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AMXFC REPORT NO. 6-63

Technical Report No. 244

THE MODULAR CONTAINER UNITIZED LOAD CONCEPT

Interim Report

August 1963

ARMED FORCES FOOD AND CONTAINER INSTITUTE
U.S. ARMY QUARTERMASTER RESEARCH AND ENGINEERING CENTER
CHICAGO 9, ILLINOIS

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The Modular Container Unitized Load Concept by Joseph P. Akrep

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2. Modulars
3. Unitized Load

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PROJECT: Container Research and Development 7-91-03-015

SUBPROJECT: Packaging and Containers for Unitized Loads

SUBTASK: Design of Lightweight Expendable Cargo Containers

PROBLEM: Conditions and Uses Applicable to the 5-Size Modular System

THE MODULAR CONTAINER UNITIZED LOAD CONCEPT

Interim Report

by

Joseph P. Akrep, General Engineer
Research and Methods Analysis Branch
Container Division

August 1963

Armed Forces Food and Container Institute

THE MODULAR CONTAINER UNITIZED LOAD CONCEPT

Objective

To provide a low cost, expendable packaging and packing system utilizing the 40" x 48" pallet base and compatible with all transportation and storage media for:

1. Preload shipments to forward areas.
2. Loading and packing capability for organizational materiel for units to be moved (STRAC, etc.).
3. TO&E packages and block loads for either new units being activated or combat units being refitted.
4. Rapid operation of the new QM combat type support companies as proposed for fast moving Class II and IV items.
5. Furnish a standard system of general purpose containers for use in depots in CONUS and ZI for materiel moving toward the combat elements, and to take system-wide advantage of the increasingly available materials handling capability now being developed up to and including combat zone resupply.
6. Survival dumps to contain prepackaged essential survival supplies, well forward.

Background

Military operations to date have, in general, been tied to a multitude of small packages which have involved an excessive manpower requirement for handling, especially in transfer operations. This problem has been the subject of study by various agencies, and progressive development of concept and doctrine through Pentana, Momar, and ROAD has

confirmed the necessity for more responsive logistical mobility to complement the improved tactical mobility of the combat units. Various studies such as Scheduled Supply, Small Field Depots, Supply Segmentation and Unitization, and Field materials Handling (by the Quartermaster Board) have furnished additional important information on the subject.[1/]

With the advent of various types of special purpose Mechanical Handling Equipment (MHE) for most operations within the supply and distribution system up to and including Army areas, it has been possible to postulate a consolidated-unitized system designed around the standard 40" x 48" pallet base with a load of approximately one ton. Solid loads of single items such as subsistence are being successfully handled on a continuing basis, and there should be no problem in utilizing this system for most high volume items in Class I, II, Packaged III, IV, and V, where required.

However, a problem occurs in the packing of small quantities, odd lots and broken lots, and mixes of various items, especially where proper identification at the consolidation point and identification at the receiving-segregation point become critical. For the six areas listed in the objective above, there has been no readily available standard packing system which would furnish these requirements. In general, this has resulted in random packaging in a multiplicity of unrelated sizes of poor compatibility with the standard 40" x 48" pallet base. To obtain a high degree of cube utilization on the pallet, the modular design premise included the feature of modularization based on the pallet size itself -- 40" x 48", with a total load height of 54".

1/ See references, Page 9.

Description

The modular container unitized load is a 5-size container system designed to fit on a standard 40" x 48" pallet base with a sleeve to completely enclose the load, and a cap to provide weather protection as illustrated in Figures 1a and 1b. The 5-sizes selected are fractional cubical multiples of the basic volume 48" x 40" x 48", as illustrated in Figure 1a. These are ½, 1/8 (2 different), 1/16, and 1/32. When assembled on the pallet, the block load will consist of any combination of the 5 sizes which will build up to a load dimension of 48"L x 40"W x 54"H, with no overhang, underhang, or spaces between the containers, so that the protective outersleeve and cap may be added. The principal advantages are:

Lightweight: The empty weight of the container set with sleeve and cap averages 105 pounds. With a standard pallet of about 65 pounds, the total weight of the system averages 170 pounds.

Collapsibility: The container sets are furnished completely knockdown and require a minimum of storage space before use. They can be quickly and easily set up for loading. Storage life indoors is indefinite.

Expendability: Because the container sets, (complete with sleeve, cap, and pallet) are in low cost, they are expendable and should not be items of accountable issue, thereby relieving military units of the problem of returnables. Cost was $9.91 per set of containers, sheath, and cap in a recent procurement. Containers and pallets are easily disposable at destination, may be reused, or the material adapted for other purposes.

Flexibility: The use of five different sizes provides an exceptional flexibility in use, allowing selection of a wide range of cube over a ratio of eight to one from the largest to the smallest container for various loads to different destinations.

Weather Resistance: The construction material of the initial test items is a weather resistant fiberboard designed especially for military field use. Use of this material in the cap and sleeve construction will furnish a rainproof sheath for the protection of the load. The same material is also used for the individual containers to provide durability for load break-down and local distribution at the point of delivery. It should be noted that special kits and/or combinations such as plastic or metal laminates may be designed for specialized purposes, such as floating loads, Arctic, CBR, and caching purposes.

Materials Handling: The modular container load is designed to take advantage of present and future expected materials handling equipment. The standard 40" x 48" pallet size, the over-all load dimensions, and the 2,000-pound design load can be handled by the maximum number of materials handling equipment which will be encountered, since the smallest general design capacity of this equipment is 2,000 pounds.

Transportation Compatibility: Use of the standard 40" x 48" pallet base will permit the modular container load to be efficiently loaded on general transportation media such as rail cars, trucks, ships, and military vehicles, including the cargo spaces of tactical supply aircraft such as the tail-ramp loading YAC-1DH Caribou, and the HC-1B Chinook helicopter.

The container sets are easily set up from the knockdown condition, loaded, and closed. Depot and factory type users may utilize their conventional equipment, while a manual has been prepared for the use of field type units such as combat organizations preparing for a move. Any quantity of containers may be held in indoor storage, in a completely knockdown condition requiring only a minimum of space, until withdrawn for use.

Uses: The six items in the objective are as follows:

1. Preloaded shipments to forward areas are considered essential, and have been included in various QM Board and other agency studies. While load lists should necessarily be used with caution, it is very likely that certain preloaded supplies in large quantities will be used in delivery to large units to eliminate as much rehandling as possible in the normal intermediate depot, port, issue, and distribution system inherent in the quasi-retail peacetime supply operation. The five sizes should permit a good degree of flexibility in packaging by item, destination unit, and for consolidation.

2. Loading and packing capability for organization material for units to be moved (STRAC, etc.) would furnish a readily available, easily stored, expendable container system which could be packed quickly and easily. The modular containers would provide a readily available packing system for rapid troop movements where it

is normally a difficult and time consuming task to obtain the packing materials required.

3. TO&E packages and block loads. New units being activated, or combat units being refitted require a great number of items of various classes and services, and the assembly of all these items is a time consuming operation. It may be possible to pre-assemble most of these items as TO&E packages and block loads so that the initial unit supply or resupply can proceed with a minimum of delay. The modular load concept may provide a flexible packing system for this type of assembly which would allow efficient consolidation into a palletized unit load, yet provide a segregation capability within the entire load package in a range from one-fourth down to 1/32 of the unit load.

4. QM combat type support units. Modern concepts of field operations have eliminated QM units within a division. However, since the required QM functions cannot be eliminated, this has necessitated the formation of independent QM combat type field support units, such as the QM Direct Support Company (2-3 days supply) and the QM Field Depot Company (5-7 days supply). Effective operation of the relatively close support companies requires a mobility in movement and a flexibility in distribution which probably can only be met with mechanically handled unit loads capable of easy breakdown into issue units. Immobile stocks are completely vulnerable under modern open field operational concepts, and mobility of the close support echelon is essential to prevent capture or destruction of the valuable supplies.

5. Standard general purpose CONUS or ZI depot use. Depot operations, especially in the packing lines, utilize many unrelated container sizes, all generally without consideration for dimensional compatibility with the standard 40"x48" pallet. In many instances these dimensions and cubes vary only slightly from container to container with no apparent design or logical progression. Since both internal cube in the box and external cube on the pallet may be lost, it would appear that use of the modular container sizes would result in more efficient cube utilization on the pallet and therefore eliminate one of these losses. Also, the modular sizes may permit standardization within many depot organizations and eliminate the confusion of an excessive number of sizes.

6. Army area survival dumps. The atomic and nuclear potentials have increased the vulnerability of rear area organizations, and any supply concentrations will become prime targets. To insure against this possibility and provide for continued sustained operations of the combat units, Army area survival dumps of prepackaged essential survival supplies cached well forward have been proposed. One example cited the need for 2,000 tons of prepackaged supplies for two divisions for two days (Col. H.E. Nelson, "Mobile Resupply", Army, Feb. 1960). The two primary considerations would be environmental protection and ready transportability, and these requirements would both be met by an integrated packaging-materials handling system utilizing palletized 40" x 48" one ton loads. The bulk of the 2,000 tons for the division units would probably be Class I, III, and V, much of which could be

packed in solid one ton pallet loads. However, as much as two or three hundred tons might be Class II and IV materiel (essential spares, equipment, etc.) which could advantageously be packed in the modular containers for proper identification and segregation.

While designed primarily as a general purpose container system, it should be noted that exceptional flexibility exists in terms of sources of supply, styles and types of containers, and materials and methods of construction. Practically all of the military fiberboards are readily available and can be procured on short notice in large quantities in any of the usual styles. For extreme conditions or uses such as Arctic long-term storage, floating unit loads, CBR and caching; conversion kits and/or various combinations, especially in the sheathing systems, should be possible.

In-house testing will consist of laboratory compression and spray tests, especially for variables in materials and methods of sheathing fabrication and assembly. External testing will consist of evaluation of actual environmental hazards in loading, shipping, handling, storage, and extended outdoor exposure under hot, wet, and cold conditions.

References

1. "Scheduled Supply", March 1959, QMB Proj. No. 15, QMCCD Proj. 57-7.

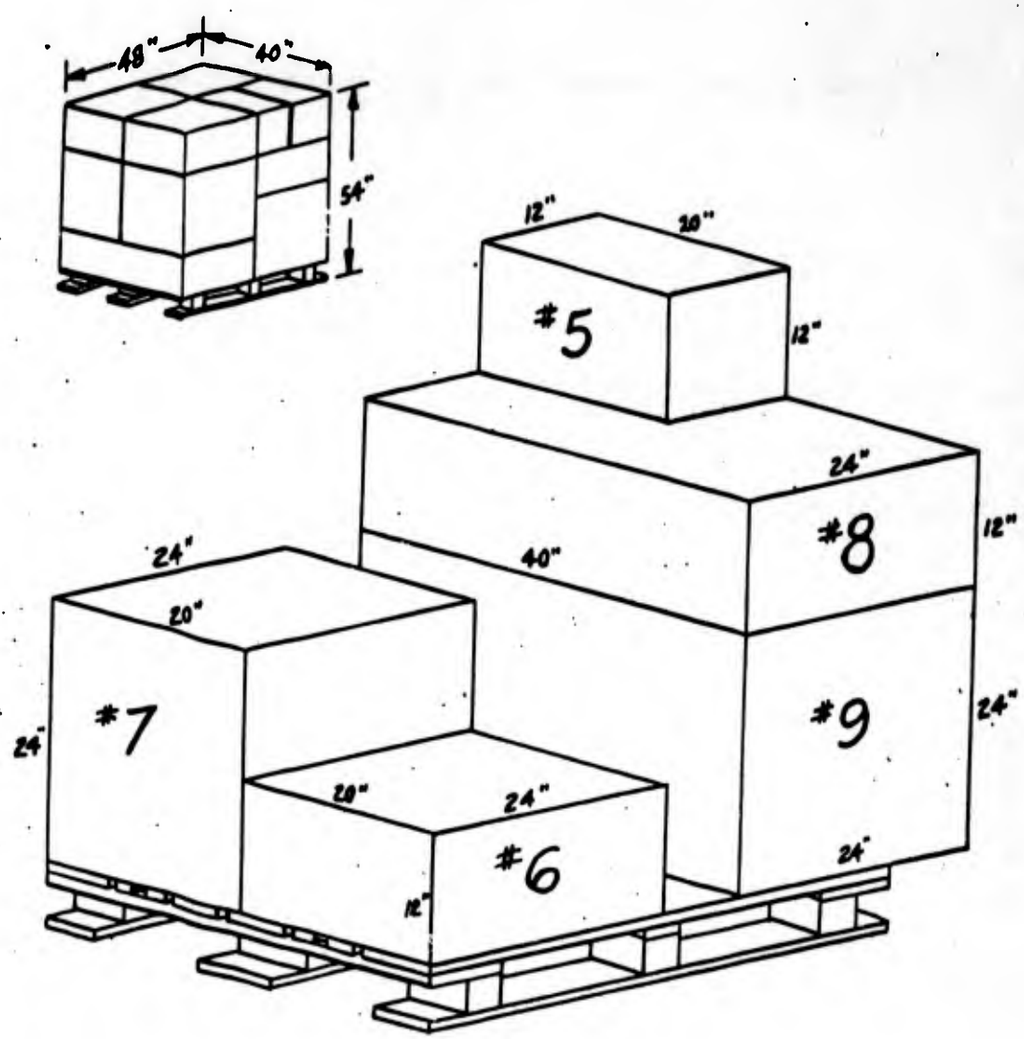
2. "Small General Depot Concept", Phase I Sept. 1956, Phase II, Feb. 1961. QMB Proj. No. 17, QMCCD Proj. 57-8.

3. "Supply Segmentation and Unitization for Combat Support", June 1961, QMB Proj. No. 23, QMCCD Proj. 56-7.

4. "Integrated Materials Handling Methods and Equipment", Sept. 1961, QMB Proj. 24, QMCCD Proj. 57-9.

MODULAR SIZES
ON THE STANDARD
40" X 48"
PALLET

	OVERALL DIM.	GROSS CU.
# 5	20"X 12"X 12"	1.67
# 6	24"X 20"X 12"	3.34
# 7	24"X 20"X 24"	6.67
# 8	40"X 24"X 12"	6.67
# 9	40"X 24"X 24"	13.34



RELATIONSHIP OF SIZES FOR MODULAR CONTAINERS FOR UNITIZED LOADS.

Figure 1a

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Container Development Project 7X91-03-015 Packaging & Containers for Unitized Loads. Armed Forces Food and Container Institute, Jan. 1961.

FIBERBOARD CAP & SLEEVE

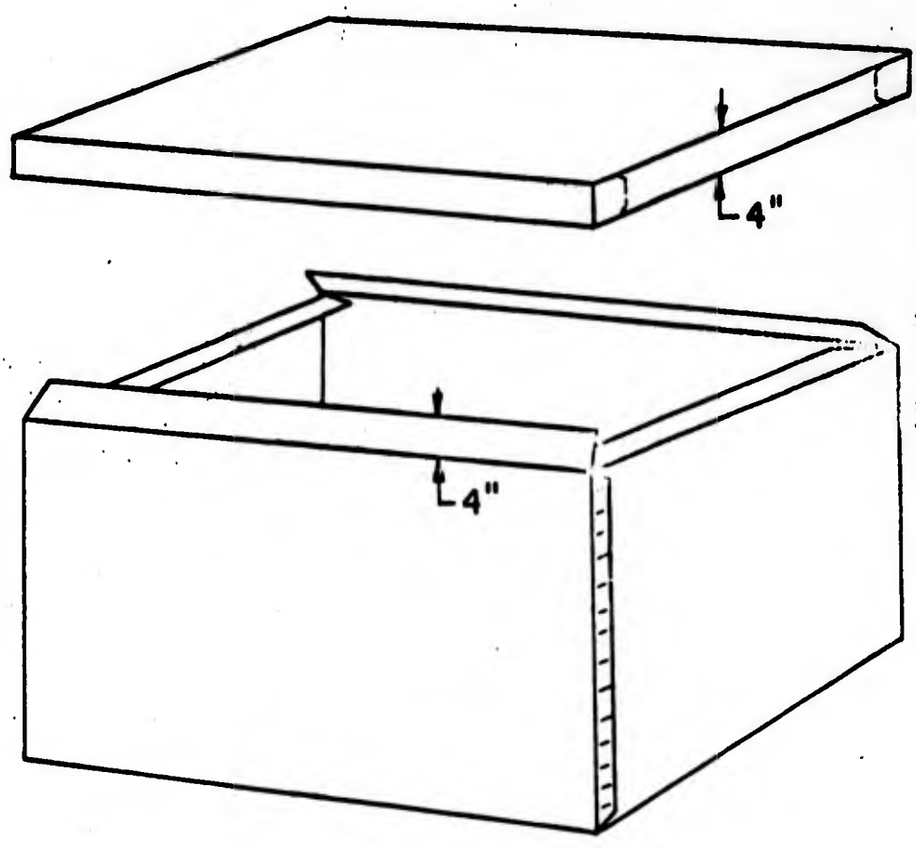

Figure 1b

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