evaporation of the solvent a thin hard film of protective remains. There are three grades:

a) TP 1a quick drying;

b) TP 1b slow-drying;

c) TP 1c slow-drying, water-displacing.

Grade TP 1c is a variety of TP 1b having water-displacing properties. It can therefore be used to protect wet articles without previous drying by more conventional means.

3.3 Type TP 2

Soft-film, solvent-deposited, consisting of solutions of protectives such as lanolin in volatile solvent and applied by dipping or spraying. On evaporation of the solvent a thin soft film of protective remains.

There are two grades:

a) TP 2a ordinary grade;

b) TP 2b water-displacing grade.

Type TP 2b has water-displacing properties similar to those referred to in **3.2** c).

3.4 Type TP 3

Soft-film, hot dipping, giving a thick soft film of protective, usually based on petrolatum (sometimes called petroleum jelly or mineral jelly).

3.5 Type TP 4

Soft-film grease, normally applied by brushing or smearing to give a thick soft film. There are two grades:

a) TP 4a mineral oil base grease;

b) TP 4b castor or synthetic oil base grease.

Type TP 4a is a conventional type grease used as a protective while TP 4b is a grease of special composition for application to metal parts to which rubber is attached.

3.6 Type TP 5

Soft-film, semi-fluid, applied by brushing or swabbing to give films of medium thickness. They are usually based on solutions of suitable corrosion inhibitors (e.g. wool fat derivatives) in mineral oils or in mixtures of mineral oils and petrolatum.

3.7 Type TP 6

Oil film type consisting of lubricating oils containing soluble corrosion inhibitors, and generally applied by dipping, spraying or circulation and generally serving as lubricants as well as temporary protectives. There are two grades:

a) TP 6a oil type, general purpose protective;

b) TP 6b oil type, engine protective.

3.8 Type TP 7

Strippable hot dip coating consisting of ethyl cellulose and small amounts of mineral oil together with plasticizers, resins and stabilizers. It is applied by hot dip application to form tough impermeable films which can readily be stripped from the protected article.

3.9 Type TP 8

Strippable coating, cold applied, consisting of solutions of protectives such as vinyl copolymer resins, plasticizers and stabilizers in flammable or non-flammable solvents. They are usually applied by spraying, brushing, or dipping to form tough impermeable films which can readily be stripped from the protected article.

3.10 Type TP 9

Vapour phase corrosion inhibitors consisting of substances, the vapour of which will inhibit corrosion of ferrous metals.

3.11 Type TP 10

Contact inhibitors consisting of substances which when in contact with metallic surfaces will inhibit corrosion.

3.12 Type TP 11

Emulsifiable substances containing film forming materials, emulsifiers and coupling agents. These are applied by dipping, brushing or spraying. There are three grades:

a) TP 11a oil type;

b) TP 11b wax type;

c) TP 11c wax type.

4 Guide to the selection of temporary protectives

4.1 General

The selection of the most suitable protective for a metal surface depends on the following factors in the following order of importance:

a) the conditions to which the protected article is to be subjected;

b) the complexity of the article (whether simple part or assembly, presence of elastomer, oilways etc; delicate mechanisms);

c) the number of articles to be treated;

d) the available means of application;

e) the cost of the protective and its application;

f) the type of packaging to be used after the protective treatment.

These points are amplified in **4.2** to **4.7** and summarized in Table 1.

4.2 Conditions of exposure

Corrosion preventive compounds may be required to provide protection for short periods between processes within a factory environment, many months during transport abroad or years in a storage environment.

Compounds described in Appendix A to Appendix L, when applied to surfaces which have been properly prepared (see BS 1133-6.1), will afford protection during transport and storage for at least twelve months in a temperate or tropical climate. Storage life will be significantly reduced by exposure to rain, salt spray and contact with wet hay, wood wool or sawdust cushioning materials. A weather resistant building heated day and night provides the ideal environment in which to store protected articles for long periods.

Where protection against corrosion will of necessity meet particularly severe conditions or where outside exposure, without additional packaging, is involved, objective evidence of satisfactory performance in such an environment should be sought from manufacturers of the corrosion preventive compounds.

4.3 Complexity of article

The solvent-deposited protectives may not be suitable for some assemblies containing blind holes or crevices unless suitable care is taken. When solvent-deposited protectives are used for the protection of complex assemblies a number of problems may occur:

a) the film may drain away rapidly from enclosed or shielded surfaces because the solvent is slow to evaporate and the intended thickness of protective layer is not obtained;

NOTE Trapped solvent may constitute an explosive, fire or corrosion hazard.

b) the solution may spread out from capillary spaces on to neighbouring surfaces after packaging the article and thin out the protective layer there;

c) it is sometimes difficult to remove hard film solvent-deposited material before the article is used. Moreover, the presence of solvent in clearance and internal spaces is often undesirable at the time of use of an article.

Vapour phase corrosion inhibitors may be used to augment the above treatment. Threaded fasteners may be pregreased prior to coating the complete assembly.

A solvent free oil-type protective, TP 6 or a vapour phase corrosion inhibitor, TP 9, is a suitable choice for assemblies with extensive internal parts which should not be filled with protective but are not fully exposed, as in a fuel tank. Complicated enclosed mechanisms, like gear-boxes, lubrication systems, many instruments, etc., are best protected with the oil-type material. Soft-film solvent deposited or non-solvent-deposited temporary protectives with self repairing properties are useful where minor mechanical damage of the film is unavoidable.

Particularly complex articles sometimes justify departure from the above general plan or the use of special materials. Thus occasionally a simple article may have a recess, e.g. a small diameter threaded hole sufficiently complicated to justify using a soft-film protective, which it is not necessary to remove, rather than the hard-film one; some articles such as small screws, washers, etc., that would stick together if protected by hard-film material or would be difficult to handle if protected by petrolatum, can be dipped in oil, and then wrapped in a wax craft paper to supplement the relatively poor protective quality of the oil. On the other hand an assembly may allow a soft-film, solvent-deposited material to be used without the above mentioned disadvantages being serious enough to justify treatment with a different material from that being used in a run of simple articles.

Table 1 — Summarized guide on the selection of temporary protective (see **4.1** to **4.7**)

Type of article	Characteristics of article	Temporary protective
Simple parts	Small articles packed in quantity (where individual wrapping is impracticable), e.g. nuts, bolts, etc.	1. Oil film type (TP 6a) supplemented by outer wrapping 2. Vapour phase corrosion inhibitors (TP 9) 3. Emulsifiable materials (TP 11a, TP 11b)
	Parts of simple geometric shape	TP 1, TP 2, TP 3, TP 4a, TP 5, TP 6a, TP 7, TP 8, TP 9, TP 10, TP 11 TP 10 contact inhibitor is of special application for certain ferrous metal and zinc items
	Articles water-wet after cleaning or manufacture	Water-displacing, solvent deposited types (TP 1c, TP 2b). Emulsifiable materials (TP 11a, TP 11b)
	Metal parts with rubber attached	Castor or synthetic oil grease (TP 4b)
	Articles without any of the characteristics given above, e.g. simple hand tools, gear wheels, crankshafts, etc.	1. Hard-film, solvent deposited type (TP 1a, TP 1b) 2. Soft-film solvent deposited type (TP 2a) 3. Grease type if a drying time is unacceptable (TP 4a or TP5) 4. Strippable coating hot or cold applied types (TP 7 and TP 8) 5. Vapour phase corrosion inhibitor (TP 9) 6. Emulsifiable materials (TP 11)
Assemblies	Articles of low degree of complexity with large proporation of simple surface	Grease (TP 4a) on working surfaces and in crevices, then whole article coated with solvent-deposited protective (TP 1a, TP 1b, TP 2 and TP 8) or emulsifiable materials (TP 11a)
	Articles with internal surfaces difficult to access e.g. lubricating oil systems, engines, gear boxes, etc.	Oil-film type (TP 6a or TP 9)
	Delicate mechanisms	1. Oil-film type (TP 6a) supplemented by water and water-vapour resistant barrier 2. No temporary protective, water-vapour resistant package with desiccant
	Oily or greasy material not tolerable	1. No temporary protective, water-vapour resistant package with desiccant 2. Vapour phase corrosion inhibitor (TP 9) with sealed package
	Assemblies containing non-metallic components	The compatibility of plastics, rubbers, paints, etc. with the intended protective system should be established
	Articles without any of the characteristics given above	1. Soft, thick film type (TP 3) where hot dipping is appropriate 2. Grease type (TP 4a) where hand application is economical or no heat is available 3. Soft-film semifluid type (TP 5) where free application is required on large articles 4. No temporary protective; water and water-vapour resistant package with desiccant
Especially valuable simple parts or assemblies, particularly having precision external surfaces		Strippable coating (hot applied) (TP 7)

Where oil or grease is not tolerable, or where a complicated assembly is involved vapour phase corrosion inhibitors may be used; alternatively the item can be packed in a water-vapour resistant container with a desiccant (see BS 1133-19). However, specialist advice should be sought regarding the suitability of using vapour phase corrosion inhibitors for the protection of non-ferrous metals or materials of composite construction.

Complex assemblies which are not suitable for close packaging may be partially dismantled to facilitate protection; this is the case where the protective might contaminate a clutch or brake lining. Strippable hot-dip coating is frequently used to afford both mechanical and chemical protection of highly finished metal surfaces, e.g. gauges.

4.4 Number of articles

When large numbers of articles are being treated it is necessary to choose both the most economical material and the most economical method of application, justifying the installation of suitable tanks, heating arrangements, etc. When the numbers are small, however, as in a repair shop, or where items like gauges are returned to store after use, simple methods are appropriate, and as wide a range of items as possible should be coated with the protectives in use. Then, for example, brush application of grease may be appropriate for simple articles as well as assemblies.

4.5 Available means of application

The choice of protective is not often governed by the available means of application because in general these are simple. It is occasionally found, however that heat is not available for melting a petrolatum or strippable material, or that a fire risk makes unsuitable a material containing flammable solvent, or that a water-displacing material is necessary because there is no means of drying, etc.

4.6 Cost of protective and application

In choosing a protective the need for a comprehensive view of costs is stressed. The cost of the protective is small and is not therefore a good subject for economy when compared with the cost of the article to be protected and the overall cost of packaging. Other things being equal, whenever possible the chosen protective should be one which entails the least labour in application or removal.

4.7 Type of packaging to be used after the protective treatment

The type of packaging should be borne in mind when selecting the most appropriate protective. Certain synthetic packaging materials, such as low density expanded polystyrene, may degrade after contact with certain oils. The compatibility of packaging material and protective should be established prior to use.

5 Methods of application of temporary protectives

5.1 General

Factors to be noted when applying temporary protectives.

a) All temporary protectives are supplied ready for use, and no adjustment of composition is initially necessary.

b) Surfaces to be protected should be clean and dry (see BS 1133-6.1). An exception is where a water-displacing protective (TP 1c or TP 2b) is being used directly on a wet surface.

c) Clean articles should not be touched with bare hands before the application of the protective.

d) The temporary protective should coat all appropriate surfaces uniformly and continously. Application by dipping is the most suitable method whenever size, shape and composition of the parts and nature of the protective permit.

e) Articles should not be handled until the coating has attained the proper consistency or “set”. Arrangements should be made for drainage of solvent-containing materials and oil after dipping or spraying.

f) Ventilating and drying equipment will accelerate the removal of solvent from solvent-deposited films; any heat applied should be moderate to avoid flow of soft coatings.

g) Some of the temporary protectives or solvents used in a number of these materials as supplied are toxic or flammable.

NOTE Attention is drawn to the fact that precautions for these materials are governed by official regulations.

5.2 Dipping

5.2.1 *General procedure*

Articles or assemblies are submerged momentarily in a bath of the protective, turning as necessary to allow all trapped air to escape. The time of immersion in the protective need only be long enough to ensure complete wetting except with dewatering grades where adequate time should be allowed for water displacement. If the temporary protective contains a flammable solvent articles that have been heated should be allowed to cool before dipping.

When not in use, dipping baths should be covered to keep out dust and dirt, and prevent loss of solvent through evaporation. The solids contents of the bath should be checked from time to time by suitably qualified staff and the appropriate solvent added if the concentration of solids is more than (say) 20 % above the initial figure.

5.2.2 *Hot dipping*

In the application of hot-dip materials the articles to be dipped are immersed in a bath of the hot material whereupon a layer of the material is chilled onto the surface, the article being withdrawn with this layer adhering to it. The thickness of the coating depends mainly on the temperature of the material in the bath and the time of immersion. These parameters should be adjusted to obtain the requisite thickness on the articles being coated.

Multiple dipping of articles of high heat capacity may be required to allow a film of the requisite thickness to be built up. A cooling period will be required before re-dipping.

Care should be taken to ensure that the dipping bath is not cooled excessively especially if large articles are being coated. Monitoring of the bath temperature and short breaks in the dipping process to allow baths to return to the required temperature may be necessary. Failure to observe this practice can result in progressive deterioration of the thickness of coating achieved.

Small holes in complex articles will be blocked by the material during short immersion times. If, however, there are holes or capillary spaces which it is desired that the protective should fill, the articles should be left in the bath long enough for the initial chilled layer to re-melt, and for the protective to penetrate. If the article contains holes which the preventive is not to enter, they should be sealed with a suitable non-corrosive material before dipping.

5.3 Spraying

Only the thin, solvent-containing fluids and the oils are normally sprayed but thicker grease-like or thixotropic materials can be sprayed by pressure, or airless sprays. They should be applied as received, not thinned down. It is more difficult to ensure an overall coating by spraying than by dipping, and particular care is therefore needed. To ensure that an adequate amount is applied, the surface should be completely wetted and the liquid coat should show evidence of beginning to flow. Aerosol containers are available from which protective material under pressure can be applied by a finger-press jet nozzle. They are useful when limited application is required. Unless carried out in open sheds, the spraying operation requires a spraying booth and extraction fan, for the removal of toxic or flammable vapours.

5.4 Brushing

This method has only limited application because of its slowness. The brush should be clean and the bristles stiff enough to ensure intimate contact of the protective with the surface, but not so stiff as to leave definite brush marks. It is often an advantage to apply thin layers and build up to the requisite thickness. The type of brush is much less critical for the solvent-containing materials because of their free-flow properties.

5.5 Smearing

This method is particularly useful for the application of grease-type protectives or where only small parts of an assembly are required to be protected. The method consists of spreading the protective on the surface by means of a lint-free swab.

5.6 Roller coating

This method is particularly applicable to sheet metal production lines. At the cut-up line, the temporary protective is applied to the metal sheets as they pass between soft rollers. The protective is fed on to the top roller by means of drip taps. The bottom roller rides in a trough containing the liquid protective.

5.7 Flow coating

This method consists of coating an article with a liquid by pouring the liquid over the article, which may be rocked or tilted to ensure complete coverage.

5.8 Flushing

For tanks and other containers with relatively small orifices, oil-type protective can be applied by flushing.

5.9 Circulation

This method is particularly useful for preservation of hydraulic systems using oil-type protectives. Application is by gravity flow or pumping throughout an enclosed system.

5.10 Barrelling

This is applicable to some solvent-deposited protectives and may take two forms as follows.

a) Predetermined quantities of material and articles are charged into a barrel which is then sealed and rotated for 5 min to l0 min. The evolved solvent vapours are then extracted and the articles are discharged.

b) Work is placed in a perforated barrel or open mesh basket such that one-half to two-thirds of the volume is occupied. The barrel is lowered into the temporary protective which may be at room temperature or at temperatures up to 80 °C. Rotation in the liquid is allowed for 5 s to 30 s when the barrel is withdrawn and further rotated for 5 s to 30 s just above the liquid level. The barrel is then removed and the contents discharged.

6 Wrapping

The primary wrap may affect the protection afforded by temporary protectives and reference is made in Appendix A to Appendix L to wrapping items coated with various types of protective. The main purpose of the primary wrap is to prevent damage to the article or its protective film, but in addition, by virtue of its own barrier properties, it considerably enhances the efficiency of the whole protective system. In view of its close proximity to the metallic surfaces, users should satisfy themselves that the primary wrap does not contain harmful amounts of corrosive material. It should be oil, grease and moisture resistant. A pliable quality of wrapping material is preferable for soft films so that these are not disturbed during handling.

When a corrosion inhibitor is used (Type TP 9 or TP 10) the primary wrap fulfils one or both of the following functions.

a) It may be used to carry a supply of inhibitive material.

b) It may be needed as a vapour barrier against excessive rate of loss of vapour phase corrosion inhibitor and/or as a water resistant barrier.

NOTE Information on wrapping is given in the following Sections of BS 1133-7 Paper and board wrappers, bags and containers, Subsection 7.1 Wrapping papers and Section 21 Regenerated cellulose film, plastic films, metal foil and flexible laminates.

7 Removal of temporary protectives

Temporary protectives are defined in this Subsection of BS 1133 as removable, but where there would be no ill effect on the subsequent functioning of the article, it is not necessary to remove them. Strippable coatings should always be removed, removal of hard film coatings is necessary in most cases, and removal of dirty or contaminated films is always necessary.

Solvent cleaning is the most common means of removal. It is important however to select a solvent that will not have an adverse effect on the article; white spirit or kerosene are the most common. Occasionally other solvents such as the less toxic of the chlorinated hydrocarbons are used. For continuous removal of protective from a number of articles certain of the other cleaning methods in BS 1133-6.1 may be used. Often there is a need for the small scale treatment of single articles or a few articles at a time; for this particular purpose immersion in solvent in a shallow dish is the most common practice, the protective film being disturbed and dispersed with a brush. Subsequent rinsing in a separate dish of clean solvent is usually desirable. The cleaning solvent and the simple equipment can easily be taken to the point of use, and subject to consideration of possible fire risk, this method is very convenient and can be applied almost universally.

Other methods of more restricted use are as follows.

a) Spraying with a suitable solvent may be useful for continuous removal of protective from a number of articles.

b) Wiping with fabric soaked in solvent is particularly useful for local cleaning of assemblies that must not be immersed.

c) Partial removal of the soft grease film can be achieved by wiping with fabric.

d) Hot-dip, soft films may be removed by immersion in hot thin machine oil, in the region of 70 °C to 90 °C.

Any solvent remaining on an article after cleaning can be allowed to evaporate naturally. Care should be taken to avoid conditions leading to condensation of moisture. For light-gauge articles, cooling by evaporation of the solvent may itself cause deposition of moisture.

Appendix A Temporary protective TP 1. Hard-film, solvent-deposited type; dipping, spraying, brushing or flow coating

A.1 General description

The materials consist of film-forming ingredients dissolved in solvents to give mobile fluids at room temperature; on evaporation of the solvent a tough, abrasion-resistant film, capable of being handled without damage, is obtained. Quick-drying and slow-drying materials are available, and the latter may be water-displacing.

a) Quick-drying materials (TP 1a) are most useful where large numbers of items are treated on a mass production basis; they contain, however, either highly flammable or toxic solvents, and adequate ventilation should be provided.

b) Slow-drying materials (TP 1b), containing less volatile solvents are useful in installations where no adequate provision can be made for the use of the quick-drying materials. Their drying times may be shortened by the use of a forced draught. Gentle heat up to about 40 °C can also be applied if convenient, but excessive heat may be harmful.

c) Slow-drying, water-displacing materials (TP 1c), are basically the same as TP 1b but in addition have water-displacing properties.

It is essential that compliance with the pertinent factory and insurance regulations is ensured when using any of these grades. Appropriate authorities should be consulted as to the regulations affecting the use of flammable and toxic materials.

A.2 Film properties

The films should not be brittle (even after ageing) or they will be liable to chipping, and if this occurs corrosion will follow. On the other hand they should not be so tacky as to cause inconvenience in handling. Slight tackiness is, however, preferred to brittleness. The films may need to be transparent so that underlying markings on items can be deciphered. The materials may also be dyed a distinctive colour to aid identification before and after application, and to enable complete coverage to be verified. The films should be easily removable with common solvents and should not deteriorate in this respect after prolonged storage. If the protectives are removed with trichloroethylene vapour a chemical check should be kept on the trichloroethylene bath, for the presence of acidity by the methods described in BS 1133-6.1.

A.3 Use

The materials are designed for use on simple unit items and are satisfactory for highly finished as well as normal machined surfaces. They may be used for certain parts of heavy equipment such as the exposed sliding areas of machine tool beds where removal with a solvent-soaked rag presents no problems.

The materials are generally suitable for long term storage although in exceptionally severe conditions, for example certain tropical areas, it may be ncessary to supplement the protective by a suitable primary wrap.

These materials are not suitable for internal use in engines, sub-assemblies embodying moving parts, items with inaccessible holes or threads, items having rubber or non-metallic parts that might be damaged by solvents, or for batches of small items that would stick together or from which the solvent would not easily evaporate.

A.4 Methods of application

Dipping, spraying, brushing or flow coating are suitable methods of application. Items should not be wrapped or packaged until the film is dry.

Materials based on chlorinated solvents should be used in equipment specially designed for the purpose. Items with partly painted surfaces should not be immersed because certain solvents may damage the paint.

A.5 Primary wrap

The wrapping of items protected with this type of protective is usually necessary for protection against mechanical damage, and to prevent ill effects from contact with other parts of the package, e.g. wooden supports. With large articles it is necessary only to interpose one or more layers of wrapping materials between the article and the package at points of contact. A recommended primary wrap is waxed paper (see BS 1133-7).

A.6 Examples

Suitable applications include:

camshafts, chains, crankshafts, cylinder liners, shackle pins, gudgeon pins, circular saws;

larger sizes of: gears, spiral springs, taps and dies, nuts and screws;

plug, ring and gap gauges;

simple hand tools;

exposed sliding surfaces of lathe beds;

steel rod and bar;

light steel sections.

Appendix B Temporary protective TP 2. Soft-film, solvent-deposited type; cold dipping or spraying

B.1 General description

The materials are mobile liquids, consisting of film-forming ingredients in solvent; on evaporation of the solvent, thin, soft films are obtained. Because of the thinness of the film, these materials may not give as good protection as the thicker films of types TP 3 and TP 4. Two grades are available, TP 2a protective grade and TP 2b water displacing grade.

B.2 Film properties

The soft, thin films are not initially resistant to abrasion or other mechanical damage but may toughen on ageing. Certain soft films self repair after minor abrasion in handling. Removal of the film before putting items into use is only necessary if the film is dirty.

B.3 Use

Grades TP 2a and TP 2b can be used on a wide range of single items and interior surfaces where elaborate protection is unnecessary and in certain cases for the interim protection of assemblies.

The materials are not suitable for articles with small-orifices, articles with non-metallic parts which will be affected by the solvent or some partially painted articles.

B.4 Methods of application

The preferred method of application for both grades is dipping at room temperature. Care should be taken to allow adequate time for the water-displacing grade to be effective and that displaced water is not trapped in pockets or crevices. Articles should be prevented, by means of a grid, from coming into contact with the displaced water layer at the bottom of the dipping tank.

Spraying, brushing or flow coating may be used for large items.

B.5 Primary wrap

Items should be subject to a minimum of handling during wrapping. They should be wrapped in for example, waxed craft paper, flexible PVC sheeting complying with BS 1763, etc.

B.6 Examples

Suitable applications include:

articles in **A.6**;

plus

TP 2a for hand tools with moving parts, such as pliers or adjustable spanners;

TP 2b for light alloy sheeting, where heating may not be permissible for drying.

Appendix C Temporary protective TP 3. Soft-film type; hot dipping

C.1 General description

The materials are soft, waxy solids at room temperature. They usually have petrolatum as their base material and may contain additives which specifically enhance their protective properties. The materials do not contain solvents; they are melted for application.

C.2 Film properties

The film is thick and should remain adherent to the protected surfaces; it should not harden or become brittle with age or flow in hot weather.

The coatings should preferably be removed from articles before use particularly to ensure freedom from dirt though meticulous cleaning is not always necessary. Removal can be achieved either by agitation in a bath of common solvent or by complete immersion in hot lubricating oil. In the latter method the protective melts and mixes with the oil, leaving only a thin residual oily film.

NOTE Materials with drop-points higher than 80 °C may be desirable for use in tropical environments.

C.3 Use

The materials are suitable for highly finished as well as normal machined surfaces. The cushioning effect of the thick film on external vulnerable surfaces gives some advantage over the hard film type. Where orifices can be capped or taped these materials may be used for the external protection of such items as pumps and blowers.

The materials are unsuitable for assemblies with inaccessible interiors from which it would be difficult to remove the protective, fine mechanisms where any residues might interfere with the free movement of parts or their lubrication with low viscosity oil and items having plastic or leather components.

C.4 Methods of application

Hot dipping is the preferred method of application, materials should be maintained in the temperature range 75 °C to 95 °C and applied at a film thickness of approximately 0.5 mm.

Molten materials may be applied by brush to partly painted articles or to nooks and crannies or equipment where a thicker film is required to prevent ingress of moisture.

C.5 Primary wrap

Items should be subjected to a minimum of handling during wrapping. They should be wrapped in for example, waxed craft paper, flexible PVC sheeting complying with BS 1763, etc.

C.6 Examples

Suitable applications include:

ball and roller bearings, piston assemblies, oil seals for use with mineral lubricants, transmission and timing chains;

single items such as milling cutters, plain bearing inserts and highly finished gauges;

adjustable spanners, die heads, small taps and dies; brake cables (solvents not tolerable because of grease packing);

large assemblies exposed to the weather (thick application required).

Appendix D Temporary protective TP 4. Soft-film, grease type; smearing

D.1 Metallic soap, mineral oil base grease (TP 4a)

D.1.1 *General description*

The materials, which are soft solids at room temperature, are lubricant greases having recognized protective properties.

The function of a lubricating grease as a protective is often subsidiary or ancillary to its use as a lubricant, e.g. in grease-packed ball bearings or gearboxes. In such mechanisms, greases may be applied as lubricants, but may also serve as protectives if so recommended by the manufacturers.

D.1.2 *Film properties*

The materials give thick films which are usually softer and less resistant to abrasion and other mechanical damage than the soft-film hot-dip type TP 3. As the films have lubricating properties and will disperse in lubricants it is unnecessary to wipe the grease off articles before use, unless they have become contaminated, or the two greases are incompatible.

D.1.3 *Use*

The materials are suitable for highly finished as well as normal machined surfaces, and for both single items and assemblies. The chief exceptions are fine mechanisms and items containing certain rubbers or elastomers not resistant to mineral oil. They are particularly useful where only part of the surface of the item requires protection because of the ease of application by cold smearing. They can be used in this way in conjunction with solvent-deposited protectives for assemblies with a low degree of complexity, by coating screw threads and filling clearance spaces before dipping the article in the solvent-containing material. The chief limitation to their use is that hand application is often uneconomic.

D.1.4 *Method of application*

Application is by smearing. A brush may be used provided it is stiff enough to ensure intimate contact of the grease with the surface but not so stiff as to leave deep brush marks. The materials should not be melted and therefore cannot be applied by dipping or spraying; no attempt should be made to dissolve them in a solvent for application. Cold application and the absence of solvent obviate any need to delay between protecting and subsequent packaging.

D.1.5 *Primary wrap*

Items should be subjected to a minimum of handling during wrapping. They should be wrapped in for example, waxed craft paper, flexible PVC sheeting complying with BS 1763, etc., immediately after application of the protective.

D.1.6 *Examples*

Suitable applications include:

bores and bosses of wheels and pulleys, the rest being painted;

threaded ends of painted tubes;

machined flange faces of painted pipes and vessels;

exposed slides and gear machine tools;

external working parts of assemblies, such as hinges and carburettor linkages;

external surfaces of ball bearings when the lubricant used internally also serves as the protective;

screw threads of large bolts to be protected otherwise by hard-film material;

metal parts of packing cases.

NOTE Care should be exercised in applying such materials for the protection of components with rubber-like elastomeric attachments which may be attacked on prolonged contact or exposure. For example:

composite ferrous metal/rubber hydraulic system spares; shock absorber bushes and flexible couplings.

D.2 Castor or synthetic oil base grease (TP 4b)

D.2.1 *General description*

The materials are soft solids of the lubricating grease type, in which castor or synthetic oil is used in place of mineral oil. It should be used where ferrous metal is to be protected and is in contact with certain rubbers or elastomers. This is because natural rubber and some types of synthetic rubber are liable to attack by petroleum products and solvents that are used in the usual range of temporary protectives. For the same reason solvents should not be used to remove the protective.

D.2.2 ***Film properties***

The material gives a thick soft film; it is not resistant to abrasion or mechanical damage. Before articles are used the film should be removed by wiping.

D.2.3 ***Use***

The material has a reasonably high drop-point and can be used for tropical conditions. Because of its special nature and relatively high cost, its application is restricted to those items for which it is absolutely necessary. This protective is not entirely without action on natural or synthetic rubber and as little as possible should be allowed to come into contact with these materials; it should not be allowed to come into contact with copper or its alloys.

D.2.4 ***Method of application***

As for TP 4a (see **D.1.4**).

D.2.5 ***Primary wrap***

As for TP 4a (see **D.1.5**).

D.2.6 ***Examples***

Suitable applications include

composite ferrous metal/rubber hydraulic system spares;

shock absorber bushes and flexible couplings.

Appendix E Temporary protective TP 5. Soft-film, semi-fluid type; spraying, brushing or swabbing

E.1 General description

The materials are semi-fluid and grease-like with flow characteristics allowing smooth films to be obtained without swab or brush marks. They may contain solvent which evaporates to leave a stiffer film.

E.2 Film properties

The materials give soft films of medium thickness. Before putting articles into use, the bulk of the protective should be cleaned off, but meticulous cleaning is not usually necessary, as the residual films, in general, have lubricating properties.

E.3 Use

The materials are usually used for equipment, including working parts, where the only feasible method of application is by hand. They may also be used for preservation of small parts.

E.4 Method of application

The materials are intended for application by spraying, swabbing or brushing. If solvent is present a time interval should be allowed between protection and packaging to permit it to evaporate from the protective film, and if a flammable solvent is present it is essential that the appropriate fire precautions are taken.

E.5 Primary wrap

When used on large equipment no wrapping is normally required except to prevent damage to the protective film by the package at points of contact. It may, however, be desirable to wrap or shroud to prevent dirt contamination in for example, waxed craft paper or flexible PVC sheeting complying with BS 1763, etc.

E.6 Examples

Suitable applications include:

exposed shafting and slides of machine tools;

exposed heavy gearing;

small parts.

Appendix F Temporary protective TP 6. Oil-film type; dipping or spraying

F.1 General description

The materials are lubricating oils containing soluble corrosion inhibitors, and may serve as lubricants as well as temporary protectives. Two grades are available as follows:

TP 6a oil type, general purpose protective;

TP 6b oil type, engine protective.

F.1.1 ***General purpose grade (TP 6a)***

The oils usually have a viscosity similar to that of medium machinery oil. Certain oils of this type have water displacing properties. Low-viscosity, low-pour-point oils are supplied for some fine instruments, serving as protectives during storage and as lubricants during the working of the mechanism.

F.1.2 ***Engine protective grade (TP 6b)***

The oils contain special inhibitors to counter the effects of the decomposition products of petrol. If the oils have to serve for a limited period as engine lubricants they should be of appropriate quality and viscosity (see also Appendix J).

F.2 Film properties

The materials give thin, fluid films, and there is usually no necessity for their removal before putting protected items into use.

F.3 Use

The materials are restricted mainly to usage on internal surfaces, where the more efficient solid protectives are not normally employed. In engines, the oils are sprayed (in controlled quantities) into the cylinders. If the engine has been run on leaded fuel the special engine protective grade is desirable. A specific use of the general purpose grade is for large numbers of small parts (nuts, washers, screws, etc).

F.4 Method of application

F.4.1 Grade TP 6a may be applied by any of the methods described in **5.2**, **5.3** and **5.5** to **5.10**.

F.4.2 Grade TP 6b is applied by flushing, spraying or circulation.

F.5 Primary wrap

Items should be subjected to a minimum of handling during wrapping. They should be wrapped in for example, waxed craft paper, flexible PVC sheeting complying with BS 1763, etc.

F.6 Examples

Suitable applications include:

internal protection of gear-boxes, back axle assemblies, sewing machines, oil and fuel pumps and lines, fuel and oil tanks;

carburettors, instruments;

hydraulic systems using mineral oil;

numbers of small spares;

combustion spaces of engines.

Appendix G Temporary protective TP 7. Strippable type; hot-dipping

G.1 General description

The materials have a rubber-like consistency at room temperature and are melted for application. They also provide good mechanical protection in addition to protection against corrosion.

G.2 Film properties

The protection provided by these materials is dependent on sealing the component in a closely conforming skin. These pale-coloured, transparent skins are thicker at 1.3 mm to 2.5 mm, than the films given by the protectives previously described. They also differ from them in not being adherent to the metal surface, often being separated by an exuded oil film; they can thus be stripped off manually without the aid of solvents.

G.3 Use

This type of protective is suitable for the protection of the surface of highly polished metals since a high degree of protection against mechanical damage is also provided. It is more expensive than the foregoing solvent types but the ease and speed of removal of the protective is often regarded as outweighing the initial cost consideration. Moreover, for economy this material may often be re-used in accordance with the manufacturer's instructions. It can be used for many different types of assembly but only when any apertures are such that the molten material cannot penetrate enough to make removal difficult; sometimes apertures can be sealed to prevent penetration. During application, components do not normally reach the temperature of the dipping bath because of the short immersion time; nevertheless it should be recognized that there is a potential danger to components which might be damaged by being subjected to such a high temperature. Thus care should be taken with components having plastic or leather parts, soldered articles and those whose temper might be affected.

G.4 Method of application

Components are dipped individually for a few seconds in the hot molten material. Too long an immersion will result in too thin a coating. They may be suspended by wire, waxed string, nylon thread, or other suitable means. They are completely coated in one dip, and allowed to hang freely while cooling; the means of suspension should then be cut off flush with the surface of the coating and the slight aperture sealed by melting the material locally with a small flame or soldering iron. Alternatively, suitable components may be "double dipped", i.e. dipped to slightly over half their length, the coating allowed to cool and then the uncoated half dipped so that there is an overlap of not less than 13 mm and preferably 25 mm.

Special thermostatically controlled baths are required to avoid overheating and consequent degradation of the material, and to avoid fire risk. The appropriate dipping temperature for materials with for example, ethylcellulose as a base is 185 °C to 195 °C.

G.5 Primary wrap

None is required.

G.6 Examples

Suitable applications include:

milling cutters, reamers, gauges.

Appendix H Temporary protective TP 8. Strippable type; cold spraying or dipping

H.1 General description

The materials are liquids at temperatures of 10 °C to 25 °C and form tough flexible films on air drying. They are normally based on vinyl copolymer resins and incorporate plasticizers and stabilizers. They generally contain flammable solvents but some are available based on non-flammable solvents.

H.2 Film properties

The protective properties of these materials are dependent on the formation of a closely conforming skin. Films of the order of 0.05 mm to 0.25 mm are normally applied and, although lightly adherent they may readily be removed by manual stripping without the aid of solvents.

H.3 Use

This type of protective is suitable for highly polished metal surfaces where the tough flexible film also provides a degree of protection against mechanical damage. The films may also be employed as primary wraps to enclose volatile or contact corrosion inhibitors e.g. in the protection of a polished crankshaft journal. A chlorine free protective should be used with items of copper, zinc or their alloys.

H.4 Method of application

The normal method of application is by spraying. Satisfactory results may be obtained by dipping although more than one dip may be required to achieve films thicker than 0.5 mm.

H.5 Primary wrap

None is required.

H.6 Examples

Suitable applications include:

polished shaft journals, milling rollers, high finish metal sheeting.

Appendix J Temporary protective TP 9. Vapour phase corrosion inhibitor

J.1 General description

Vapour phase corrosion inhibitors are usually (though not exclusively) amine salts, the acid radicals of which are known to inhibit corrosion e.g. nitrite, carbonate, benzoate. Their vapours, if present in adequate concentration, prevent the corrosion of ferrous metal in moist air.

Vapour phase corrosion inhibitors should be selected and used with due regard to their chemical and physical properties. They should be used with caution in the presence of non-ferrous metals which may be attacked, particularly in the presence of free water. Care should also be taken with painted surfaces and with some plastics and other organic materials which may become discoloured or damaged. One of the most significant physical properties is the vapour pressure of the inhibitor. An inhibitor of low vapour-pressure (e.g. dicyclohexylammonium nitrite v.p. 0.0001 mmHg at 21.2 °C) should be held fairly close to the surfaces to be protected in order to secure a rapid initial build-up of concentration at or near the surface. An inhibitor of high vapour-pressure (e.g. cyclohexylamine carbonate, v.p. 0.4 mmHg at 25 °C) will evaporate more quickly and will become rapidly dispersed through a large volume of air; this may be an asset, but on the other hand it will be lost more rapidly from a package that is not hermetically sealed. Some solid vapour phase corrosion inhibitors are not soluble in petrol or diesel fuels and may cause blockages if not removed.

J.2 Use

This type of protective is suitable for the internal surfaces of enclosed pieces of equipment, precision tools, or car body components manufactured from ferrous metals.

Painted surfaces, some plastics and other organic materials may become discoloured or damaged, non-ferrous metals may be attacked particularly in the presence of free water.

NOTE The suitability and selection of vapour phase corrosion inhibitors for a particular application is a complex procedure. Suppliers advice should be sought and instructions rigorously followed.

J.3 Methods of application

Vapour phase corrosion inhibitors can be applied in the following ways.

a) As an impregnant or coating on paper or synthetic film. Articles may be wrapped in the treated material or, in the case of small items in sealed packages, or strips of the material may be enclosed in proximity to the articles to be protected. The minimum effective concentration of vapour phase corrosion inhibitor for two specific types of impregnated paper viz dicyclohexylammonium nitrite and cyclohexylammonium cyclohexyl carbonate (c.h.c) paper, is 10 g/m^2 paper. The minimum effective size of paper to be used is obviously dependent on the capacity of the item to be protected but in general a paper area of 3.3 m^2 per cubic metre of total space has been found effective for the above two inhibitors.

Other materials may require different qualities of paper or film and guidance on their application should always be obtained from the manufacturer or supplier. New materials are continually being developed and precise details for their use should be obtained from the manufacturers.

b) As a powder. A small quantity of powder, loose or in a porous container may be enclosed in any normal type of package or within an enclosed space in a piece of equipment, providing the powder is sufficiently near to the surfaces to be protected. In certain instances it may be preferable to apply loose powder by puffing. Minimum effective concentration in grams per cubic metre should be ascertained from the manufacturer.

c) From solution. Vapour phase corrosion inhibitors are available in solution enabling them to be applied by spray, brush or swab.

d) From oil. Oils containing vapour phase corrosion inhibitors can be used where the oil is required to protect all internal surfaces, some of which may be inaccessible, e.g. oilways, channels or recesses where thickened films would be undesirable. Fuel tanks or other articles with voids which can be adequately closed may be protected internally by this material.

J.4 Primary wrap

Ideally, the primary wrap should form as close an approach to an hermetically sealed pack as possible. Where this is impossible or uneconomic the primary wrap should form a barrier which is substantially impervious to vapour from the vapour phase corrosion inhibitor and to gross amounts of water (see also clause **6**).

J.5 Examples

Suitable applications include:

precision tools, moulds and dies;

car body components;

interior surfaces of enclosed pieces of equipment such as evaporator vessels.

Appendix K Temporary protective TP 10. Contact inhibitor

K.1 General description

These materials consist of sodium benzoate, nitrite and carbonate and soluble chromates. The use of chromates is not recommended but where their use is unavoidable chromates should be used with caution because of their toxicity. The materials are held in the undissolved state in contact with the surface to be protected.

K.2 Use

It is important that prospective users of these materials establish the suitability of an inhibitor for a particular application. The suppliers instructions for use should be strictly adhered to.

Articles of simple geometric shape made from ferrous and/or non-ferrous metals are suitable subjects for these inhibitors.

K.3 Method of application

Application is commonly by wrapping the articles to be protected in a waxed paper coated or impregnated with an inhibitor. The wrapping must be in contact with the entire surface to be protected. Contact inhibitors may also be applied as pastes or gels. However, the behaviour of such preparations is not easily predictable in conditions of widely varying relative humidity.

K.4 Primary wrap

The wrap may be the carrier of the contact inhibitor and should be substantially impervious to gross amounts of water (see clause **6**).

K.5 Examples

Suitable applications include:

razor blades, slip gauges, zincs and other steel or zinc articles of simple geometric shape.

Appendix L Temporary protective TP 11. Emulsifiable rust preventives

L.1 General description

These substances are normally supplied as liquid concentrates which when added to water produce a stable emulsion. Three grades are available:

TP 11a oily film;

TP 11b thin hard waxy film;

TP 11c thick waxy film.

L.2 Use

These preventives are suitable for use in areas where solvents or oils can present hazards and the possible increase in drying time presents no difficulty.

TP 11a. Thin oily film

Such films provide protection during indoor storage or transit for approximately three months. They will resist water wash off after drying but may be removed if necessary by hot water and detergent or by solvents.

TP 11b. Thin waxy coatings

Such films give similar levels of protection as TP 11a but are more easily handled and less easily removed by wiping.

TP 11c. Thick waxy coating

Films of this material will give medium to long term protection and can be used for exterior exposure.

L.3 Method of application

The concentrate is added to water with rapid stirring in the proportions recommended by the supplier. Articles to be protected may be sprayed or dipped (TP 11c may also be applied by brush) ensuring that the emulsion is spread evenly over the surface of the article.

L.4 Primary wrap

Articles should not be wrapped until sufficient time has elapsed for the emulsion to dry.

L.5 Examples

See **A.6**.

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Publication(s) referred to

BS 1133, *Packaging code.*

BS 1133-6, *Protection of metal surfaces against corrosion during transport and storage.*

BS 1133-6.1, *Cleaning and drying of metal surfaces.*

BS 1133-7, *Paper and board wrappers, bags and containers.*

BS 1133-19, *Use of desiccants in packaging.*

BS 1133-21, *Regenerated cellulose film, plastics film, aluminium foil, flexible multilayer structures and metallized materials.*

BS 1763, *Specification for thin PVC sheeting (calendered, flexible, unsupported).*

BS 7195, *Guide for prevention of corrosion of metals caused by vapours from organic materials*[1)].

CP 3012, *Code of practice for cleaning and preparation of metal surfaces.*

[1)] Referred to in the foreword only.

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