

B.S. 1133 : SECTION 10 : 1966

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METAL CONTAINERS

**B.S. 1133
PACKAGING CODE**

BRITISH STANDARDS INSTITUTION

B.S. 1133 : SECTION 10 : 1966

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Incorporating amendment issued July 1968 (AMD 23)

BRITISH STANDARDS INSTITUTION

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THIS SECTION of B.S. 1133, having been approved by the Packaging Standards Committee, was published under the authority of the General Council on 28th December, 1966.

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First revision, February, 1953.

Second revision, December, 1966.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9,000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- B.S. 678. Carboys and carboy hampers.
- B.S. 785. Rolled steel bars and hard drawn steel wire for concrete reinforcement.
- B.S. 814. Mild steel drums (light duty—fixed ends).
- B.S. 1133. Packaging Code—Sections 1–22.
- B.S. 1262. Tins for liquid paints and varnishes (packed by volume).
- B.S. 1449. Steel plate, sheet and strip.
- B.S. 1470. Wrought aluminium and aluminium alloys for general engineering purposes. Sheet and strip.
- B.S. 1476. Wrought aluminium and aluminium alloys for general engineering purposes. Bars, rods and sections.
- B.S. 1680. Paste polish tins.
- B.S. 1702. Mild steel drums (heavy duty—fixed ends).
- B.S. 1764. Nominal diameters for round built-up tins other than processed food tins.

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- B.S. 1817. Tins for honey.
- B.S. 2003. Full open top mild steel drums (heavy and light duty—removable beads).
- B.S. 2006. Metal collapsible tubes.
- B.S. 2469. Round tins for lubricating greases.
- B.S. 2611. Crates for 1-pint and 1-quart milk bottles.
- B.S. 2620. Dimensions of tins for printing inks.
- B.S. 2698. Containers and notes for filmstrips.
- B.S. 2835. Containers for sub-standard projector spools.
- B.S. 2920. Cold-reduced tinplate and cold-reduced black-plate.
- B.S. 2989. Continuously hot-dipped galvanized plain steel sheet and coil.
- B.S. 3370. Wrought magnesium alloys for general engineering purposes. Sheet and strip.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:
Committee reference P/125, P/133
Draft for comment D64/577

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CO-OPERATING ORGANIZATIONS

The Packaging Standards Committee, under whose supervision this Section of the Packaging Code was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- *Association of Steel Drum Manufacturers
- Board of Trade
- British Carton Association
- British Jute Trade Federal Council
- British Paper Bag Federation
- British Paper and Board Makers' Association
- British Paper Box Federation
- British Plastics Federation
- *British Railways Board
- *British Tin Box Manufacturers' Federation
- *Chemical Industries Association
- *Collapsible Tube Manufacturers' Association
- Crown Agents for Oversea Governments and Administrations
- Envelope Makers' and Manufacturing Stationers' Association
- Fibreboard Packing Case Manufacturers' Association
- *Food Manufacturers' Federation
- Glass Manufacturers' Federation
- Institute of Packaging
- Institution of Production Engineers
- Ministry of Aviation
- Ministry of Transport
- Packaging Films Manufacturers' Association
- *Paintmakers' Association of Great Britain
- Printing, Packaging & Allied Trades Research Association
- Society of British Soap Makers
- Society of Motor Manufacturers & Traders
- Timber Container Federation

The industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this Section of the Packaging Code:

- Aluminium Federation
- Association of British Pharmaceutical Industry
- British Artists Colour Manufacturers Association
- British Iron & Steel Federation
- British Rubber & Resin Adhesive Manufacturers' Association
- Federation of British Rubber & Allied Manufacturers
- Lead Development Association
- London Chamber of Commerce (Incorporated) (Dentifrice Manufacturers Section)
- Ministry of Agriculture, Fisheries & Food
- Ministry of Defence—Air Force Department
- Ministry of Defence—Navy Department
- Ministry of Health
- Oil Companies Materials Association
- Sole & Heel Manufacturers Association
- Tin Research Institute
- Toilet Preparations Federation Limited
- Tyre Manufacturers Conference (Materials Supplies Committee)

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FOREWORD

B.S. 1133 'Packaging Code' was originally issued in 1943 primarily to give guidance on the packaging of Service and other Government supplies. It was found, however, that the guidance given by a Code of this kind was of considerable value to civilian packers and, accordingly, various sections have been added or revised with normal commercial requirements uppermost in mind.

The Metal Containers Section was first revised in 1953 and the present revision brings up to date the information on tins and cans, drums and collapsible tubes. The Sub-section added in 1953 on metal crates, trays and hampers remains unaltered. The Sub-section on composites is being transferred to Section 7, 'Paper and board wrappers, bags and containers', as it is considered that it falls more appropriately within the scope of that Section.

It is emphasized that the recommendations of the Code do not abrogate any transport or other regulations that may relate to packages; these apply unless special agreements are made between the packer and the relevant authority.

B.S. 1133, 'Packaging Code', now consists of the following sections, several of which are also being revised. (For the convenience of those interested only in certain aspects of packaging, the various Sections are issued as separate publications with facilities for binding them into a single cover if required). Special attention is drawn to Sections 1-3 which give guidance on the choice and storage of packaged materials.

Sections 1-3. Introduction to packaging.

Section One gives general guidance on the choice of containers, precautions to be taken in the packaging and choice of packaging methods, and notes relating to physical and statutory limitations and packing bay conditions. An appendix describes the categories of methods of packaging recommended by the Services. Section Two gives recommendations in regard to the storage of packaging materials and deals with covered and open storage, weight limitations, fire hazards, dangerous goods and inspection.

Section Three gives guidance on the addressing, marking and labelling of containers.

Section 4. Mechanical aids in package handling.

Describes briefly the many types of mechanical handling equipment suitable for the moving of packaging materials and filled packages in factories and warehouses. Also gives notes to assist users in selecting equipment and using it to the best advantage.

Section 5. Protection against spoilage of packages and their contents by micro-organisms, insects, mites and rodents.

Gives guidance on the avoidance of damage to packages and their contents from attack from moulds, bacteria, insects, mites and rodents.

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Section 6. Temporary protection of metal surfaces against corrosion (during transportation and storage).

Gives guidance on the cleaning and drying of metal surfaces prior to the application of temporary (i.e. easily removable) corrosion preventives and on the selection and application of the protectives. Performance specifications are included for seven types of corrosion preventives together with methods of test.

Section 7. Paper and board wrappers, bags and containers.

Gives general guidance on the use of paper and board in the following forms: Wrapping papers, waxed papers, greaseproof paper, glassine, vegetable parchment, waterproof paper, wet strength paper, cellulose and other films, foils, laminates, bags, envelopes, multiwall sacks, liners and linings, paperboard cartons and boxes, moulded pulp, and fibreboard cases and drums. Methods of test are also given.

Section 8. Wooden containers.

Gives general information regarding the styles, design and construction of large framed wooden cases, nailed wooden cases, wirebound wooden boxes, plywood cases of battened and metal edged construction, plywood postal type boxes, wooden casks, plywood barrels, veneer casks, wooden crates, metal-lined cases and closures for returnable cases.

Section 9. Textile bags, sacks and wrappings.

Describes and defines materials and methods of stitching and closing jute bags. Cotton bags are also dealt with. Methods of baling and the jute materials to be used are described, and typical specifications are given.

Section 11. Packaging felt.

Covers pressed felts and needle-loom felts for cushioning against shock. It describes five types of felt, and methods of proofing. Chemical requirements are specified, together with methods of test.

Section 12. Cushioning materials and suspension packing (excluding packaging felt).

Gives general information on cushioning, and describes cushioning materials in the form of cellular rubber, cellulose wadding, cotton waste, cork, corrugated and embossed papers, fibreboard, moulded pulp, paper shavings, plastics, rubberized hair, wood wool and miscellaneous cushioning materials. Methods of suspension packing with springs and rubber are described.

Section 13. Twines and cords for packaging.

Gives guidance on the types of twine and cords available for packaging and the purposes for which they may be used.

Section 14. Adhesive closing and sealing tapes.

Gives general guidance, with illustrations, on the uses and various properties of gummed tape and self adhesive tape available for packaging purposes.

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Section 15. Tensional steel strapping.

Gives guidance on the use of tensional steel strapping for packaging purposes. It covers flat band and wire strapping and the machines used for applying both kinds of strapping.

Section 16. Adhesives for packaging.

Describes the characteristics and use of nine broad groups of adhesives used in packaging, namely:

Animal and fish glues	Rubber and latex adhesives
Bituminous adhesives	Silicates and silicate mixtures
Natural resins and gums	Synthetic resin adhesives
Protein adhesives	Vegetable adhesives

Waxes (microcrystalline)**Section 17. Wicker and veneer baskets.**

Gives general descriptions and definitions relating to wicker baskets, skips and hampers, cane and willow baskets used in the fishing industry, veneer baskets and chip punnets.

Section 18. Glass containers.

Gives general guidance on the types of glass containers available for packaging and describes the factors to be considered when ordering or using them. Details of various forms of closures are also given.

Section 19. Use of desiccants in packaging.

Gives guidance on the use of desiccated packages, the factors governing the choice of desiccant, determination of quantity of desiccant and general considerations affecting this method of packaging.

Section 20. Packaging for air freight (excluding livestock).

Gives general guidance on the special problems of packaging for air freight in relation to different types of containers; also includes clauses on the general precautions to be taken in the carriage of machinery, fragile items, restricted articles, obnoxious cargo, and cargo susceptible to variations in temperature. Prohibited packaging materials, labelling and marking are also discussed.

Section 21. Transparent cellulose films, plastics films, metal foil and flexible laminates.

Gives general information and guidance on the manufacture, properties and uses of various forms of these four types of material.

Section 22. Plastics containers (in preparation).

NOTE 1. Where metric equivalents have been given, the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in B.S. 350, 'Conversion factors and tables'.

NOTE 2. In place of the customary, but incorrect, use of the pound and kilogramme as units of force, the units called pound-force (abbreviation lbf) and kilogramme-force (abbreviation kgf) have been used in this standard. These are the forces which, when acting on a body of mass one pound or one kilogramme respectively, give it an acceleration equal to that of standard gravity.

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SECTION 10
METAL CONTAINERS

A. TINS AND CANS

1. GENERAL

a. The terms 'tin' and 'can' are customarily distinguished by the use of the word 'can' for a food can with an open top and 'tin' for other containers. This usage, however, is not universal and for all practical purposes the two words are synonymous.

b. Tins and cans can readily be fabricated in desired sizes, and whilst in general they can be made strong enough to give adequate protection to their contents in transit, it should be noted that British Railways Board may regard tins and cans covered in this Section of B.S. 1133, 'Packaging Code', as requiring to be overpacked for acceptance under its regulations.

Tins and cans are light for economical handling, readily opened, impervious to air, light and water, and may be easily decorated, thus obviating the use of paper labels, which tend to become detached.

c. Tins and cans are not normally made with base dimensions greater than 11 in (28 cm) diameter or 13 in (33 cm) diagonal measurement.

The sheet thickness and the construction of tins should be appropriate to the weight and nature of the contents.

d. The following British Standards relate to tins and cans:

B.S. 1262, 'Tins for liquid paints and varnishes (packed by volume)'.

B.S. 1680, 'Paste polish tins'.

B.S. 1764, 'Nominal diameters for round built-up tins other than processed food tins'.

B.S. 1817, 'Tins for honey'.

B.S. 2469, 'Round tins for lubricating greases'.

B.S. 2620, 'Dimensions of tins for printing inks'.

B.S. 2698, 'Containers and notes for filmstrips'.

B.S. 2835, 'Containers for sub-standard projector spools'.

2. MATERIALS

Tinplate, blackplate (tinplate base) aluminium and aluminium alloys are the base materials used in the manufacture of tins and cans.

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Under normal conditions of storage and use these materials are suitable for surface treatments such as lacquering and printing, and in the appropriate quality are suitable for:

Shaping operations—e.g. stamping, drawing, folding and bending.

Assembly work—e.g. joint forming, soldering and welding.

NOTE. Aluminium and blackplate are not normally used for the fabrication of containers having soldered seams.

When ordering, it is recommended that the manufacturing process for which the material is intended be stated.

a. Tinplate. Low carbon mild steel sheet coated on both sides with a very thin film of tin. The tincoating can be applied either by hot dipping the blackplate in molten tin or by a process of electro-deposition.

The following British Standard relates to tinplate and blackplate.

B.S. 2920, 'Cold reduced tinplate and cold reduced blackplate'.

(i) The following types of tinplate are those normally used in the tin box industry:

Hot dipped tinplate	A continuous coil of steel is cold rolled to the required thickness, and subsequently cut into sheets prior to hot dip tinning by passing the sheets through a tinning pot.
Electrolytic tinplate	A continuous coil of steel is cold rolled to the required thickness and subsequently tinned by passing through an electro-deposition process. The tinplate is supplied either in coil form or cut into sheets. By the nature of the electro-deposition process it is possible to produce Differentially Coated Tinplate, which is tinplate having a heavier tin coating on one surface than the other.

(ii) *Grading*

A. Hot dipped tinplate. After coating, hot dipped tinplate is inspected and graded as follows:

First grade or primes	Tinplates which at the time of despatch are free from defects readily visible to the unaided eye. They are suitable for lacquering or printing over the whole surface of the sheet.
Second grade or seconds	Tinplates which at the time of despatch have visible imperfections of moderate magnitude or frequency. Lacquering or printing over the whole surface of the sheet cannot be guaranteed.

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Unassorted Unassorted tinplate is inspected during processing and material not of First or Second grade is rejected. The accepted material, however, is not segregated into First and Second grades.

B. Electrolytic tinplate.

Standard grade Standard grade electrolytic tinplate represents the normal production of high speed lines. Constant inspection during tinning eliminates major defects in appearance. Standard grade electrolytic tinplate permits lacquering and printing over the whole surface.

Menders Menders are sheets of tinplate not adequately 'tinned' in the electrolytic process, and are supplied either hot dipped to C100, C125, C150 (see Subclause 2a (v)), or unmended.

(iii) *Unit of trading.* Tinplate is sold in units of area, each unit being 100,000 in² called the 'Standard Area of Tinplate' or S.A.T. The S.A.T. replaces the now obsolete 'Basis Box' (defined as 112 sheets of size 20 in × 14 in, i.e. 31,360 in²). The term 'Basis Box', and other terms relating to tinplate, were established by the physical characteristics of the methods of production of an earlier era and are no longer relevant to current practice of tinplate manufacture or use. For convenience in handling, counting and calculation, bulks for shipment will be made up in multiples of 100 sheets, instead of 112 as was the practice when dealing with the 'Basis Box'.

(iv) *Definition of thickness.* It used to be the practice to quote tinplate thickness in terms of 'substance per basis box' (substance being the trade name for weight per unit of area). With the disappearance of the terms 'substance' and 'basis box' the current practice is to refer to tinplate in terms of nominal thickness. The range of thicknesses are as follows:

Nominal thickness		Old nomenclature Nominal substance per basis box
in	mm	(lb)
0.0055	0.14	50
0.0060	0.15	55
0.0066	0.17	60
0.0071	0.18	65
0.0077	0.20	70
0.0082	0.21	75
0.0088	0.22	80

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Nominal thickness		Old nomenclature Nominal substance per basis box
in	mm	(lb)
0.0093	0.24	85
0.0099	0.25	90
0.0104	0.27	95
0.0110	0.28	100
0.0118	0.30	108
0.0149	0.38	136
0.0171	0.43	156
0.0193	0.49	176

The nominal thickness represents the average thickness of a sheet of tinplate. Thickness is *not* determined by using a micrometer, but by weighing a whole sheet and applying the following formula:

$$\text{Nominal thickness (inches)} = \frac{\text{Weight (lb)}}{\text{Actual area (in}^2\text{)} \times 0.283}$$

*As amended
July 1968*

(v) *Tincoating*. In the past hot dipped coatings were described by a number following the letter C, the number indicating approximately the number of ounces on the tinplate per basis box. Electrolytic coatings were described as a decimal part of a pound per basis box.

Under the scheme introduced on 1st January, 1964, electrolytic coatings are described by a number following the letter E. The number is a code indicating the same thickness of electrolytic coating as before, e.g. E.75 is the same thickness of tin as the old 0.75 lb per basis box. Hot dipped coatings follow a similar pattern of a number following the letter C, e.g. C100 is the same thickness of tin as the old C16, which meant 16 ounces per basis box. With differentially coated tinplate the coating is described by a combination of numbers following the letter D e.g. D50/25 was designated 0.50/0.25 ET.

Note on differentially coated tinplate. D50/25 tinplate with the same thickness of tin on one side as would be found on one side of tinplate coated to E.50, and on the other side the same as on one side of tinplate coated to E.25.

Coatings, with their old equivalents, are as listed below:

	Coating grade code	Old nomenclature
<i>Electrolytic</i>	E25	0.25 ET
	E50	0.50 ET
	E75	0.75 ET
	E100	1.00 ET

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<i>Differentially coated</i>	D50/25	0.50/0.25 ET
	D75/25	0.75/0.25 ET
	D75/50	0.75/0.50 ET
	D100/25	1.00/0.25 ET
	D100/50	1.00/0.50 ET
	D100/75	1.00/0.75 ET
	D135/25	1.35/0.25 ET
	D135/50	1.35/0.50 ET
<i>Hot dipped</i>	C100	C16
	C125	C20
	C150	C24
	C175	C28
	C200	C32

b. Blackplate. Cold reduced uncoated blackplate can be supplied for applications requiring the use of steel sheet in the tinplate thickness range. It is supplied in the same metallurgical qualities as tinplate.

This material is very susceptible to atmospheric corrosion and great care should be taken when handling and warehousing. Conditions most favourable to the prevention of sweating and rusting should be ensured and the plate should be used or treated as soon after delivery as possible.

Blackplate is sold in unassorted quality only. It is not normally used for the fabrication of containers having soldered seams.

c. Aluminium and aluminium alloys. Both are loosely referred to as 'aluminium'. They are specified by thickness and size, but marketed by weight. The weight of 0.141 lb/ft² for 0.010 in thickness (i.e. approximately 1 lb/1000 in²) may be taken as a basis for commercial purity (99 per cent).

Because aluminium can be worked by the same techniques as tinplate it has tended to be regarded merely as an alternative material. Aluminium should be regarded as a material having its own characteristics and not as a substitute material. Soldering is not commercially practicable.

The following British Standard relates to aluminium and aluminium alloys:

B.S. 1470, 'Wrought aluminium and aluminium alloys for general engineering purposes. Sheet and strip'.

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3. PROTECTION AGAINST CORROSION

Tinplate is a partially rust-proofed form of steel, and the tinplating process is fairly effective relative to its cost. The protection is only partial, however, as the tin coating is not continuous and its porosity is increased by the subsequent fabricating processes.

Lacquering and decorating of tinplate sheets is carried out prior to fabricating the container and this, too, gives partial protection. Although this applied film may not be wholly continuous, lacquering is still worth while. Attention should be paid not only to the physical and chemical properties of the lacquer itself, but also to the adhesion and continuity of the lacquer film after application and stoving on the plate and after subsequent shaping operations and assembly work.

Tinplate is susceptible to corrosion by condensation, the degree of corrosion being dependent upon the coating thickness. Storage of tins in unheated warehouses with day and night temperature gradients should be avoided. Parcelling of the tins and packing them in fibreboard cases reduces the hazard but does not eliminate it. Attention should be given to the materials used in the manufacture of overpacks, labels and label adhesives. For example, materials with high chloride and sulphate content will accelerate corrosion of tinplate under moist conditions.

Lacquering and decorating of tinplate base (blackplate) should be carried out soon after rolling. Unprotected steel is exposed at the cut edges of the various components from which the tin is built up. In the case of lacquered tinplate base, underfilm corrosion can spread from these edges.

The post-lacquering of fabricated containers should prevent broken and distorted coating films, but there are production difficulties which have prevented the manufacturers of containers from developing this for general production.

Where a tin is printed (lithographed) it is usually protected by a film of varnish, which may have a matt or glossy finish. These applied coatings are usually less than 0.0005 in (0.000 127 cm) thick, in order that they may withstand the stress of subsequent fabrication.

Owing to the naturally formed oxide film on its surface, aluminium is inherently resistant to attack by a great variety of products and this resistance can, to some extent, be increased by anodizing*. However, the application of a protective lacquer coating is required in certain instances. Shallow containers may be pressed from anodized* and/or lacquered strip, and deep-drawn containers may be spray-lacquered when necessary.

Surface coatings on the outside of aluminium containers are not necessary on protective grounds and external lacquering, enamelling, etc., is usually applied for decorative purposes only.

* Not yet generally available for packages in the United Kingdom.

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4. BASIC TYPES OF TINS AND CANS

A tin is normally classified according to its type of closure, but the true definition of basic type relates to the body. There are only three basic types:

- Seamless (or 'solid drawn') body
- Locked (or 'seamed corner') body
- Built-up (or 'rolled') body.

Impact-extruded containers are made in aluminium, and these are described separately in Clause 5.

a. Seamless body type. (See Fig. 1.) This type has a body drawn or pressed to shape in one piece, free from any form of joint. The work is usually completed by the follow-on operations of trimming, beading and curling.

Cylindrical shapes are used for such products as household polishes, ointments, etc.

Rectangular and square section shapes are used for dry non-homogeneous products, such as cigarettes, tobacco and pastilles. A truly square corner cannot be made (but see Subclause 4b, 'Locked corner body'), and the deeper the body, the greater must be the corner radius. As a rough guide, the relation of corner radius and finished depth of body should be of the order of:

Body finish	Corner radius
Curled (inward)	Not less than 60 per cent of finished depth of body.
Raw edge	Not less than 40 per cent of finished depth of body.

Up to $4\frac{1}{2}$ in (11.43 cm) diameter the round seamless tin finds a ready and proper use; beyond this it tends to be less satisfactory economically and functionally.

The size range for rectangular and square section shapes is determined by the functional use of the filled tin and by economics; seamless tins, whatever their shape, are usually flat packages of large surface area relative to their depth.

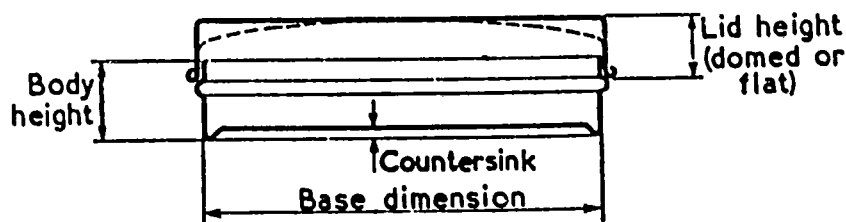


Fig. 1. Seamless (or solid drawn) tin

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b. Locked corner body. This type falls between the seamless and built-up body and has certain characteristics of each. It is peculiar to 'flat-sided' shapes and an interlocked seam formed on each corner produces a very sharp, though not truly square, corner. The body is in one piece and the flat sides between the corner points are finished by folding the edge.

The square corners are the significant characteristic. The corners are mechanically secure but not normally sealed. Generally speaking, there is no limitation to the length or depth of the body.

c. Built-up body. (See Fig. 2.)

(i) *General purpose tins.* This type of body consists of two parts secured together, viz. a side wall and a bottom. The side wall is rolled or formed and is secured by a side seam joint. The body may be fitted with some form of top or closure, which can be separate from, or secured to, the body.

Except for the cylindrical shape, or locally at the corners of flat-sided shapes, the body derives no structural strength from its section. This is important since although the attachment of the bottom imparts great local rigidity, the top can be distorted unless it is secured mechanically by the forming of another permanent joint with a third integral component. Some stiffness is imparted by forming a bead, curl or fold, at the 'open' end. This is most effective on small and medium size tins. A further increase in the rigidity in the larger diameters can be attained by corrugating the body.

The common size of tinplate sheet is not more than 36 in (91 cm) long and the periphery of tins having side walls in one piece should be within this limit. The side seams of bodies that are in two pieces should be soldered for strength.

A fundamental difference in strength exists between tins of circular section and of other shapes. The even stresses and the strength of section of cylindrical bodies permits the closure of open-ended bodies, e.g. slip lid types, to be made with both lid and body in a state of even tension and compression. With square section bodies, the corners, being relatively rigid, transmit the forces of compression to the flat sides, which since they are restrained by the lid from moving outwardly, bow inwardly.

The influence of material consumption upon choice of shape is significant. The 'built-up' type is preferable from the point where the seamless or locked corner is too extravagant or does not provide the intrinsic depth needed. The effective size limit varies with the particular shape, type and function, the considerations being:

- A. Inherent rigidity, e.g. slip lid, lever lid or flat top.
- B. Shape (circular section, square section, rectangular section or oval section).
- C. Support provided by contents, e.g. products which set solid after filling.

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The dimensional limits given in Table 1 are those generally accepted.

TABLE 1. DIMENSIONAL LIMITS FOR BUILT-UP BODY
TINS AND CANS

Shape	Type	Reference on Fig. 2	Characteristics	Maximum dimensions of base, <i>D</i>		Maximum height	
				in	cm	in	cm
Circular section	Slip lid	<i>a.</i>	Side seam not soldered	9 dia.	22.86	9	22.86
			Side seam soldered	9½ dia.	24.13	12	30.48
	Lever lid* Taper top* Flat top* Dome top*	<i>b.</i> <i>c.</i> <i>d.</i> <i>f.</i>	Side seam not soldered	9½ dia.	24.13	12	30.48
			Side seam soldered	11 dia.	27.94	17	43.18
Square section	Slip lid or hinged lid	<i>a.</i>	Side seam not soldered	6 × 6	15.24 × 15.24	6	15.24
			Side seam soldered	9¼ × 9¼	23.49 × 23.49	15	38.10
	Lever lid* Taper top* Flat top*	<i>b.</i> <i>c.</i> <i>d.</i>	Side seam not soldered or soldered	9¼ × 9¼	23.49 × 23.49	15	38.10
Rectangular section	Slip lid or hinged lid	<i>a.</i>	Side seam not soldered	13 diagonal	33.02	10	25.40
			Side seam soldered	13 diagonal	33.02	12	30.48
	Lever lid* Flat top*	<i>b.</i> <i>d.</i>	Side seam soldered	13 diagonal	33.02	15	38.10
Oval section	Slip lid or hinged lid	<i>a.</i>	Side seam not soldered	13 major axis†	33.02	10	25.40
			Side seam soldered	13 major axis†	33.02	12	30.48
	Lever lid* Flat top* Dome top*	<i>b.</i> <i>d.</i> <i>e.</i>	Side seam soldered	13 major axis†	33.02	15	38.10

* i.e., double seamed top and bottom.

† Assuming maximum ratio of length to width of base as 2 : 1.

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(ii) *Thermally-processed food cans.* A highly specialized form of 'built-up' containers, the 'open top can' (see Fig. 3) usually comprises three parts: a side wall, an end fixed by the can maker, and an identical end supplied loose for fixing by the canner after filling and before thermally processing the can and its contents.

The physical, chemical and bacteriological 'stresses' involved in food canning create an exacting requirement. These cans have the simplest construction of rolled body ('built-up') in order to meet the standard of performance required. There is little scope for compromise or chance: the high speeds at which they are produced are a product of this constructional simplicity and not the cause of it.

The 'stud hole' type is the original form. Both ends are fitted by the can maker. The canner fills through a centre hole in one end and seals the tin by soldering a 'stud' or disk of tinplate over that hole.

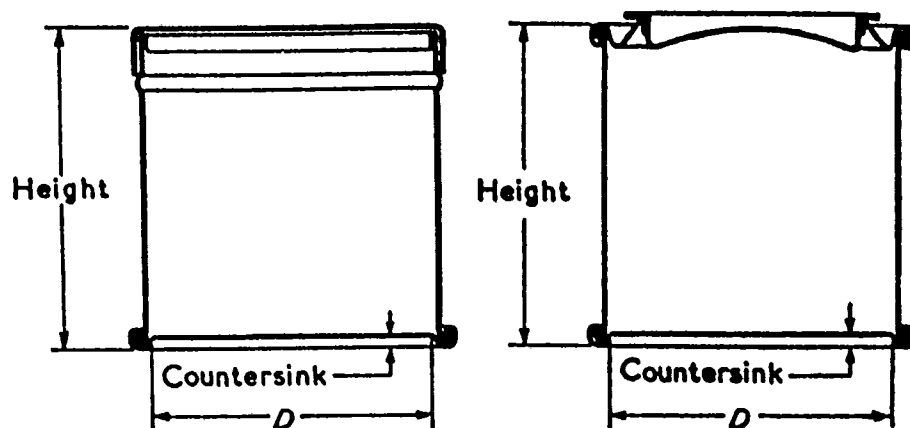
The 'vent hole' can is quite different in character and is widely used for liquid milk products. The can is vacuum filled through a very small tapered orifice in one end and sealed by a blob of solder. The can maker fits both ends and uses a 'capped-on' soldered-end construction.

Open top and vent hole cans are made to rigid engineering standards of dimension, construction and performance. They are made in a series of standard sizes, known by name or by their nominal dimensions.

Open top cans are lacquered inside where the contents require it. Each type of product, e.g. fruit, vegetables, fish, meat, requires a particular type of lacquer and lacquer application; there is no universal lacquer.

NOTE. Lacquering is not primarily intended to protect the tinplate from corrosion, but rather to preserve the colour and appearance of the food.

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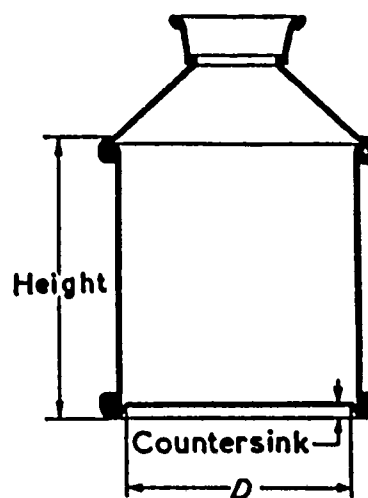


a. Slip lid or hinged lid tin

b. Lever lid tin

The symbol D represents any of the following dimensions (see Table 1):

- (i) Diameter of circular section tin.
- (ii) Length of sides of square section tin.
- (iii) Length of diagonal of rectangular section tin.
- (iv) Length of major axis of oval section tin.



c. Circular section or square section taper top tin

Fig. 2. Built-up (or 'Rolled') body tins

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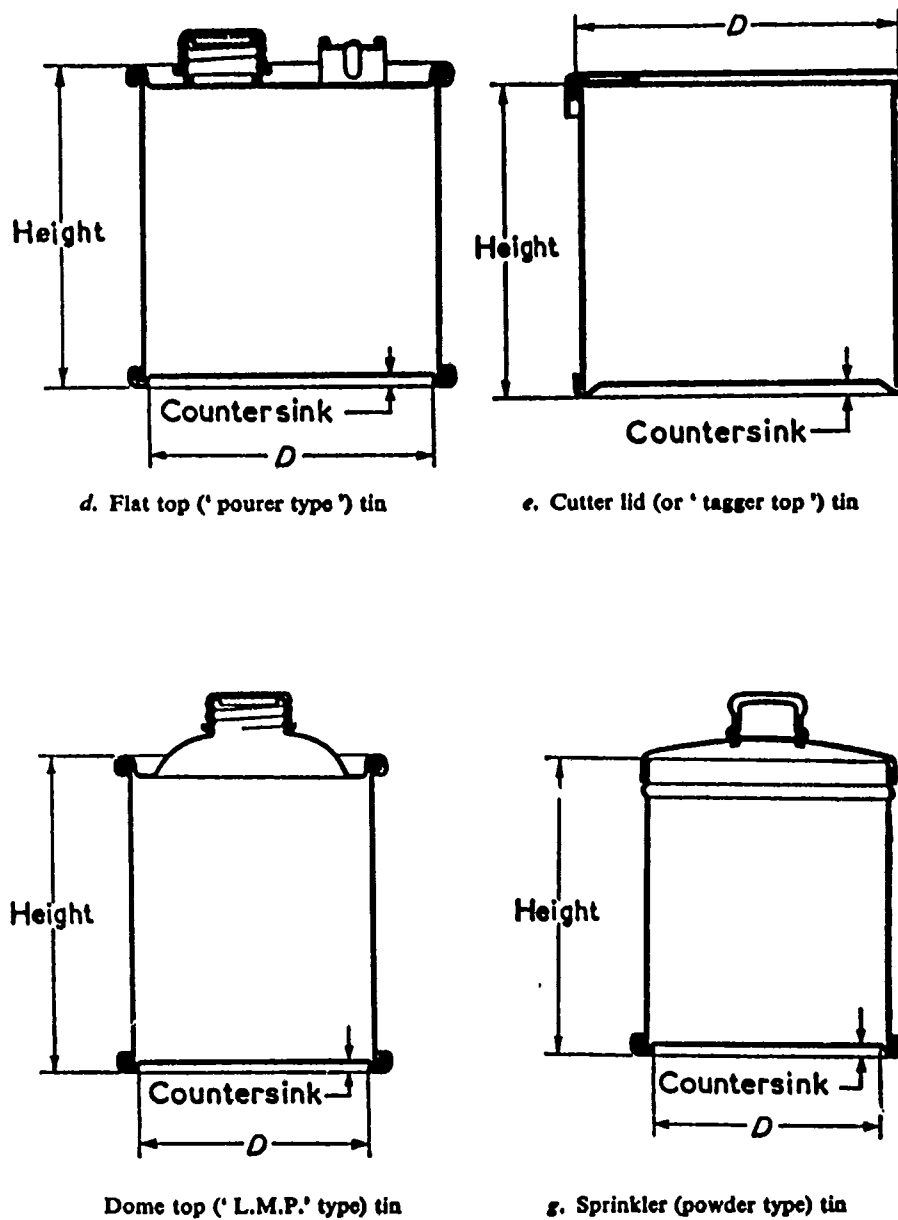
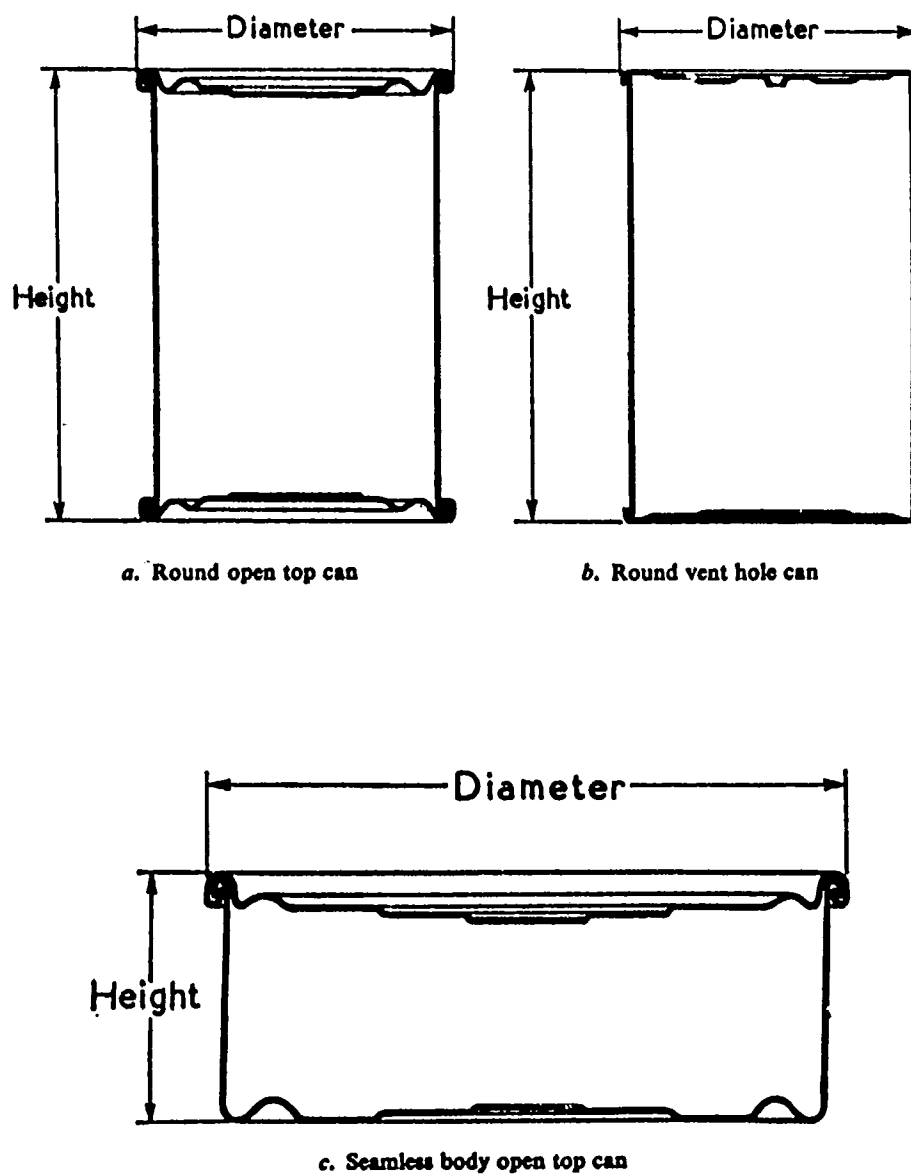


Fig. 2. (contd.) Built-up (or 'Rolled') body tins

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**Fig. 3. Thermally processed food cans**