

Guide to

Stowage of goods in freight containers

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British Bag Federation	Ministry of Defence*
British Fibreboard Packaging Association	Oil Companies Materials Association
British Paper and Board Industry Federation (PIF)	Paintmakers Association of Great Britain Ltd.
British Stationery and Office Products Federation	Pira (the Research Association for the Paper and Board, Printing and Packaging Industries)
Chemical Industries Association*	Soap and Detergent Industry Association
Collapsible Tube Manufacturers' Association	Society of Motor Manufacturers' and Traders Limited*
Department of Transport*	Timber Packaging and Pallet Confederation
General Council of British Shipping*	Timber Research and Development Association
Glass Manufacturers' Federation	Coopted member
Institute of Packaging	
Institute of Trading Standards Administration	
Institution of Production Engineers	

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Aluminium Federation	Health and Safety Executive
Association of British Railway Carriage and Wagon Manufacturers	Home Office
British Airways	Institute of Freight Forwarders Limited
British Ports Association	Institute of Materials Handling
British Railways Board	International Institute of Container Lessors
British Shippers Council	National Freight Corporation (nfc) Ltd.
Freight Transport Association Limited	Road Haulage Association Ltd.
	Coopted member

This British Standard, having been prepared under the direction of the Packaging and Freight Containers Standards Committee, was published under the authority of the Board of BSI and comes into effect on 30 September 1982

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Foreword

This British Standard has been prepared under the direction of the Packaging and Freight Container Standards Committee. It is a revision of BS 5073:1974 "Recommendations on the carriage of goods in freight containers" which is withdrawn.

This revision concentrates more on guidance for those concerned with the stowage of goods in containers and the title has been changed to reflect this.

The principles set out in the "ILO/IMO Guidelines for packing cargo in freight containers or vehicles"¹⁾ have been followed where applicable.

The attention of users is drawn to the national regulations or administrative arrangements in various countries which implement international agreements and conventions, amongst others:

- International Convention for Safe Containers (CSC) 1982¹⁾
- Freight Containers (Safety Convention) Regulations 1984, SI 1984 No. 1890²⁾
- HSE, 1984. Arrangements in Great Britain for the approval of containers³⁾
- HSE 1984. Conditions for approval of examination schemes or programmes⁴⁾
- Health and Safety Commission. Docks Regulations 1988. Approved Code of Practice and Guidance²⁾
- Health and Safety Commission. Dangerous Substances in Harbour Areas Regulations 1987. SI 1987/37²⁾
- Customs Conventions on Containers 1956 and 1972²⁾
- Customs (TIR) Conventions 1959 and 1975²⁾
- European Agreement concerning the carriage of dangerous goods by road (ADR)²⁾
- International Maritime Dangerous Goods Code, Section 12, Freight Container Traffic¹⁾
- International Regulations concerning the carriage of dangerous goods by rail (RID)²⁾
- European Agreement on international carriage of perishable foodstuffs and on the special equipment to be used for such carriage (ATP) 1970²⁾

Additional safety guidance is given in HSE Guidance Note PM69 Safety in the use of freight containers and a list of other publications providing information which may be relevant is included in Appendix D.

The specification and test requirements for freight containers and their corner fittings, together with information on the handling and securing of freight containers, are covered in BS 3951-1 and BS 3951-2 which are identical with the international standards on this topic published by the International Organization for Standardization (ISO).

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, 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.

¹⁾ Obtainable from IMO, IMCO House, 4 Albert Embankment, London SE1 7SR.

²⁾ Obtainable from HMSO.

³⁾ Obtainable from SPISD, C3 enquiry point, Baynards House, Chepstow Place, London W2 4TF.

⁴⁾ Obtainable from Docks National Industry Group, East Anglia Area Office, 39 Baddow Road, Chelmsford CM2 0HL.

0 Introduction

The advantages offered by the use of freight containers, especially where door to door operation is possible, are well known. But as with all equipment, if containers are not properly looked after, or are wrongly used, various problems may arise.

Improper or careless stowage of goods in a freight container can lead to personal injury, damage to cargo, damage to the container itself or damage to the container's handling or transport equipment.

It is important that consideration is given to quarantine requirements, pest control, and the possibility of contamination. Because freight containers are re-usable thought should be given to problems which may arise by reason of the nature of previous cargoes.

The person who packs and secures cargo into a container may be the last person to look inside until it is opened by the consignee at its final destination. Consequently, a great many persons will rely on his skill; drivers of road vehicles and other highway users when the container is carried by road, railway personnel and others when the container is carried by rail, dock workers when the container is lifted on or off a ship, the crew of the ship, and the final consignees. Anyone may be at risk from a poorly packed container.

1 Scope

This British Standard provides general guidance to those concerned with the stowage of goods in freight containers designed for movement by surface modes of transport (road, rail, inland water and sea), with special emphasis on ways of achieving satisfactory levels of safety and minimizing damage to cargo. It does not cover the special precautions which have to be taken when stowing containers for transport by air.

The standard does not cover the special requirements applicable to the stowage of goods requiring temperature or atmosphere control, e.g. the provision of optimum air circulation paths in refrigerated, insulated or ventilated containers, nor the additional requirements relating to the stowage of dangerous goods. It does not cover the stowage of bulk cargoes.

NOTE The requirements relating to dangerous goods are covered in the IMCO IMDG Code (in particular, see Section 12 of the general introduction to that code) for carriage by sea and in the relevant national and international regulations for transport by road and rail (see foreword).

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

2 Factors affecting the stowage of goods in freight containers

2.1 Mechanical hazards

2.1.1 The principal mechanical hazards to the container and contents are acceleration and deceleration effects and vibrations. In addition vertical impacts can occur if the container is set down carelessly or carried by road with insufficient regard to road surface conditions. Where containers are carried on loosely coupled rail wagons there is a possibility of longitudinal impacts but these are virtually eliminated when close coupled wagons or special block trains, i.e. with bar couplings, are used.

2.1.2 Where containers are carried by sea they may be subject to additional forces of vertical, lateral and longitudinal acceleration due to the motion of the ship. (See Appendix A for more detailed information.)

2.1.3 Guidance on packing and securing cargoes in containers to minimize the effects of these movements is given in 5.4.

2.2 Climatic conditions

2.2.1 When stowing goods in freight containers account should be taken of the information given in 2.2.2 to 2.2.15.

2.2.2 Conditions to which goods in transit and storage are subjected may lead to the deterioration of the goods. These conditions may be influenced by extremes of temperature and humidity, cyclic changes of temperature and humidity, wetness, snow, etc. that may be encountered by a container on any particular journey.

2.2.3 The use of a totally closed container will have some obvious effects on the conditions to which cargoes are subjected, and some less obvious. The outer skin of the closed container, or the cover of an open container will obviously give protection against rain or spray, provided it is in good condition.

Less obvious temperature and condensation effects are described in 2.2.4 to 2.2.15.

2.2.4 Direct exposure to solar radiation can produce air temperatures under the skin of a non-insulated container which are significantly higher than external air temperatures. Radiation from the container at night can produce air temperatures under the skin of the container that are marginally lower than external temperatures. The combination of these effects can result in a range of day and night cycle temperature variations in the air just inside the skin of a non-insulated container which is greater than the corresponding range of air temperatures just outside the skin.

2.2.5 The effects of temperature variations (see 2.2.4) are so much reduced with well insulated containers, that, even without refrigeration, the air temperature ranges at any point inside the container will always be less than the range of air temperatures outside it.

2.2.6 Longer term changes in temperature conditions external to the container, either seasonal or due to movement of the container from one prevailing climatic condition to one significantly different, will sometimes have to be taken into account. Only a container in which the internal conditions are artificially controlled, e.g. by refrigeration, will provide internal conditions unaffected, or not significantly affected by such long term temperature changes.

2.2.7 Goods closest to the container skin will be more affected by external variations than those in the centre of the container, but, whenever the possible extent of temperature variations or their full significance is not known, advice should be obtained from specialists.

2.2.8 Under certain circumstances condensation may be encountered in most types of containers, either on the surface of cargo (cargo sweat) or on the inside surfaces of a container (container sweat) both during transport and when the container is opened for discharge or for any other reason.

An understanding of condensation phenomena is important because condensation may lead to such damage as rust, discoloration, dislodging of labels, collapse of fibreboard packages, mould formation, caking and clogging.

2.2.9 The main factors leading to condensation inside the container are:

- a) sources of moisture inside the container which, depending on ambient temperature conditions, will affect the moisture content of the atmosphere in the container;
- b) a difference between the temperature of the atmosphere within the container and the surface temperature of either the cargo or the inner surfaces of the container itself;
- c) changes in the temperature of the outer surface of the container which affect factors a) and b).

2.2.10 When the outside of the container is heated, e.g. by the heat of the sun during the day, then, unless the container is insulated and perhaps refrigerated as well, the air inside the container will become heated and absorb moisture from the goods, the packaging and any pallets or dunnage used. Where the container has a wooden floor or lining, moisture may be absorbed from these as well. This can lead to high humidity conditions and, eventually, to the air becoming saturated with moisture.

2.2.11 If, under these conditions, some of the cargo has a surface temperature lower than the dewpoint⁵⁾ of the air adjacent to it, condensation will form on the cargo and damage can occur.

2.2.12 If, after a high humidity has been established inside the container, the outside of the container is cooled, e.g. at night, then the temperature of the container skin may fall below the dewpoint of the air inside it. Under these circumstances moisture will form on the inside surfaces of the container. After forming under the roof, it may drop on to the cargo and lead to rain stains and the other problems listed in 2.2.8.

2.2.13 Cyclical repetition of the cargo/container sweat phenomena can result in a greater degree of damage.

2.2.14 Condensation can also occur immediately after the doors of the container are opened if the air inside the container is humid and the outside air is relatively cool. Such conditions can produce a fog and even precipitation, but, because this phenomenon usually occurs only once, it seldom results in serious damage.

2.2.15 Somewhat different condensation phenomena may be encountered in insulated and in refrigerated containers, e.g. where warm moist air is allowed to enter such a container at the time of loading, ice or frost may form on the cargo and, especially if the container is pre-cooled, on the inner surfaces of the container as well. This can have a significant effect on the subsequent performance of refrigeration equipment and care should be taken at the time of loading to minimize the amount of moisture admitted.

The practice of running refrigeration equipment at the time of loading should be avoided as this tends to exacerbate the problem.

2.3 Contamination

2.3.1 General. The principal types of contamination are taint and infestation. Infestation by pests or micro-organisms is dealt with in Appendix B.

⁵⁾ Dewpoint is the temperature at which air saturated with moisture at the prevailing air pressure will start to shed moisture by condensation.