

B.S. 1133 : SECTION 4 : 1965

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MECHANICAL AIDS

IN PACKAGE HANDLING

**B.S. 1133
PACKAGING CODE**

BRITISH STANDARDS INSTITUTION

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BRITISH STANDARDS INSTITUTION

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THIS PACKAGING CODE, having been approved by the Packaging Standards Committee, was published under the authority of the General Council on 29 September, 1965.

First issued (as Section 5) December 1943.

First revision, October 1953.

Second revision September 1965.

The Institution desires to call attention to the fact that this Packaging Code 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 section of B.S. 1133 makes reference to other sections of the 'Packaging Code' and the Appendix contains a list of British Standards for handling equipment that may be used in packaging.

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/144 Draft for comment D62/2677

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CO-OPERATING ORGANIZATIONS

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

- Association of British Chemical Manufacturers
- *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 (Incorporated)
 - British Paper Box Federation
 - British Plastics Federation
- *British Railways Board
 - British Tin Box Manufacturers' Federation
 - Collapsible Tube Manufacturers' Association
 - Crown Agents for Oversea Governments and Administrations
 - Envelope Makers' and Manufacturers Stationers' Association
- *Fibreboard Packing Case Manufacturers' Association
 - Food Manufacturers' Federation Incorporated
 - Glass Manufacturers' Federation
 - Institute of Packaging
 - Institution of Production Engineers
 - Ministry of Transport
 - Packaging Films Manufacturers' Association
 - Paint Makers' Association of Great Britain
 - Printing, Packaging and Allied Trades Research Association
 - Society of British Soap Makers
- *Society of Motor Manufacturers and Traders Limited
- Timber Container Federation

The Government department and 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:

- British Industrial Truck Association
- Covered Conductors Association
- Lloyd's Packing Warehouses Ltd.
- Mechanical Handling Engineers Association
- Ministry of Aviation
- Ministry of Defence, Army Department

FOREWORD

B.S. 1133, 'Packaging Code', was originally issued in December, 1943, primarily to give guidance on the packaging of Service and other Government supplies. It was found, however, that in practice the Code was also widely used by industrial packers, and it was revised in 1953 so that it would be more suited to the needs of industry, whilst also assisting Government Departments. The present revision of this Section, prepared under the authority of the Packaging Standards Committee, is a further move to bring it up to date and abreast of current developments.

The main object of B.S. 1133, 'Packaging Code', is to assist packers. Much of the information contained in this Section may be regarded as elementary by those familiar with the design, manufacture and use of mechanical handling equipment, but experience has shown that there is a real need for guidance of this character so far as packers are concerned.

The proper handling of goods is as important as correct packaging and much damage can occur as a result of poor handling of packaging materials or filled containers. The packer often cannot control the methods of handling applied to his goods between the factory or warehouse and their ultimate destination and it is not intended to cater for this aspect of handling in the Code. He should ensure, however, that goods are properly handled during the movement from one part of his premises to another, and that the final packages are correctly loaded on to vans or wagons for the first stages of their journey.

Packaging materials, too, should always be carefully handled, both when they are received into store and when they are taken from the store for use in the packing bays. Recommended storage conditions for empty containers and other packaging materials are given in Section 2 of B.S. 1133, 'Packaging Code'.

'*Materials handling*' may be defined as the rationalization of handling, moving and storing materials economically and with speed. Manual handling, however experienced the operator, is expensive in both time and labour. There are many mechanical aids to the movement of goods and packaging materials in factories and warehouses and the use of an efficient system of mechanical handling (i.e. materials handling with mechanical aids) generally results in a reduction of accidents, with consequent greater safety to the operatives and less damage to the goods.

It is impossible in a Code of this kind to describe fully all the appliances available. Recent developments include, for example, automatic warehouses for handling and storage of standard sized loads, and the use of standard large freight containers, and no attempt has been made to compile a comprehensive catalogue. This section gives brief details of the types of equipment most commonly used in packing bays, together with notes on

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their use, but specialists should be consulted in the application of the equipment.

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.)

Sections 1-3. Introduction to packaging.

Section 1. Choice of containers and method of packaging.

Section 2. Storage of packaging materials.

Section 3. Addressing, marking and identification.

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. Temporary protection of metal surfaces against corrosion (during transport and storage).

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

Section 8. Wooden containers.

Section 9. Textile bags, sacks and wrappings.

Section 10. Metal containers.

Section 11. Packaging felt.

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

Section 13. Twines and cords for packaging.

Section 14. Adhesive closing and sealing tapes.

Section 15. Tensional steel strapping.

Section 16. Adhesives for packaging.

Section 17. Wicker and veneer baskets.

Section 18. Glass containers.

Section 19. Use of desiccants in packaging.

Section 20. Packaging for air freight.

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

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 4

MECHANICAL AIDS

IN PACKAGE HANDLING

1. SCOPE

This Section of B.S. 1133, 'Packaging Code', describes briefly the main types of mechanical handling equipment suitable for the movement of packaging materials and filled packages in factories and warehouses; it also gives notes to assist users of the Code in selecting equipment and using it to the best advantage.

British Standards have been issued for many items of mechanical handling equipment and ancillaries, and others are in course of preparation; a list of relevant standards already published is given in the Appendix.

2. REGULATIONS

The use of much of the equipment described in this Section of B.S. 1133, 'Packaging Code' is subject to statutory regulations or local byelaws*. For example, many items are required to be provided with safety guards, although these have been omitted in the interests of clarity of illustration.

Moreover, package handling equipment often has to be used for loading packages on to vehicles and for unloading them, and ideally the dimensions of vehicles should be borne in mind in selecting such equipment.

Road and rail vehicles of many different types and dimensions are in current use in the United Kingdom and it is not possible to give even a range of dimensions that would be of real assistance to packers in making a selection.

Users should, however, take note of any statutory or other regulations or byelaws affecting the use of either equipment or vehicles.

3. CHUTES

Chutes are smooth inclined trough-like surfaces, used to convey packaged goods or loose materials from a higher to a lower level under the force of gravity.

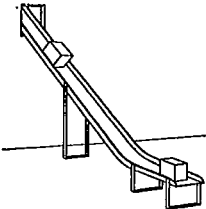
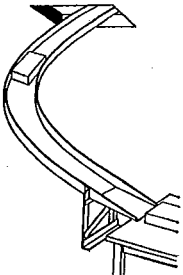
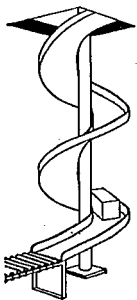
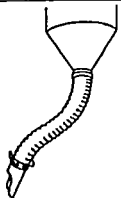
For packaged goods, such as those in cases, cartons or sacks, the types illustrated in Figs. 1 and 2 are most suitable but it should be noted that for specific purposes a curved surface, as distinct from a flat one may be advantageous. They can be covered to protect goods against atmospheric conditions and to prevent the escape of dust.

* For example, Sections 22/28 of the Factories Act 1961.

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Flexible chutes are, in general, suitable only for loose, free-running materials.

Chutes are not recommended for fragile articles.

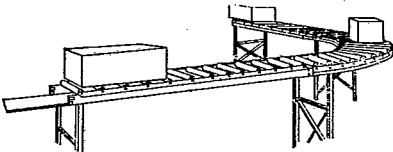
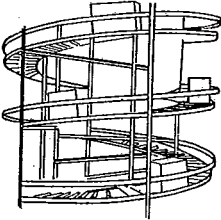
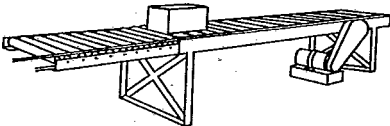
Typical examples	Type and use
 Fig. 1. Straight chute	Straight chute The simplest form of chute providing an inclined trough down which goods can be conveyed by gravity.
 Fig. 2. Curved chute	Curved chute This type is used to change the direction of delivery from the original line of despatch, and it can provide some economy of space. The speed of descent is reduced by the curvature.
 Fig. 3. Spiral chute	Spiral chute An extension of the principle of the curved chute. It economizes space and can be made to serve more than one floor.
 Fig. 4. Flexible chute	Flexible chute By suitable arrangement of the flexible tubing or sleeves this type can be used to deposit free-running materials at any point within a wide arc.

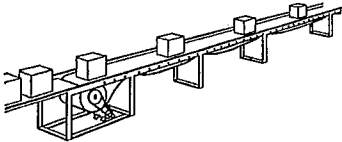
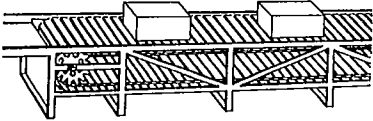
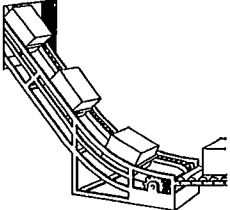
4. CONVEYORS

a. Description of use. A conveyor is a device for the continuous transportation of packages or loose materials either horizontally or between different levels. It comprises a framework embodying means of carrying packages or material in the required direction. The motion may be imparted by power, force of gravity or manually.

It should be noted that conveyors designed for one purpose may not prove equally efficient if used for a slightly different but apparently similar purpose.

Typical examples of conveyors are given in Figs. 5-12.

Typical examples	Type and use
 Fig. 5. Roller conveyor  Fig. 6. Skate wheel conveyor  Fig. 7. Spiral roller conveyor	Roller conveyor (non-powered) An inclined conveyor consisting of a number of free-running rollers on which the packages travel under the force of gravity. It is suitable for articles having at least one flat surface and is frequently used for cased goods which are not too heavy to be lifted on and off the conveyor by hand. Irregularly shaped or soft articles can be conveyed by using trays or plates. If arranged horizontally, the conveyor can be used for transporting packages by manual propulsion. It may also be used as a packing table. Wide variation in the weight of articles should be avoided, since the correct incline for a light package may be too severe for a heavy one.
 Fig. 8. Roller conveyor (power-operated)	Roller conveyor (power-operated) A roller conveyor (straight, inclined or curved) in which the packages are carried on power-driven rollers. Powered conveyors can be arranged to allow packages to build up behind each other whilst the conveyor is still running to allow for stoppages on the line.

Typical examples	Type and use
 Fig. 9. Flat belt conveyor	Belt conveyor A conveyor incorporating a belt which may either be flat for the conveyance of cased or otherwise packed goods or troughed for loose materials. The endless belt is usually driven by a drum at one end, and passes over a freely rotating drum at the other end, the upper portion in between the drums being supported on either free-running rollers or suitable flat surfaces. Belt conveyors can be arranged for horizontal or inclined travel, the amount of slope depending on the character of the goods to be carried. Belts may be made of rubber and canvas, cotton, balata, steel, asbestos, woven wire or other suitable materials. For steep slopes non-slip belts can be used or slats arranged at intervals across smooth belts. Some types of belt conveyor are reversible.
 Fig. 10. Slat conveyor	Slat conveyor A conveyor where the carrying face is composed of a number of timber or metal slats attached to one or more endless power-driven chains. The power drive to the chains will normally be through a sprocket wheel and the slats may be flat or provided with ridges, the latter being necessary when the conveyor is required for inclined working.
 Fig. 11. Push bar conveyor	Push bar conveyor A conveyor in which the packages are moved along a smooth path by means of bars between a pair of chains. It can be used horizontally or inclined.

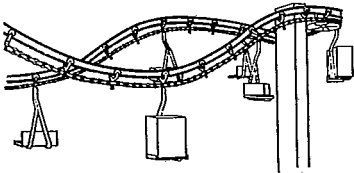
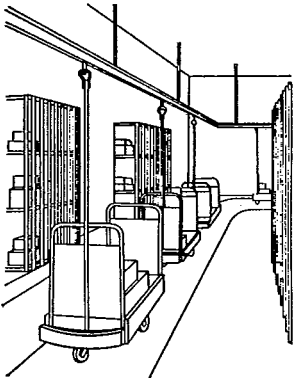
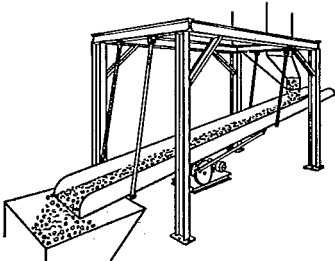
Typical examplless	Type and use
	Overhead chain conveyor A conveyor in which an endless power-driven chain is used to pull trolleys along an overhead track, suitable carriers or hooks being attached to the trolleys. It can be arranged to transport articles at a height above process plants and to change direction in both horizontal and vertical planes. In addition, it is possible to change the carriers or hooks to accommodate different commodities. Long and heavily loaded conveyors may have two or more driving points.
	Truck towing conveyor Conveyors of this type can operate by means of an overhead or underfloor hauling chain. The layout and speed of the conveyor and the design and size of the trucks can be varied to suit particular needs. Each truck can be disconnected from the conveyor for loading or unloading and can then be pushed along. The truck can then be put back into the circuit until it is necessary to take it out again. It may be so constructed that the trucks automatically detach themselves from the hauling chain if they strike an obstruction.
	Oscillating or vibrating conveyor A conveyor consisting of a trough which is subjected to slow or fast oscillating movement, the material travelling along the trough as a result of this movement; generally used for granular or loose material. Under suitable conditions, material can be elevated or lowered.

Fig. 12. Overhead chain conveyor

Fig. 13. Truck towing conveyor

Fig. 14. Oscillating conveyor

Typical examples	Type and use
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Flow storage racks

Racks which are designed to concentrate storage and movement of packages or pallet loads into a small area between one loading aisle and one selecting aisle: they normally operate by gravity and ensure the principle of first in first out, but powered rollers can be incorporated.

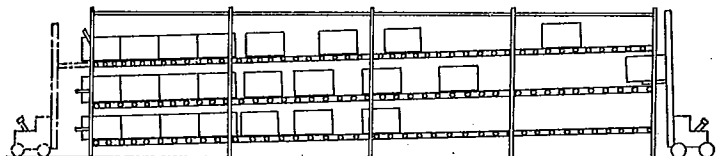


Fig. 15. Flow storage rack

b. Application. It should be appreciated that, whilst the conveyors described above can be used as individual units, the various types can be combined to form a comprehensive handling scheme. In addition, numerous items of an ancillary nature can be incorporated, for example:

- (i) Switches to direct goods on to co-related lines of conveyors;
- (ii) Apparatus to weigh or count products in transit;
- (iii) Turn-over devices to facilitate marking, strapping, etc.;
- (iv) Vibrator tables to consolidate the contents of containers;
- (v) Pre-selector devices to enable the operator to select any one of a given number of discharge points.
- (vi) Self-adjusting constant level load tables (see Fig. 97).
- (vii) Conveyor units, consisting of straight section conveyors leading into one another at an angle, and used to deliver packages from individual feeder lines into a common main pick-up line in the system.
- (viii) Conveyor transfer sections, either turntable type, or with balls to facilitate the moving of packages at right angles or other directions to the main run of the conveyor.

5. CRANES

a. Description and use. The term 'crane' covers a wide variety of machines used to handle heavy packages between different levels or between different places on the same level. Typical examples are given in Figs. 16–23. Cranes may be either hand-operated or power-operated throughout or may contain

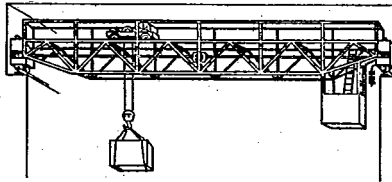
any combination of hand and power operation. A power-operated crane is usually operated from a control cabin attached to it and travelling with it, but under certain circumstances it may be controlled from floor level by switches or other remote control devices. Hand-operated cranes are normally controlled by an operator from floor level.

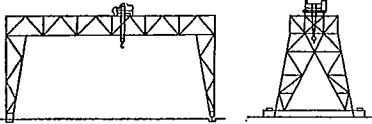
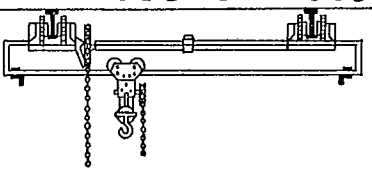
b. Rating. The rating of a crane is the 'safe working load' for which it has been designed or which has been nominated by an inspecting authority or insurance company. It should be noted that special duties, adverse working conditions, or other reasons, may cause the inspecting authority to allot a safe working load to the crane lower than that specified for the original machine or a new machine of similar construction. The safe working load should never be exceeded.

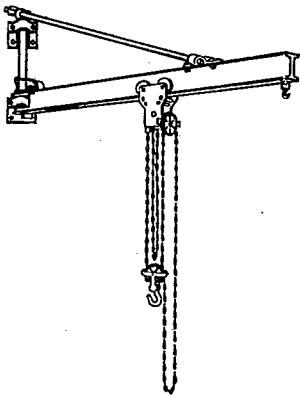
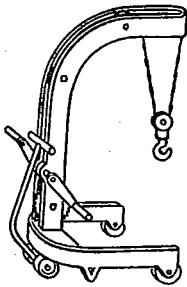
c. Wire ropes. Wire ropes will require renewal from time to time and care should be taken to replace a rope by a new one of equivalent strength and flexibility. It is a mistake to assume that replacement by a stronger rope will necessarily lead to a longer interval between renewals.

d. Lifting tackle. Chains, wire rope slings, hooks and other equipment used on or with cranes are required to be inspected periodically (see Sub-clause 5f below).

e. Compliance with statutory requirements. Users of the equipment are reminded that there are statutory requirements in regard to the operation of cranes and all associated lifting equipment in so far as safety, health and welfare to workers is concerned.

Typical examples	Type and use
 Fig. 16. Overhead travelling crane (power-operated)	Overhead travelling crane (power-operated) A crane which consists of one or more girders forming a bridge mounted on wheeled end-carrriages which are carried on rails mounted on the upper surfaces of girders forming part of the structure of the building. Sometimes the rails are mounted on the top girders of a separate gantry. A wheeled crab, comprising the hoisting and cross traverse mechanism, travels on rails along the bridge, its movement being controlled from the cabin.

Typical examples	Type and use
	Overhead travelling crane (power operated) (continued) This crane is made in a wide range of capacities and to meet a variety of spans. It will cover the maximum floor area and permits space required for gangways to be reduced to a minimum.
 Fig. 17. Goliath crane	Goliath crane A crane having applications similar to an overhead travelling crane illustrated in Fig. 16. It is normally used in the open and is mounted, therefore, on rails at ground level.
 Fig. 18. Underslung travelling crane	Underslung travelling crane (hand-operated) A crane which is similar to the overhead travelling crane but it runs on the lower flanges of rolled steel beams forming the track. It can be adapted to coincide with runway tracks so that the travelling pulley block with its load can be transferred to a runway system and operated as a normal hoist. The travelling pulley block or load can also be transferred from one crane to another so that any number of bays can be covered by one travelling pulley block without removing the load from the hook. It will be appreciated that this type of crane is regularly produced as a fully powered crane, or in various combinations of hand- and power-driven operation. The load transfer feature could still be maintained on the powered crane, which could be cage controlled, although it is usually floor controlled.

Typical examples	Type and use
 Fig. 19. Swing jib crane	Swing jib crane A hand-operated or power-operated crane mounted on a wall or stanchion of a building. The jib may be fixed but it usually slews about pivots for convenience of operation and stowage when not in use. A similar type of jib crane can be arranged to travel on rails although these are generally power operated. The rails can both be at floor level, or one at floor level and the other mounted on the wall or gantry structure in a building at the level of the top of the mast. If the supporting structure permits the passage of rail or road vehicles between the supports, the crane is described as of the 'portal type'. Jib cranes may be hand operated or power operated throughout, or may employ any combination of hand and power operation (see also mobile cranes).
 Fig. 20. Hand-operated portable crane	Hand-operated portable jib crane Jib cranes may be of the fixed type (as shown in Fig. 19), or may be movable. They may have a fixed jib or be arranged for luffing (or derricking). Operation may be by winding a hydraulic jacking system. Jib cranes may be mounted on a fixed base or on brackets attached to the wall or columns of a building. Alternatively, they may be mounted on wheels or on crawlers.