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GUIDE TO THE DETERMINATION OF OPTIMUM DIMENSIONS OF PACKAGES FOR UNIT LOAD HANDLING

STANDARDS ASSOCIATION OF AUSTRALIA
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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australia Post

Australian Fibre Box Industry

Australian Institute of Packaging

Australian Retailers Association

Australian Road Transport Federation

Confederation of Australian Industry

Department of Defence

Department of Productivity

Grocery Manufacturers of Australia

International Cargo Handling Co-ordination Association

Packaging Council of Australia

Railways of Australia Committee

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GUIDE TO THE DETERMINATION OF OPTIMUM DIMENSIONS OF PACKAGES FOR UNIT LOAD HANDLING

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PREFACE

This standard was prepared by the Association's Committee on Modular Coordination of Packaging Dimensions under the direction of the Packaging Standards Board.

Modular coordination, in relation to packaging, is the development of an efficient dimensional relationship between packages, unit loads, materials handling and transport equipment to achieve optimum cost efficiency.

A number of systems have been devised to simplify the selection of optimum packaging dimensions by allowing users to vary different parameters. The committee has included a description of the systems developed by Australian Paper Manufacturers Ltd and National Materials Handling Bureau so that users may be aware of some of the systems available.

Australian industry has achieved a significant degree of modular coordination between packages, unit loads and transport equipment because of the early adoption and widespread acceptance for distribution of a standard 46-inch square pallet as originally specified in AS E41—1966. A revised metric standard was published in 1977 as AS 2068 and specifies the nominal pallet size as 1165 mm square.

In 1976, a new Australian standard, AS 1899, for a 1100 mm square pallet suitable for use in ISO general purposes freight containers was published. The 1100 mm square pallet was selected from several sizes proposed by the ISO Technical Committee TC 122, Transport Packages and Unit Loads.

In preparing this standard, the committee found it necessary to consider unit loads compatible with the 1165 mm and 1100 mm square modules.

Some other Australian standards relating to packaging are as follows:

AS 1048	Recommendation for the International Code for Fibreboard Cases (The Selin Code)
AS 1233	Glossary of Terms for Dimensional Coordination
AS 1234	Recommendations for Coordinated Preferred Dimensions in Building
AS 1301	Methods of Test for Pulp and Paper (Metric Units)
AS 1520	Fibreboard Containers for General Purposes
AS 1598	Recommendations for the Selection and Use of Paperboard Boxes and Cartons
AS 1899	Flat Pallets for Materials Handling (1100 mm × 1100 mm Suitable for Use in ISO Series 1 Freight Containers)
AS 2068	Flat Pallets for Materials Handling (1165 mm × 1165 mm General Purpose, Not Intended for Use in ISO Series 1 Freight Containers)
AS Z47*	Glossary of Packaging Terms
AS Z48	Methods of Test for Fibreboard Shipping Containers
AS Z55	Methods of Test for Wooden Cases

*In course of revision.

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FOREWORD

Packaging is a vital element in the product manufacturing, marketing and physical distribution processes. The transport package interacts across all three of these areas and its impact extends beyond them.

An analysis of overall costs could therefore start with an evaluation of packaging costs, including the costs of warehousing, transportation and handling, against the required level of product protection. It is also essential that the impact of marketing decisions and the needs of distributors and retailers be weighed against the effects on manufacturing and distribution efficiency.

The optimum system is one that accounts for all performance requirements and offers a minimum cost solution compatible with overall financial policy and objectives. In order to give benefits in one area it may therefore be necessary to pay a premium to another.

In addition, there may be factors peculiar to some products or industries that may further complicate package and unit load design. For example, mechanized and automated handling systems often place dimensional constraints on package design.

This standard gives full consideration to these important factors and is framed to provide practical guidelines on the selection of package dimensions that will form efficient unit loads compatible with Australian distribution systems.

GUIDE

1 SCOPE. This standard provides guidelines for the determination of the optimum dimensions of packages for unit load handling.

Ways of improving modularity of package dimensions are described.

These guidelines are based on two sets of plan view dimensions for unit load that are compatible with Australian distribution systems. The first set of dimensions is based on transport and handling equipment designed to accommodate the 1165 mm × 1165 mm pallet, which is widely used for domestic freight movement. The second set is based on the 1100 mm × 1100 mm pallet and is suitable for use in ISO Series 1 general freight containers.

This standard does not preclude the use of other plan view dimensions which may be necessary to suit specific requirements of some part of the total distribution system.

The height of the unit load is an important variable dependent on the nature of the product and the distribution system used. The height of the transport package is left to the discretion of the designer and the systems described in this standard will be of assistance.

NOTE: The performance aspects of packaging systems are not included in this standard.

2 DEFINITIONS. For the purpose of this standard, the terms in AS Z47 and the following definitions apply:

2.1 Bulge, filling—expansion of the original outside dimensions of a transport package during the filling and packing process.

2.2 Bulge, compression—expansion of outside dimensions of a filled transport package resulting from downward pressure caused by strapping of the unit load or by the weight of superimposed packages.

2.3 Bulge, settling—expansion of the outside dimensions of a filled transport package caused by vibration during transit, by fatigue, or by slumping during long-term storage.

2.4 Gross unit load size (GULS)—the dimensions of the rectangular space defined by the intersection of the floor by four vertical planes which totally enclose all extremities of the unit load in an assembled condition.

2.5 Modular coordination—a coordinated dimensional relationship between packages, unit loads, materials handling, transport and storage equipment.

2.6 Net unit load size (NULS)—the theoretical plan view dimensions of a unit load which are used as the basis for the calculation of the dimensions of transport packages, excluding allowances.

2.7 Pallet—a portable load-carrying platform having two interconnected decks, spaced to permit the entry of lifting equipment such as fork arms or tines and slings with bars.

2.8 Pallet area utilization—the area occupied by the transport packages (net unit load area) expressed as a percentage of the overall area of the pallet deck.

2.9 Primary package—a package that ultimately reaches a consumer as a basic unit of sale. (Sometimes called a 'consumer package'.)

2.10 Stacking irregularity—enlargement of the net unit load dimensions by irregular stacking, out-of-plumb stacking, out-of-square stacking, or a combination thereof.

2.11 Transport package — package intended for the transportation of one or more articles such as primary packages. (Sometimes called 'secondary pack', 'outer', 'shipper', etc.)

2.12 Unit load—a number of filled transport packages, or other items, that are held together by one or more mediums such as a pallet, slip sheet, strapping, interlocking, glue, shrink or stretch wrap, to make them suitable for transporting, stacking and storing as a unit. The term may also be used to describe a single large item suitable for transporting, stacking and storage.

3 UNIT LOAD DIMENSIONS AND TOLERANCES.

3.1 General Principles.

3.1.1 *Concept.* A standard unit load should have a dimensional tolerance to prevent, on the one hand, oversizing which may result in damage during handling in transport or storage equipment and, on the other hand, undersizing which wastes available cubic capacity and again may result in damage because of excessive movement in transit.

To simplify the expression of unit load dimensions and tolerances, the concepts of gross unit load size (GULS) and net unit load size (NULS) are used to define the design limits of the unit load base dimensions.

3.1.2 *Net unit load size (NULS).* The NULS as defined in Clause 2.6 represents the length and width dimensions used as the basis for the calculation of the dimensions of the transport packages and is derived by deducting from the GULS allowances for filling, settling and compression bulge and stacking irregularities.

The NULS may also be thought of as the overall length and width of a single layer of transport packages which are accurately aligned, free from bulge and in closest contact with each other (see Fig. 1).

3.1.3 *Gross unit load size (GULS).* The GULS as defined in Clause 2.4 represents the maximum length and width dimensions of unit load which will provide the optimum handling clearance in transport vehicles and storage facilities.

The unit load should therefore be designed to ensure that the GULS dimensions are not exceeded at any stage in distribution otherwise damage and inefficient handling practices may result (see Fig. 1).