MIL-STD-1663
25 APRIL 1980

MILITARY STANDARD

LOADING AND RESTRAINT OF AMMUNITION AND EXPLOSIVES IN COMMERCIAL INTERMODAL CONTAINERS UTILIZING THE INTERNAL RESTRAINT SYSTEM KIT

FSC 8140

DEPARTMENT OF DEFENSE
Washington, D.C.20360

Loading and Restraint of Ammunition and Explosives in Commercial Intermodal Containers Utilizing the Internal Restraint System Kit.

MIL-STD-1663

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. As of the promulgation date of this document, this standard is a mandatory requirement to be invoked in all applicable specifications, purchase descriptions, or military interdepartmental procurement requests (and contracts, when necessary) in the procurement of ammunition, explosives, and associated inert items to be transported in commercial intermodal container when using the Internal Restraint System developed by the Naval Weapons Handling Center (NWHC). When using the Internal Restraint System during loading operations, all DOD Department and Agencies shall meet the requirements of this standard.

3. Requests for technical interpretations, approval of deviations, or special assistance should be sent to Commanding Officer, Naval Weapons Station Earle, Naval Weapons Handling Center, Colts Neck, NJ 07722, or call Autovon 449-7691, 7692, or 7693 or A/C 201-462-9500.

4. Copies of this complete standard or individual dash sheets may be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Ordnance Station, Standardization/Documentation Division, Code 501, Indian Head, MD 20640 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This standard addresses the loading and securing of ammunition, explosives and associated items for transportation by or to DOD in commercial containers. The procedures and practices described use the Internal Restraint System Kit (IRSKIT) developed by the Naval Weapons Handling Center.

Physical dimensions, weights, types of loads, and container configuration vary greatly, precluding the coverage of all combinations. It is the intent of this military standard to describe typical applications for different blocking and bracing procedures and to set up acceptable standards. Requirements for specific loads are given in a series of MIL-STD dash numbered sheets which form a part of this standard.

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NOTE: The cover page of this standard has been changed for administrative reasons. There are no other changes to this document.

INCH-POUND

MIL-STD-1663
25 APRIL 1980

DEPARTMENT OF DEFENSE
STANDARD PRACTICE

LOADING AND RESTRAINT OF AMMUNITION AND EXPLOSIVES IN COMMERCIAL INTERMODAL CONTAINERS UTILIZING THE INTERNAL RESTRAINT SYSTEM KIT

AMSC N/A

FSC 8140

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

FF-N-105	Nails, Brads, Staples and Spikes: Wire cut and Wrought.
PPP-B-621	Box, Wood, Nailed and Lock Corner
MM-L-751	Lumber; Softwood
QQ-S-781	Strapping, Steel, Flat and Seals

STANDARDS

MILITARY

MIL-STD-137	Material Handling Equipment

HANDBOOKS

MILITARY

MIL-HDBK-138	Container Inspection Handbook for Commercial and Military Intermodal Containers (Dry Cargo Type)
MIL-HDBK-236	Index to Standards for Palletizing, Truck Loading, Railcar Loading, and Container Loading of Hazardous Materials

MANUALS

TM-(Number Pending)	Technical Manual Ammunition Restraint Systems for Commercial and Military Intermodal Freight Containers(Assembly Installation and Removal Operations)

DRAWINGS

NAVAL SEA SYSTEMS COMMAND (Code Ident 10001)

DL5166424	Internal Restraint System (IRSKIT)

PUBLICATIONS

NAVAL SEA SYSTEMS COMMAND (Code Ident 10001 and 53711)

OP 5	Ammunition and Explosives Ashore - Safety Regulations For Handling, Storing, Production, Renovation and Shipping
OP 2165	Navy Transportation Safety Handbook
OP 2173	Approved Handling Equipment for Weapons and Explosives
OP 4098	Handling Ammunition Explosives and Hazardous Materials With Industrial Material Handling Equipment

NAVAL MATERIAL COMMAND

NAVMAT P-5100	Safety Precautions for Shore Activities (Copies available from Naval Material Command Headquarters, Washington, DC)

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids shall apply.

CODE OF FEDERAL REGULATIONS (CFR)

46 CFR 146N	Detailed Regulations Governing the Transportation of Military Explosives and Hazardous Munitions Onboard Vessels
49 CFR 100-199	Transportation
49 CFR 310-398	Federal Highway Administration

COAST GUARD

Coast Guard CG 108	Rules and Regulations for Military Explosives and Hazardous Munitions, Department of Transportation
Coast Guard CG 001-80 or applicable superseding issue	Commandant Coast Guard Approval

(Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. Orders for publications should cite the latest issue and supplements thereto.)

AMERICAN TRUCKING ASSOCIATION

Tariff No. 111D	ATA Hazardous Materials Tariff
(No Number)	Summary of Size and Weight Limitations

(Copies may be obtained from the American Trucking Association. Inc., 1616 P Street, NW, Washington, DC 20036.)

ASSOCIATION OF AMERICAN RAILROADS (AAR)

Pamphlet No. 6c	Illustrating Approved Methods for Loading and Bracing Trailers and less than Trailer Shipments of Explosives and other Dangerous Articles via Trailer-on-Flat-Car (TOFC) or Container-on-Flat-Car (COFC)

(Copies may be obtained from the Bureau of Explosives, A.A.R., Suite 620, 1920 L Street, NW, Washington, DC 20036.)

3. DEFINITIONS

3.1 General. The following definitions cover terms used in this standard and are not to be confused with definitions appearing elsewhere.

3.1.1 Container (intermodal). A container (intermodal) designed to be transported by various modes of transportation; having an interior volume of 400 cubic feet or more; designed to facilitate and optimize the carriage of goods by one or more modes of transportation without intermediate handling of the contents and equipped with features permitting its ready handling and transfer from one mode to another.

3.1.2 IRSKIT (internal restraint system kit). A kit containing metal hardware required to restrain the lading within the container when used in conjunction with wood dunnaging.

3.1.3 Ammunition. A contrivance charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or chemical material for use in connection with defense or offense including demolition, training, ceremonial, or nonoperational purposes.

3.1.4 Bay. One or more stacks of lading in a container separated from the remainder of the lading by a separator gate.

3.1.5 Buffer piece. A dunnage piece which serves as a bearing surface between lading or other dunnage.

3.1.6 Cleat. A member used to reinforce another member or to hold it in position.

3.1.7 Dunnage. Lumber, strapping nails or other materials (including IRSKIT hardware) used to secure and protect lading.

3.1.8 Explosive. A chemical compound or mixture of substances which, when subjected to suitable initiating impulses or agents such as flame, spark, heat, impact, or friction (whether applied mechanically or electrically), will undergo chemical and physical transformation at speeds varying from extremely rapid to virtually instantaneous, resulting in sudden and rapid development of very high pressure in the surroundings. Examples are: black powder, smokeless powder, tetryl, TNT and HBX.

3.1.9 Fill material. Dunnage lumber suitable for shimming between other dunnage components and/or container.

3.1.10 Front bulkhead. A dunnage structure, consisting of horizontal wood beams and vertical wood members, used to retain the lading from moving forward and to transfer the forward longitudinal forces to the corner posts of the container front wall.

3.1.11 Hazardous materials. A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce.

3.1.12 Hold -down. Dunnage component placed across the top of lading to prevent upward movement.

3.1.13 Horizontal. Dunnage member serving as a horizontal component of a dunnage structure.

3.1.14 Lading. The load or cargo in the intermodal container.

3.1.15 Lateral. Dunnage-structure member which runs parallel with the lateral centerline of a container.

3.1.16 Layer. A course or stratum of items parallel to the floor, one item in height, and two or more items in width (see Figure 1).

3.1.17 Load pattern. Relative placement of lading in a container.

3.1.18 Longitudinal. Dunnage-structure member which runs parallel with the longitudinal centerline of a container.

3.1.19 Pitch. The movement of a ship in which the bow and stern alternately move up and down.

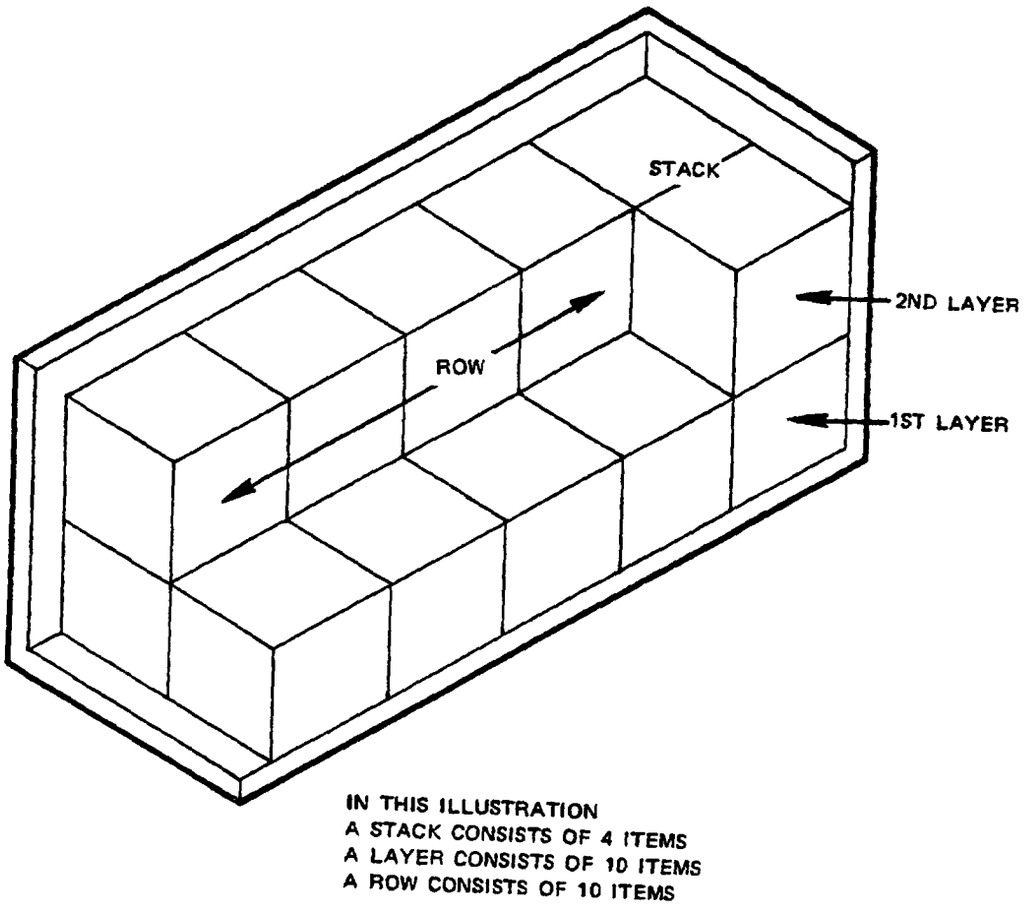


FIGURE 1. Container load terminology.

3.1.20 Rear bulkhead. A dunnage structure near the doors of a container consisting of horizontal and vertical wood members used to retain the lading from moving rearward and to transfer the rearward longitudinal forces to the IRSKIT hardware which is attached to the corner posts of the container front wall.

3.1.21 Roll. Ship motion described as angular displacement about the longitudinal axis of the ship.

3.1.22 Row. Items extending lengthwise of the container, parallel to the sides, and one item in width (see Figure 1).

3.1.23 Seal. Metal device for fastening and securing metal straps.

3.1.24 Separator gate. A dunnage structure consisting of dimensional lumber or plywood used to facilitate transmittal of longitudinal forces from one stack to another and/or to separate the stacks of lading into sections throughout the container.

3.1.25 Shim. Dunnage component of suitable thickness to fill voids between dunnage members or container and lading.

3.1.26 Side-frame assembly. Dunnage structure constructed so that it extends from a side of a container and bears directly against the lading to restrict free movement in a lateral direction.

3.1.27 Sleeper. Wood member nailed to floor and butted against the lading to prevent lateral movement.

3.1.28 Spacer. Small pieces of lumber used to adequately space other dunnage members.

3.1.29 Stack. Items extending from one side of the container to the other, parallel to the ends, one unit in length, and one or more units in height (see Figure 1).

3.1.30 Strapping. Metal banding used for securing lading in the container.

3.1.31 Stringer. The longitudinal member of a sway-brace assembly that bears against the pallet posts.

3.1.32 Sway brace. Dunnage component or assembly used to prevent lateral motion of the lading.

3.1.33 TDA (Technical Direction Agent). An activity designated by the cognizant systems command headquarters by contract, task, assignment, or project order to assume responsibility for performing, directing, or monitoring the design and testing of equipment for weapon system components.

3.1.34 Tie piece. Dunnage component which connects two other dunnage members.

3.1.35 Unit load. Two or more items arranged on a base or pallet, bound together and to the base or pallet, and constructed to facilitate handling with equipment such as forklift trucks, slings, etc.

4. GENERAL REQUIREMENTS

4.1 General. This section covers the general requirements for the safe transportation of hazardous materials using the Internal Restraint System Kit (IRSKIT) in commercial intermodal containers manufactured to ISO (International Standards Organization) specifications and capable of transporting lading by road, railcar and ship. Detailed requirements are contained in Section 5.

4.2 MIL-STD dash-number-sheets. This MIL-STD is supplemented by a series of individual documents identified by a dash number following the basic MIL-STD-1663 designator. The individual documents, or dash-number sheets, provide detailed instructions for loading, blocking and bracing of a specific ammunition, explosive, or associated items in commercial containers using the IRSKIT system.

4.2.1 Use of MIL-STD dash-number sheets. The MIL-STD dash-number sheets provides the approved plans for loading hazardous items. Where a MIL-STD dash number sheet exists for a given item, the loading, blocking, and bracing procedures given on that sheet shall be followed without exception. If no MIL-STD dash-numbered sheet exists for an item which is to be shipped, this standard will provide guidance to allow plans to be developed by the shipping activity. If required, NWHC will provide technical assistance on a case-by-case basis. Repetitious requests for the same commodity will prompt development of a specific MIL-STD dash-number sheet.

NOTE

It is anticipated that the activities concerned with loading explosive items in commercial containers will develop a working relationship with NWHC in order that safe and authorized shipping practices will be universally observed.

4.3 MIL-HDBK-236. MIL-HDBK-236, titled "Index to Standards for Palletizing, Truckloading, Railcar Loading and Container Loading of Hazardous Materials", provides an index to MIL-STD dash documents (container loading) in addition to the documents in the other areas listed in the title. The handbook includes three types of listings:

Section 1 lists, in alpha-numerical sequence, Department of Defense Identification Code/Navy Ammunition Logistic Code (DODIC/NALC) designated items that have "specific" or "typical" dash number sheets authorized for container loading of the items listed.

Section 2 lists, in alphabetical order, all the ammunition and weapon system component items that have "specific" or "typical" dash number sheets authorized for container loading of the items listed.

Section 3 lists, numerically, all dash number sheets giving the revision and change notice status of each document.

NOTE

Users of MIL-STD-1663 dash-number sheets shall consult Section 3 of the latest revision of MIL-HDBK-236 to confirm that they are using up-to-date dash number sheets.

4.4 Commercial containers. Commercial containers used for shipping ammunition and explosives have the following outside dimensions: 8 feet wide, 20 feet long, and either 8 or 8 1/2 feet high. The interior dimensions vary depending on the type of construction and the height. There are three basic types of construction: (see Figure 2)

a. Steel frame, aluminum panel exterior, plywood panel interior, aluminum roof, wood flooring (see Figure 2A).

b. Steel frame, fiberglass reinforced plywood (FRP) walls and roof, wood flooring (see Figure 2B).

c. Steel frame, corrugated steel walls, steel roof, wood flooring (see Figure 2C).

4.4.1 Interior dimensions. The interior dimensions vary from 19' to 19' 7" long, 7'7" to 7'10" wide, and 7'1" to 7'10-3/8" high. The door dimensions vary from 7'5" to 7'7" wide, and 6'10" to 7'6" high. The corner post configurations are of several designs and shapes ranging from simple angles to corrugated angles including double angles and compound angles.

4.4.2 IRSKIT hardware. The IRSKIT hardware (see Figure 3) which is used to restrain the lading in an intermodal container (see Figure 4) during transit, consists of the following:

a. 4 ea 5/8" diameter steel wire rope assembly

b. 4 ea steel anchor blocks

c. 4 ea threaded steel rods 1"x8 UNC-2A x 48"

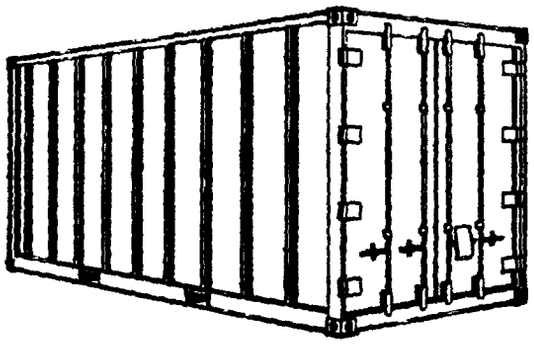


Figure 2A. Steel frame, aluminum panel exterior, plywood panel interior, aluminum roof, wood flooring.

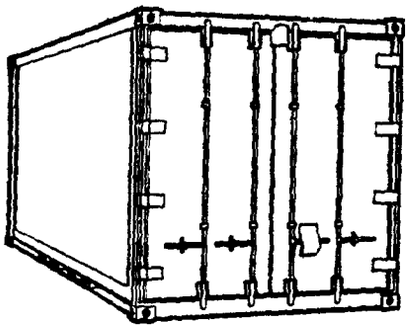


Figure 2B. Steel frame, fiberglass reinforced plywood walls and roof, wood flooring

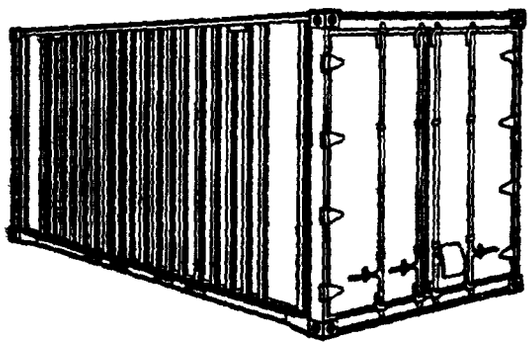


Figure 2C. Steel frame, corrugated steel walls, steel roof, wood flooring

FIGURE 2. Typical commercial containers.

d. 4 ea backup plates

e. 2 ea aluminum structural angle (one right hand, one left hand) 8 x 6 x 11.68lbs. per ft. x 84.75.

f. 2 ea spherical washer sets

g. Screws, nuts, shackles, washers, etc.

4.5 Load movement. Under normal transportation conditions the load is subjected to vertical, lateral, and longitudinal forces that could cause a loosening of the load and may allow some movement of the lading. Blocking and bracing of the lading must be sufficient to control any movement that may cause accidential damage to, or ignition detonation of the lading.

4.5.1 Depending on the mode of travel forces exerted upon loads occur in varying degrees and from different causes. On highways, longitudinal forces exerted in the forward direction are caused primarily by braking on steep descents or by sudden stops. Forces exerted in a rearward direction are caused primarily by ascension of steep hills or load rebound after a sudden application of brakes. Lateral forces occur when rounding corners or sharp curves, when traveling on high-crowned or banked roads, or when swerving. Vertical forces are caused by vibration or when traveling over rough terrain.

4.5.2 On railways, longitudinal forces are much more severe than those occurring laterally and vertically. Longitudinal forces are induced while coupling cars, humping them in marshalling yards, and by changes of slack within a long train. Some lateral forces are experienced when rounding curves but to a much lesser degree. Similarly, vertical forces are primarily limited to vibration.

4.5.3 Forces exerted upon loads aboard ships can occur in all directions, particularly during transit in rough seas. Both longitudinal and vertical forces are induced primarily by a movement of the ship called pitch; whereas lateral forces are induced by a movement called roll. At sea, the different forces may occur randomly or simultaneously.

4.6 Control of load movement. Load movement is controlled by careful application of the following fundamental principles:

a. Develop a loading plan in which the commodity to be shipped is distributed systematically throughout the intended stowage area

b. Place each individual item in the container so that the overall load is tight.

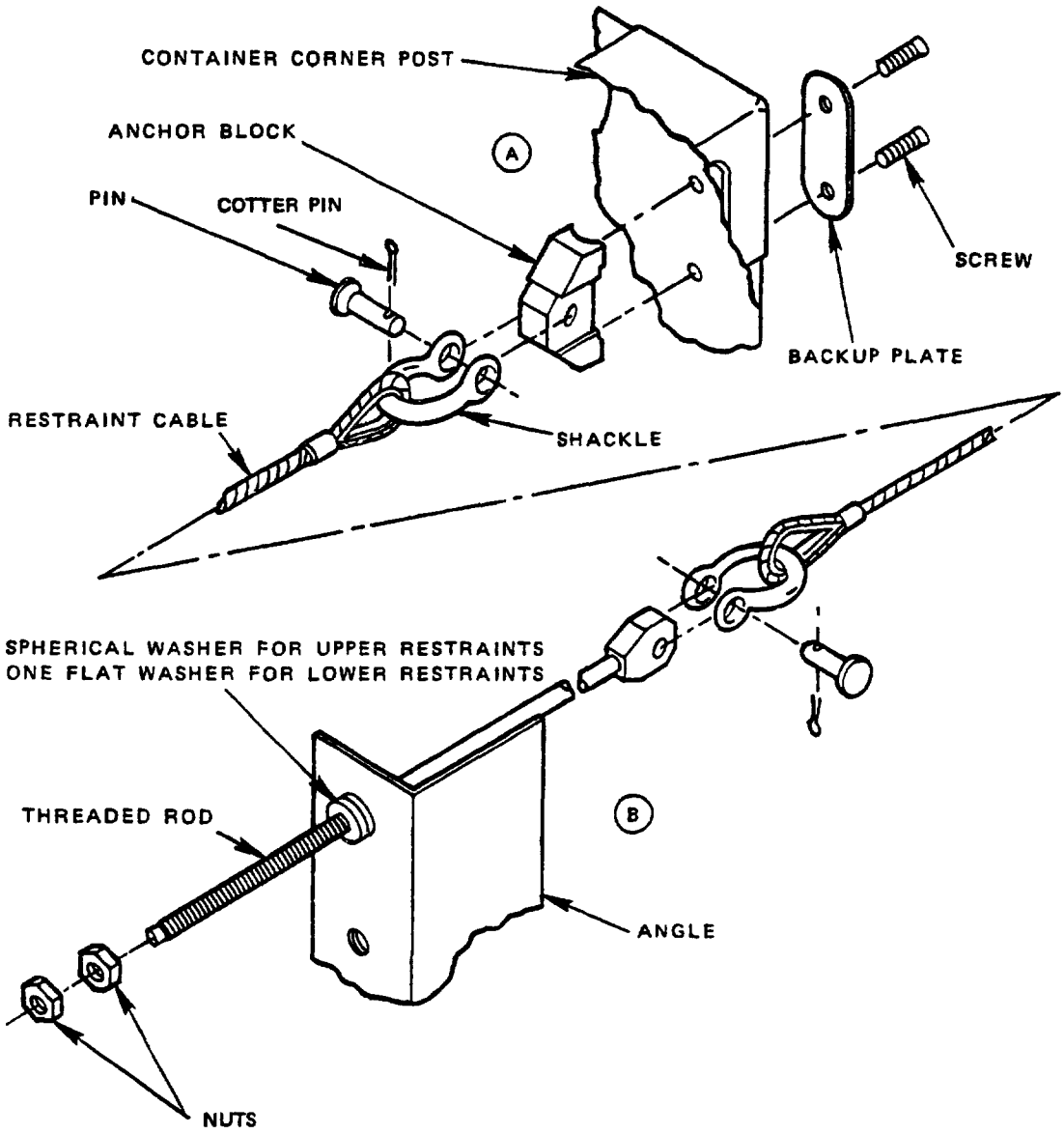


FIGURE 3. IRSKIT hardware.

c. Utilize the IRSKIT hardware (see Figure 4) and the proper wood dunnage components and structures to block and brace the load so that forces exerted during transit will not cause load movement which might cause damage to the lading.

4.6.1 If the load is not properly blocked and braced, is out of alignment, or is improperly distributed, the load might move when subjected to the forces existent during transit. When the load is properly blocked, braced, aligned, and evenly distributed, the use of the IRSKIT hardware and various dunnage pieces described herein will prevent the type of load movement which might cause damage to the lading.

4.6.2 Forward movement of the lading is controlled by the front bulkhead. This bulkhead carries the forces developed into the forward corner posts and front wall.

4.6.3 Rearward movement of the lading is controlled by the rear bulkhead which carries the forces developed into the IRSKIT harware. This hardware is attached to the forward corner posts.

4.6.4 Lateral movement is controlled by wood blocking such as side wall blocking, floor sleepers, sway brace assemblies, top-of-the-load sway bracing, or interpallet sway bracing.

4.7 Shipping modes. Commercial containers may be used for transporting ammunition and explosives via public highway, rail, or waterway . All of these shipping modes may be used in transit without having to handle the lading (load/unload) except at point of origin and destination.

4.7.1 Public highway. Commercial containers are authorized for transporting ammunition and explosives over public highways providing all the requirements of 49 CFR Parts 100 to 199 and all State and local laws are adhered to. Guidance is also contained in the American Trucking Association Hazardous Materials Tariff No11D and the summary of size and weight limitations. Attaching devices which fasten a container to a trailer chassis shall meet the requirements of 49 CFR Part 393.

4.7.2 Rail. Containers may be shipped by railcar in either of two ways: Container-on-Flatcar (COFC) or Trailer-on-Flatcar (TOFC). The regulations of the Department of Transportation require that the efficiency of both the bracing of the lading in the container and the securing of the container or the trailer on the railcar be determined by actual impact testing. Therefore:

a. All MIL-STD-dash number sheets which provide instructions for loading ammunition and explosives in commercial containers intended for shipment by container on flat car (COFC) or trailer on flat car (TOFC) must be approved by the Bureau of Explosives before use.

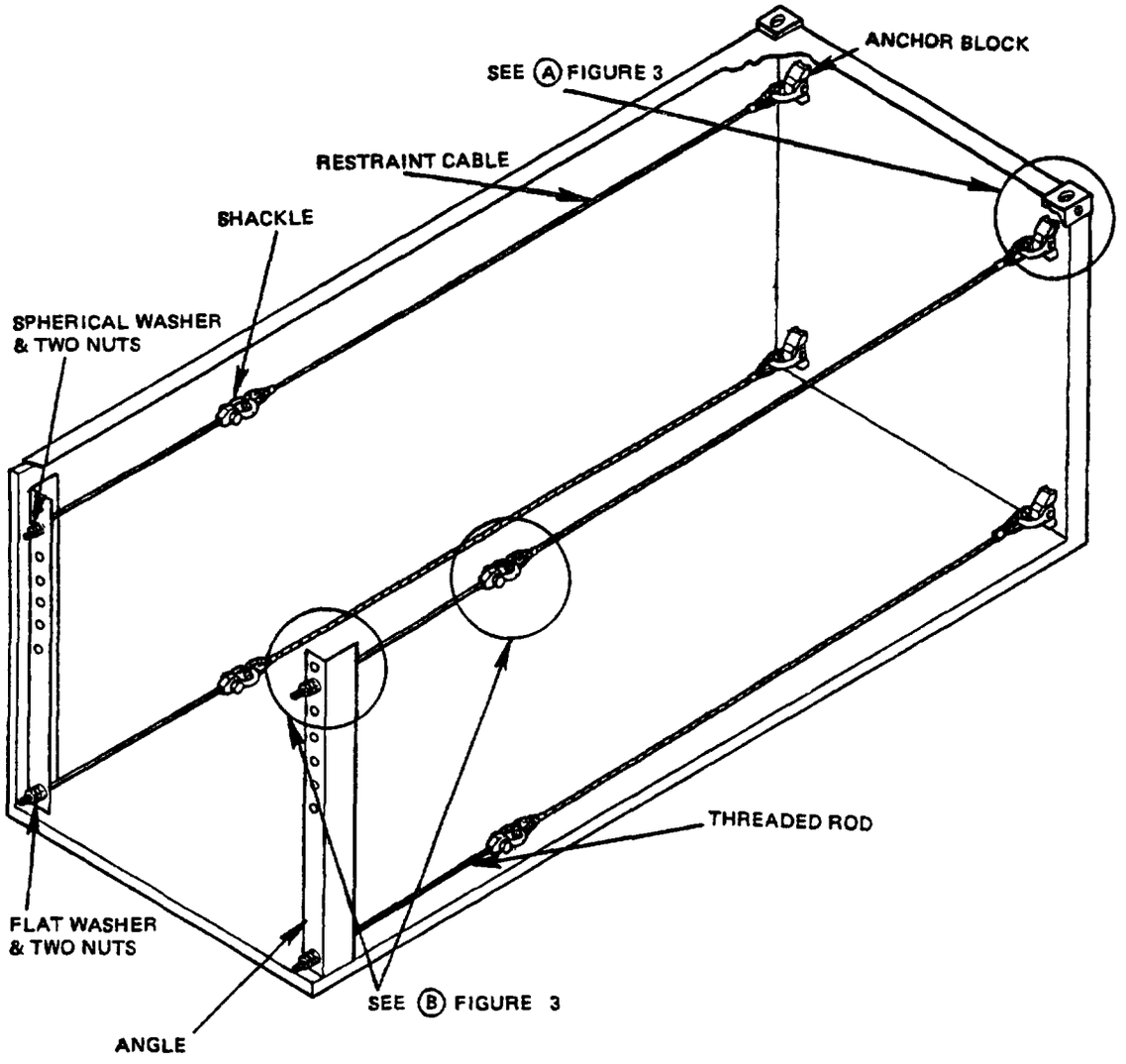


FIGURE 4. Typical assembly of IRSKIT hardware in commercial containers.

b. Containers on trailer chassis shall be shipped only on those TOFC railcars approved by the Bureau of Explosives pamphlet 6C.

4.7.3 Water. Commercial containers are designed for shipment by water primarily aboard containerships. These have specially constructed holds with cell guides and decks with special fittings for stowage of containers. Transfer of the containers between piers and containerships is accomplished by special handling equipment designed for this purpose. All MIL-STD dash-number sheets which provide instructions for loading ammunition and explosives (except Coast Guard Class I and Class II-A through II-H inclusive) in containers intended for shipment by water must be approved by the US Coast Guard.

4.8 Shipping regulations. When planning to load and ship ammunition and explosives in commercial containers, consideration must be given to type, size, weight and the Department of Transportation (DOT) hazard classification of the material. DOT regulations for the preparation of hazardous materials for shipment are contained in ATA Hazardous Materials Tariff 111D ; Code of Federal Regulations 46 CFR 146N entitled " Detailed Regulations Governing the Transportation of Military Explosives and Hazardous Munitions Onboard Vessels"; 49 CFR 100-199 entitled "Transportation"; 49 CFR 310-398 entitled " Federal Highway Administration" and in Coast Guard CG108 entitled "Rules and Regulations for Military Explosives and Hazardous Munition, Department of Transportation". These publications normally are filed with the Naval Transportation Officer of the Activity. However, activities concerned with loading and shipping ammunition and explosives are expected to maintain subscriptions to these regulatory documents and to be apprised of the latest issues in effect.

4.8.1 In determining the DOT hazard classification for an intended lading, refer to the aforementioned tariffs or NAVORD OP 2165. If the hazard classification of the item is not clear after consulting these references, futher clarification may be obtained by contacting the Naval Sea Systems Command (Code SEA-05M13), Washington, DC.

5. DETAILED REQUIREMENTS

5.1 Preloading inspection of commercial containers. Prior to loading a container it shall be inspected in accordance with the criteria contained in MIL-HBK-138 and applicable Commandant Coast Guard Approval. Qualified personnel shall determine by a detailed visual examination of the containers that they meet the following physical requirements:

a. The interior and exterior are clean, in the opinion of the cognizant inspector, to permit detailed inspection and to ensure freedom of any residue from previous cargoes.

b. Containers must be structurally sound and watertight with no missing fasteners, popped or cracked rivets, damaged, cracked or spliced side frames, end frames or corner posts. Corner castings (fittings), door headers, door sills, front transverse roof rails, bottom side rails, forklift pockets, floors, floor cross members, top rails, side posts (if any) or corrugation. Doors are considered structural components and shall not be dented, crushed, broken out, cut, gashed, fractured, punctured, torn, or distorted. Welds shall not be cracked or broken from attachments. Door hardware and hinges shall not be seized, broken, twisted, or missing. Seals and gaskets must seat. Normal wear, including light rust (oxidation), slight dents and scratches, and other damage that does not affect the structural integrity or watertightness of the equipment is acceptable. Patches not affecting strength are acceptable. Container components showing signs of overstress are unacceptable.

c. There shall be no deterioration of metal (or signs of deterioration that may have been covered with paint or otherwise concealed) in any structural components. Deterioration of any container or container component, whether of ferrous or nonferrous material construction, such as rusted-out metal in sidewalls or disintegrated fiberglass, is unacceptable.

d. In addition to a manufacturer's data plate, each container must bear a CSC SAFETY APPROVAL PLATE, a decal or other certification. This certification shall show that the container was built to, and met the requirements of the International Convention for Safe Containers or the requirements of a recognized classification society which are: American Bureau of Shipping; Germanisher Lloyd; Registro Italiano Navale; Nippon Kaiji; Lloyds Register of Industrial Services; Bureau Veritas, Det Norske Veritas; Register of Shipping of the USSR; and Polish Register of Shipping. Acceptability of a certification by a recognized inspection organization that is not listed here may be verified by message or telephone to Commandant, US Coast Guard, phone 202-462-1577.

e. The interior of the container shall be a nonmetallic surface free of protrusions and nonsparking in nature. Floors shall be wood or wood-covered. Steel and aluminum containers shall be lined with a minimum of 1/4 inch plywood. Metal parts of fiberglass containers shall be covered with a minimum of 1/4 inch plywood. All linings shall extend from the floor to the height of the lading or higher. Dimensional lumber dunnage, such as side bracing structures which do not permit the lading to contact the sides of the containers, may be substituted for plywood or other lining.

5.1.1 If the inspection reveals any unsatisfactory condition, the container shall be unacceptable for shipment of ammunition and explosives.

5.1.2 Once an unsatisfactory condition has been remedied by minor repair, a container shall be reinspected to determine if the condition causing rejection has been eliminated. If so, container(s) may be authorized for use.

5.2 Loading procedure. Ammunition and explosives usually are loaded into containers in the form of palletized unit loads designed for handling by forklift trucks. The load pattern for unit loads of a given commodity shall be determined prior to loading, with the type, size, and weight of the unit loads being of prime importance. The criteria used to determine palletized unit load pattern for containers are:

a. Arithmetical computations based on the dimensions of the unit loads with reference to the inside dimensions of the container, weights of the unit loads and permissible axle load limits if the shipment is intended for transportation over public highway.

b. The longitudinal center of gravity of the lading must be within 12 inches of the longitudinal center of the container.

c. Weighing the loaded container to establish that the pattern has produced a load which is within the limits of legal restrictions for the intended method of transport.

5.2.1 The detailed instructions given on dash-number sheets that are a part of this standard shall be followed for loading and dunnaging specific items in commercial containers. The instructions include illustrations which show clearly the load pattern and dunnaging of the unit loads. Also provided are data concerning the palletized unit load and the overall container load, such as dimensions, weights, cubic area, hazard classification, and a list of the materials required for accomplishing the required blocking and bracing, including nails, strapping, lumber, etc.

5.3 Dunnage materials. Dunnage materials in commercial containers consist of the IRSKIT hardware, lumber, fasteners, strapping and occasional pieces of plywood used as shims and spacers.

5.3.1 IRSKIT hardware. IRSKIT hardware is manufactured in accordance with DL 5166424. It shall be complete as detailed in 4.4.2 and ready for installation in a commercial container as shown in Figure 4.

5.3.2 Lumber. Lumber shall be sound, generally free from crossgrain, knots, knot holes and checks or splits which would impair the strength of the material or interfere with proper nailing. The lumber selected shall comply with MM-L-751. When available, use No. 2 or better Douglas fir, hemlock, or pine (other than ponderosa). These woods will furnish sufficient strength for practically all loads. Only the amount of lumber necessary to safely retain the load should be used. Excessive and unnecessary use of lumber reduces the payload and increases the cost. The use of sound, precut dunnage pieces and prefabricated structures will minimize loading time.

5.3.3 Fasteners. Nails are used as fasteners for dunnaging ammunition and explosive unit loads in commerical intermodal containers. Nails shall comply with FF-N-105, type II, style 10, common-bright unless otherwise indicated on the MIL-STD dash-number sheet.

5.3.3.1 The proper selection of nails and their location will ensure the necessary holding power without the risk of splitting the lumber and affecting integrity of the dunnage structures. Some general rules for nail selection and application are listed below.

a. All nailing shall be into the side grain of the lumber; end grain nailing should be avoided. Use a sufficient quantity of nails. Balanced nailing is important. Stagger nails along the piece being nailed. Do not nail along one grain of wood. Whenever possible, drive nails straight; do not toenail unless called for in the MIL-STD dash-number sheet.

b. Nails shall be of such length as to give the necessary holding power and ample penetration into floors or bracing and blocking. To obtain the maximum holding power, nails shall be of such length that they nearly penetrate but do not protrude through the timber holding the point of the nail. Nails shall be of a size as not to cause splitting. The general rule is that the nail should be three times as long as the thickness of the piece holding the head of the nail. The nail point should not protrude beyond the second piece unless clinching is required. Recommended sizes consistent with this rule are given in Table 1.

TABLE I. Recommended nail sizes.

NOMINAL THICKNESS OF MEMBER HOLDING HEAD (IN.)	NOMINAL THICKNESS OF MEMBER HOLDING POINT (IN.)			
	1	2	3	4
1	4d 6d*	6d 10d*	12d	16d
2	-	12d	20d	40d
3	-	20d	40d	60d

*If clinched

c. Generally, no nail shall be driven closer to the end of a piece of lumber than the thickness of that piece, nor closer to the edge than half the thickness of the piece holding the nail head.

d. When pieces of different thicknesses are nailed together, the nailhead should be in the thinner piece.

e. When the density of the wood dunnage is such that diamond-point nails cause splitting the nails should be blunted before driving.

f. Nail heads should be set flush with the surface. If deeper penetration occurs it should not be more than one-eighth the thickness of the piece retaining the head.

WARNING

When driving nails near ammunition and explosives extreme care must be taken to ensure that the nails are not directed, or likely to be deflected, toward or into the packaging of the item. Never nail dunnage directly to the lading.

g. Pieces which are end nailed and which are used as a supporting structure should always be reinforced by cleats.

5.3.4 Strapping. When using steel strapping as dunnage in commercial containers, it shall conform to QQ-S-781, Type 1, Heavy Duty, Finish A, B or C. All seals shall be in accordance with QQ-S-781, Style II, Heavy Duty. All strapping shall be drawn tight and secured with metal seals with two notches per seal or two seals abutted together with two pairs of crimps per seal. The seals shall be notched or crimped so that the joint develops at least 75 percent of the minimum breaking strength of the strap. Sealing methods and tools shall be tested frequently by pulling sample sealed joints.

5.4 Internal restraint system dunnage. The dunnage described in the following paragraphs is used for retaining unit loads of ammunition and explosives in commercial containers. Illustrations show both the IRSKIT hardware, and the wood dunnage assemblies generally used, identify their component parts, and display their application. Specific dimensions of wood dunnage assemblies are not provided since there is a wide variation in dimensions as dictated by the size, weight and configuration of the lading. Dunnage shall be constructed and installed in commercial containers in accordance with more detailed instructions provided in applicable dash-number sheets of this standard.

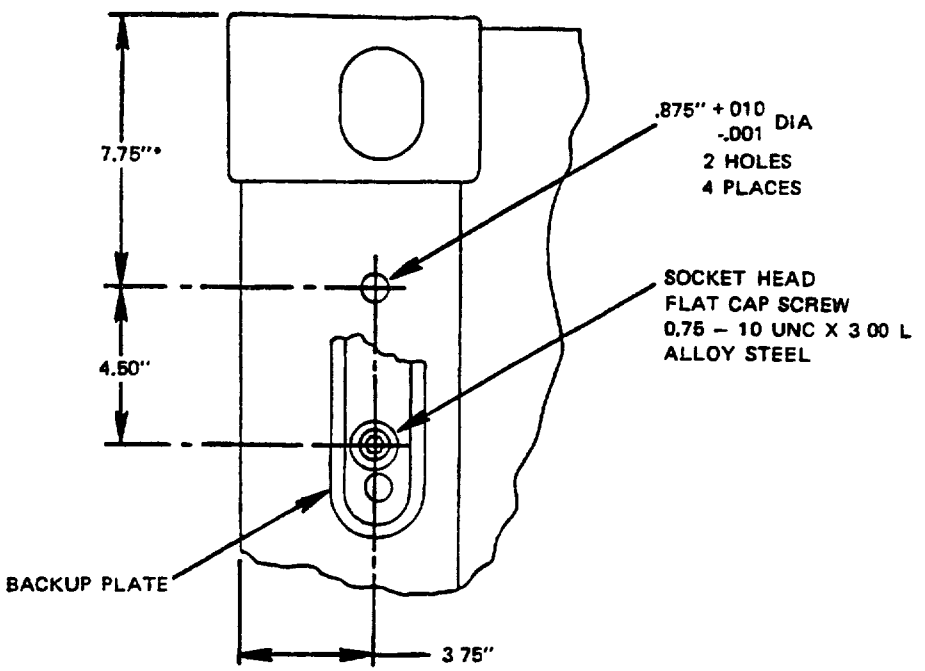
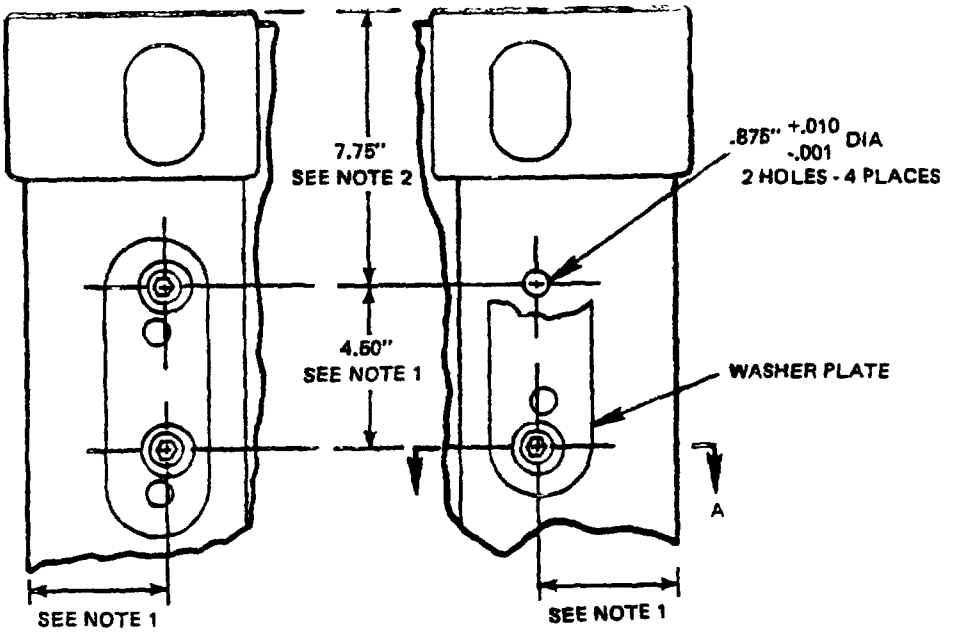


FIGURE 5. Flat angle corner post hole locations.

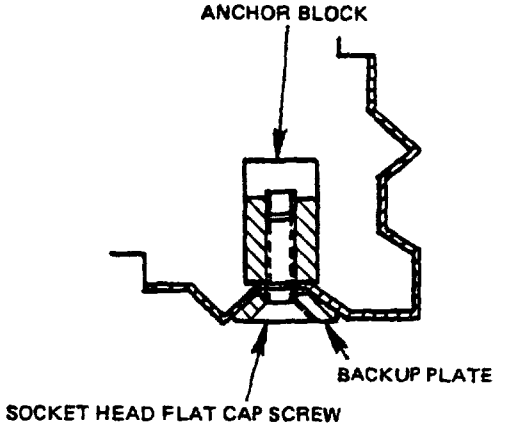
5.4.1 Preliminary container preparation. Containers are prepared by drilling holes in the forward corner posts for attaching anchor block fitting assemblies to the containers. Location of the holes depends on the container corner post configuration. Drill holes in containers constructed with flat angle corner post in accordance with Figure 5 and those constructed with irregularly shaped (corrugated) corner posts in accordance with Figure 6.



NOTE

1 LOCATION OF HOLES FROM OUTSIDE EDGE OF CORNER POSTS IS ACCOMPLISHED BY USING BACKUP PLATE AS A TEMPLATE POSITION BACKUP PLATE IN DEPRESSION OF CORRUGATION AS SHOWN IN SECTION A-A. MARK VERTICAL LINE OF HOLES USING COUNTERSUNK HOLE IN BACKUP PLATE. LOCATE HOLES ON THIS VERTICA CENTER LINE.

2 THIS DIMENSION T) FIRST HOLE APPLICABLE TO ALL FOUR ATTACHMENT POINTS.



SECTION A-A

FIGURE 6. Irregularly shaped (corrugated corner post hole locations).

5.4.1.1 Preliminary IRSKIT equipment installation. Install an anchor block fitting assembly consisting of an anchor block, backup plate, and two cap screws in the upper and lower hole locations (4 places). Apply light machine oil to screw threads and torque each cap screw to 200 foot pounds. Attach restraint cables to anchor blocks with shackles (see Figure 3) and position them so that they will not interfere with loading the lading in the container.

NOTES
1. NUMBER AND LOCATION OF BEAMS DEPENDS ON THE CONFIGURATION AND WEIGHT OF THE LADING AND DUNNAGE. (SEE FIG 8)
2 USE NUMBER AND LOCATION OF VERTICAL LOAD BEARING PIECES AS REQUIRED TO CARRY THE FORCES THROUGH THE STRONG AREAS OF THE LADING.
3 LENGTH OF VERTICALS MUST BE LADING HEIGHT PLUS 24 INCHES OR TO ONE INCH BELOW THE ANCHOR BLOCK.
4. BULKHEAD MUST NOT INTERFERE WITH ANY IRSKIT RESTRAINT SYSTEM HARDWARE.
5. FABRICATE A BEAM BY LAMINATING EACH PIECE TO THE OTHER WITH ONE 10D NAIL EVERY 8 INCHES, STAGGERED PATTERN.

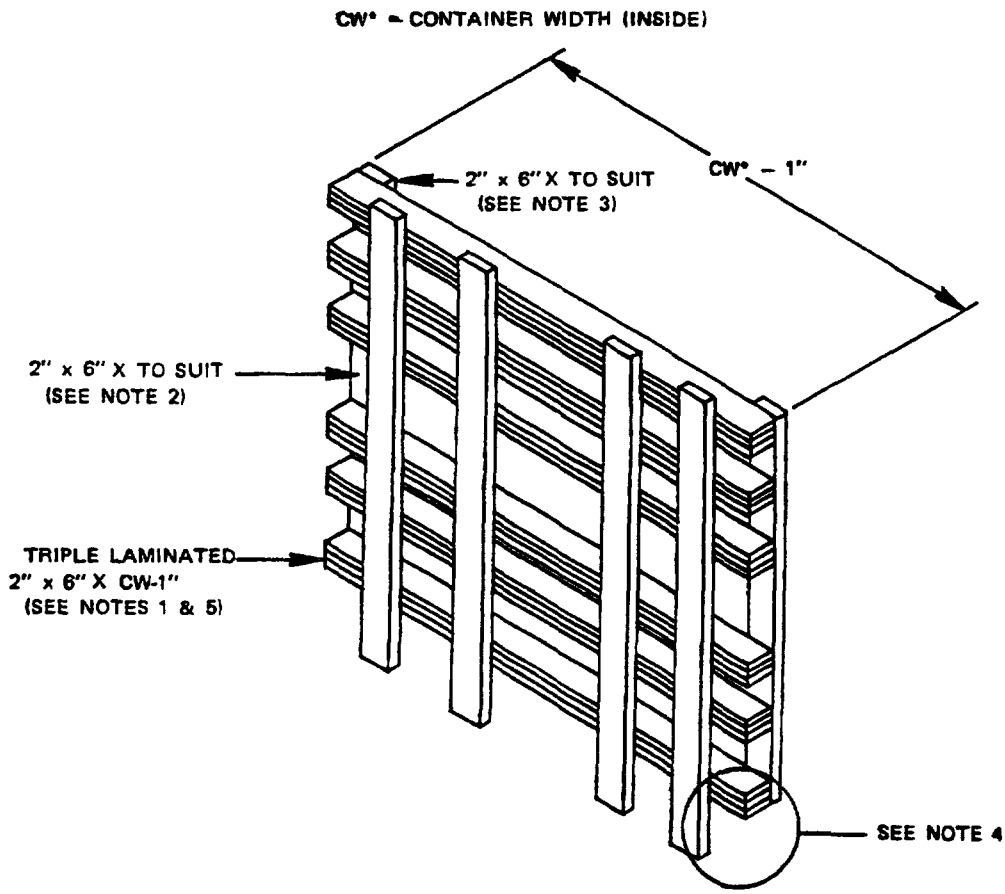


FIGURE 7A. Typical front bulkhead with six triple laminated beams. (Maximum rated capacity-48,000 lbs.)

5.4.2 Wood dunnage. Wooden components are required in addition to the IRSKIT hardware to make up the dunnage system. These consist of front and rear bulkheads and, depending on the lading configuration and weight, may also consist of side blocking, separator gates and sway braces.

NOTES
1. NUMBER AND LOCATION OF BEAMS DEPENDS ON THE CONFIGURATION AND WEIGHT OF THE LADING AND DUNNAGE (SEE FIG 8)
2. USE NUMBER AND LOCATION OF VERTICAL LOAD BEARING PIECES AS REQUIRED TO CARRY THE FORCES THROUGH THE STRONG AREAS OF THE LADING.
3. LENGTH OF VERTICALS MUST BE LADING HEIGHT PLUS 24 INCHES OR TO ONE INCH BELOW THE ANCHOR BLOCK.
4. BULKHEAD MUST NOT INTERFERE WITH ANY IRSKIT RESTRAINT SYSTEM HARDWARE.
5. FABRICATE A BEAM BY LAMINATING EACH PIECE TO THE OTHER WITH ONE 10D NAIL EVERY 8 INCHES, STAGGERED PATTERN.

*CW = CONTAINER WIDTH (INSIDE)

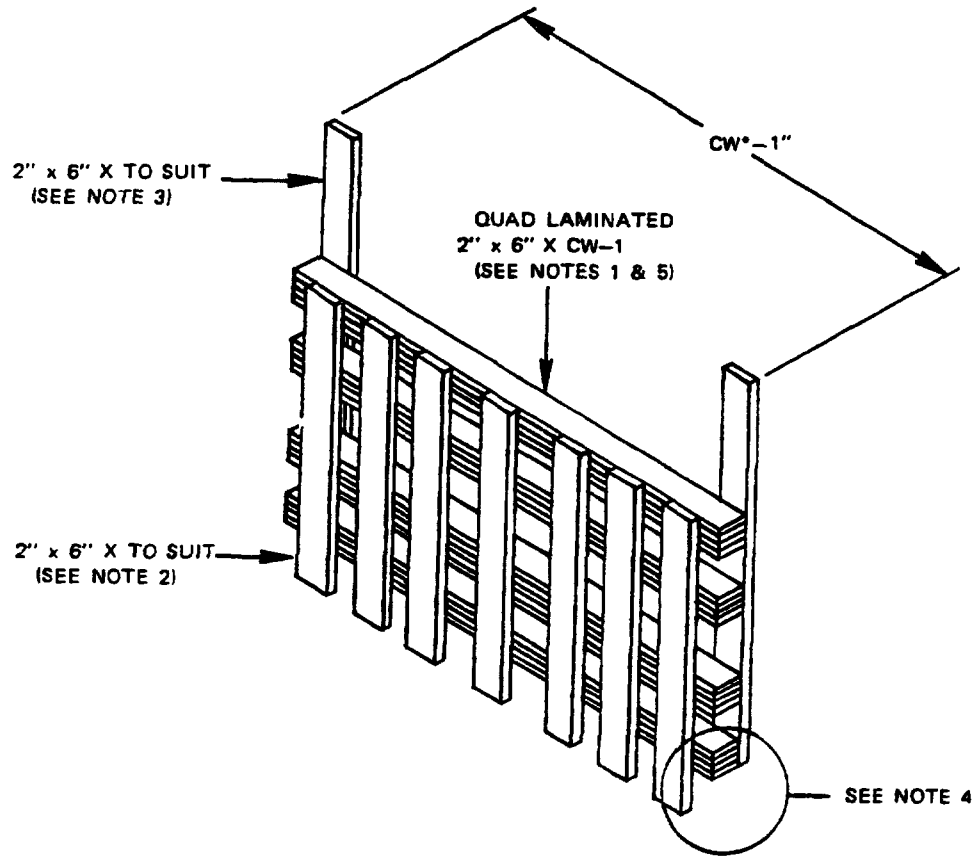


FIGURE 7B. Typical front bulkhead with four quad laminated beams. (Maximum rated capacity-40,000 lbs.)

5.4.2.1 Front bulkhead. This structure transfers the forward longitudinal forces developed to the strong area of the front wall which are the corner posts, the area adjacent to the corner posts and the bottom of the container. The bulkhead is constructed with horizontal beams and verticals. Each horizontal beam consists of a sufficient number of laminated 2"x6" or 2"x8" wood members to form a beam of required strength (see 7A, 7B, 7C). The number and locations of the horizontal beams depends on the configuration and weight

NOTES
1. NUMBER AND LOCATION OF BEAMS DEPENDS ON THE CONFIGURATION AND WEIGHT OF THE LADING AND DUNNAGE (SEE FIG 8)
2. USE NUMBER AND LOCATION OF VERTICAL LOAD BEARING PIECES AS REQUIRED TO CARRY THE FORCES THROUGH THE STRONG AREAS OF THE LADING
3. LENGTH OF VERTICALS MUST BE LADING HEIGHT PLUS 24 INCHES OR TO ONE INCH BELOW THE ANCHOR BLOCK
4. BULKHEAD MUST NOT INTERFERE WITH ANY IRSKIT RESTRAINT SYSTEM HARDWARE
5. FABRICATE A BEAM BY LAMINATING EACH PIECE TO THE OTHER WITH ONE 10D NAIL EVERY 8 INCHES, STAGGERED PATTERN

*CW = CONTAINER WIDTH (INSIDE)

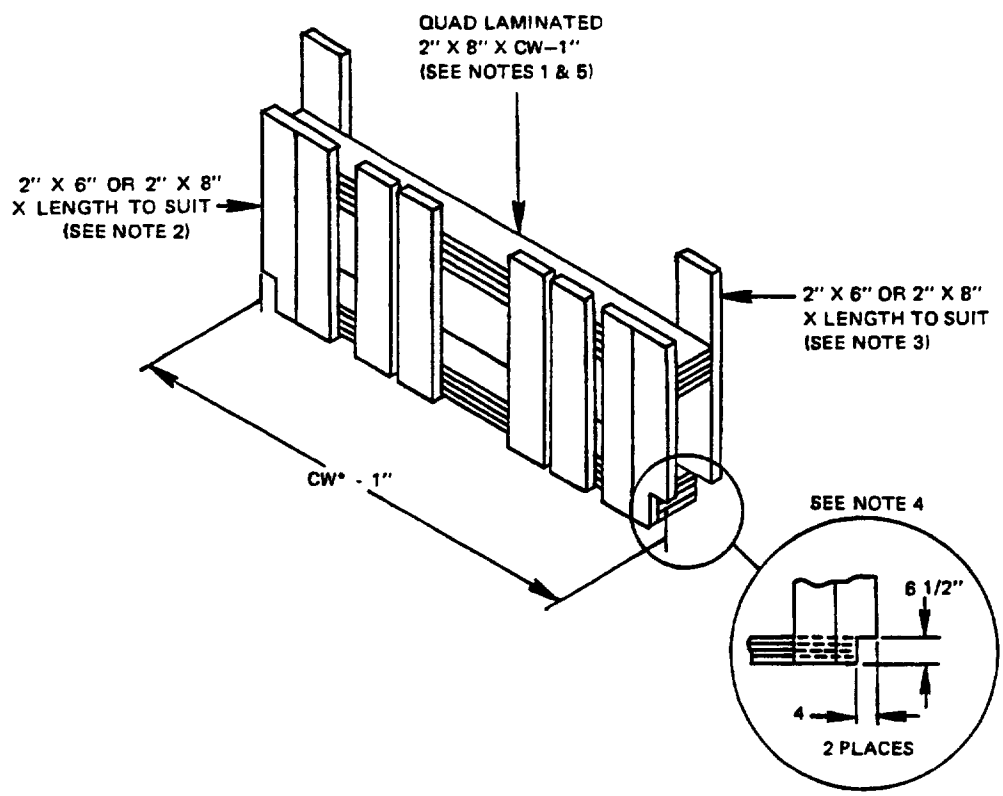
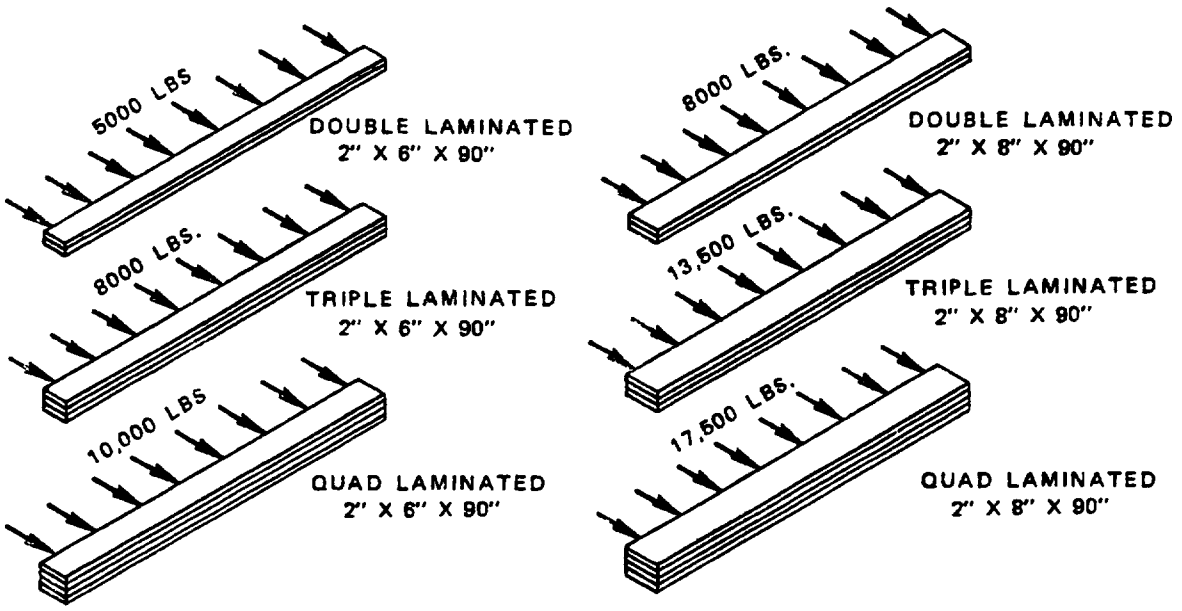


FIGURE 7C. Typical front bulkhead with two quad laminated beams. (Maximum rated capacity-35,000 lbs.)

of the lading being retained (see Figure 8). The number and locations of the verticals on the side of the bulkhead facing the lading depends on the configuration of the lading and the location of the strong areas through which the forces are transferred. The two verticals on the sides of the bulkhead facing the container end wall are located at each end of the beams to carry the forces into the container corner post and the strong areas of the front wall.

LOAD EVENLY DISTRIBUTED OR CONCENTRATED
ON END PORTIONS OF LAMINATED BEAM



LOAD CONCENTRATED ON CENTRAL PORTION OF LAMINATED BEAM,
MINIMUM ONE HALF CONTAINER WIDTH

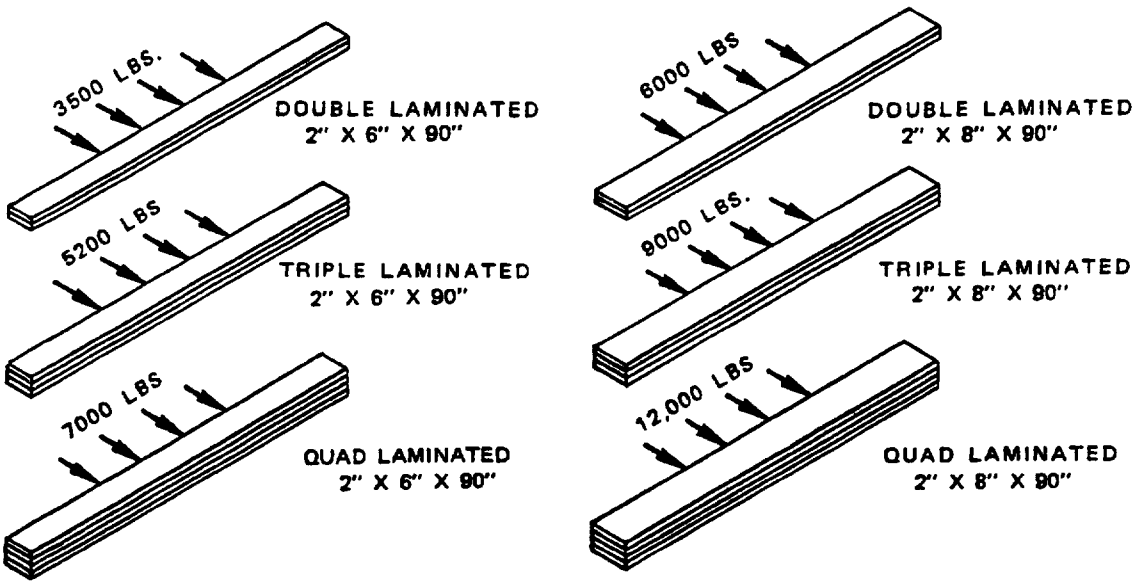


FIGURE 8. Maximum allowable load ratings for front and rear bulkhead horizontal laminated beams.

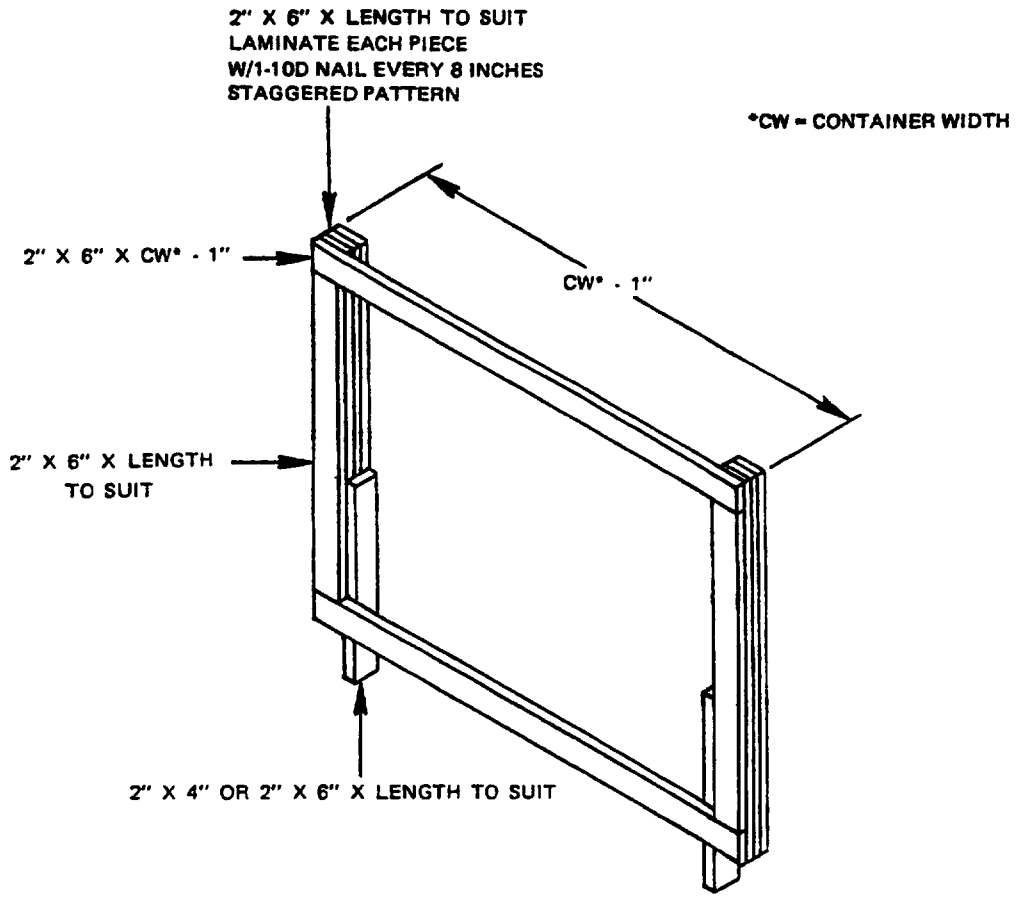


FIGURE 9. Typical forward filler assembly.

5.4.2.2 Forward filler assembly. When necessary to move the center of gravity of the lading more to the rear of the container, a forward filler assembly shall be installed in addition to the front gate. This structure consists of laminated 2x6 verticals with appropriate horizontal members (see Figure 9). It is positioned forward of the gate and carries the forward longitudinal forces to the corner posts of the front wall of the container. By varying its thickness it permits positioning the center of gravity of the lading further to the rear of the container as required.

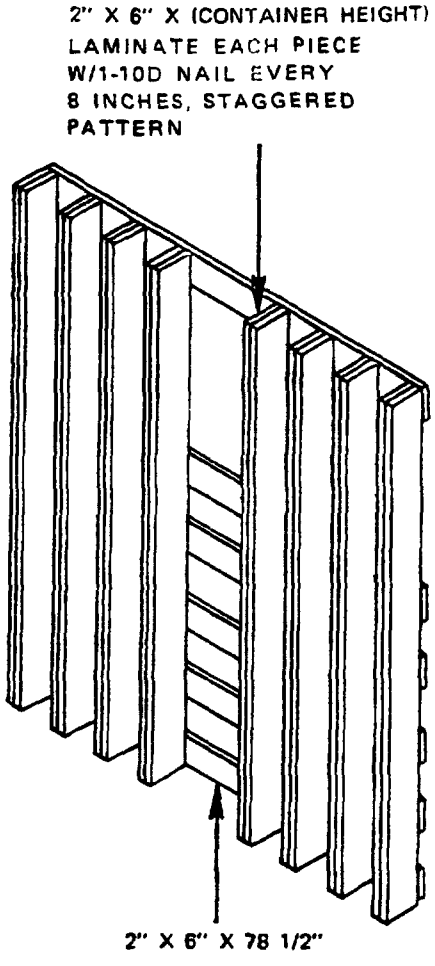


FIGURE 10. Typical front auxiliary bulkhead.

5.4.2.3 Front auxiliary bulkhead. When loading steel containers having corrugated front walls with lading configurations that result in concentrated loads (forces), a front auxiliary bulkhead shall also be required. This auxiliary bulkhead is designed to distribute some of the forces over the corrugated front wall area. It consists of laminated 2x6 or 2x8 vertical columns with appropriate horizontal members to accomplish the distribution (see Figure 10).

QUANTITY, SIZE, AND LOCATION OF DIMENSIONAL LUMBER MAKING UP THE SIDE BLOCKING DEPENDS ON THE CONFIGURATION, WEIGHT, AND SIZE OF THE LADING.

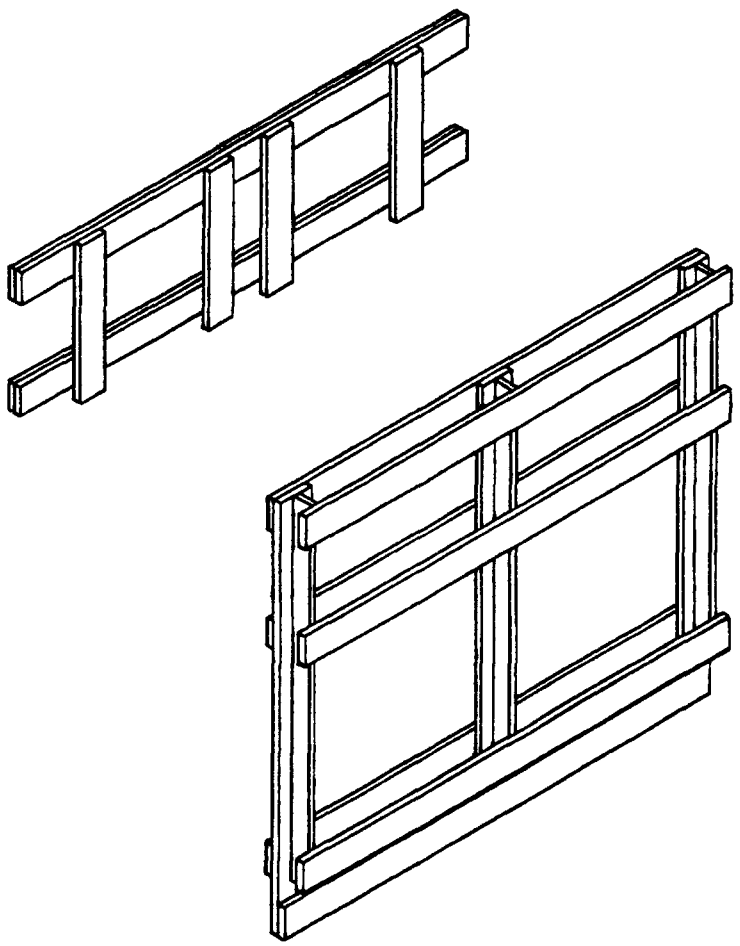


FIGURE 11. Typical side blocking assemblies.

5.4.2.4 Side wall blocking. This blocking is required to more uniformly distribute the load onto the container side walls and/or to fill up a part of the lateral void space. It consists of 1"X 4", 2"X 4", and 2"X 6" wood members nailed together to form an assembly that contacts the side wall and lading at the strong areas of each. It can be made in convenient lengths and constructed so that the lading will not snag straps or otherwise hang up on the side blocking during loading operations (see Figure 11).

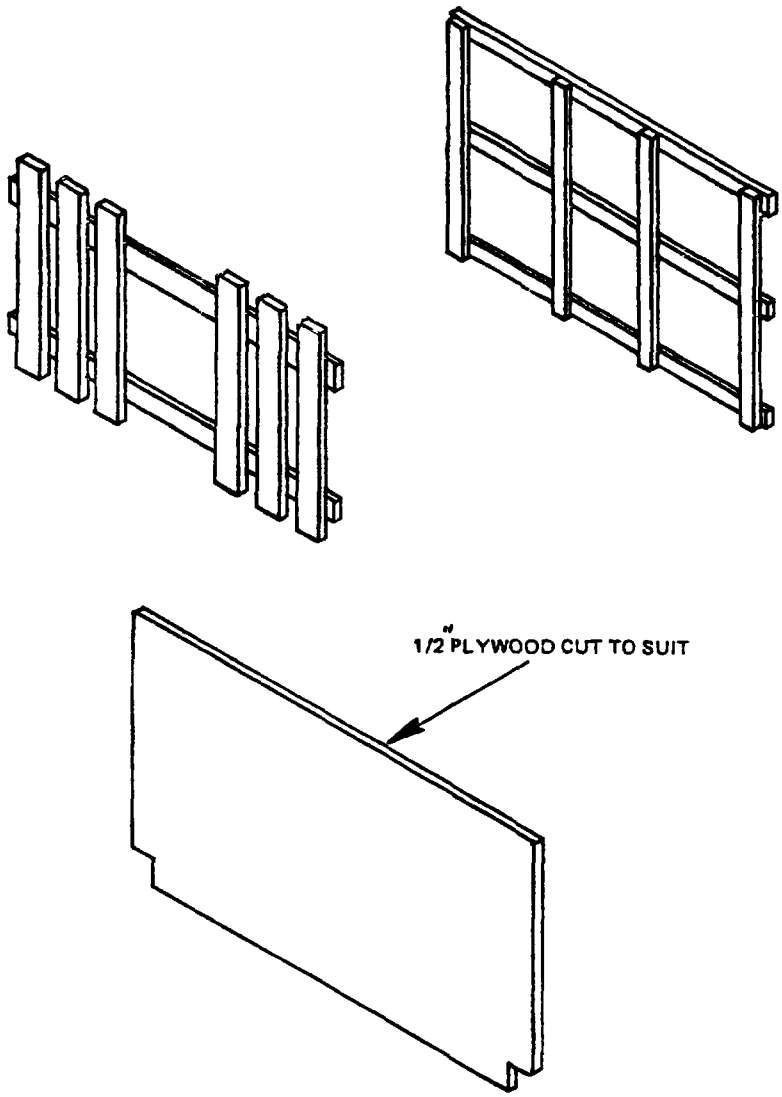


FIGURE 12. Typical separator gates.

5.4.2.5 Separator gates. To assure that the longitudinal forces are transferred from one stack to the next without any damage to or telescoping of the lading, separator gates are required between stacks of lading having irregular configurations. Separator gates may consist of 1"X 4", 2"X 4", or 2"X 6"wood members nailed together to form a gate that contacts the lading at strong areas capable of transferring the forces. It shall be constructed in such a manner that the lading will not hang up on the gate during vibration or other movements in transit. Separator gates may also be made of 1/2 inch plywood (see Figure 12).

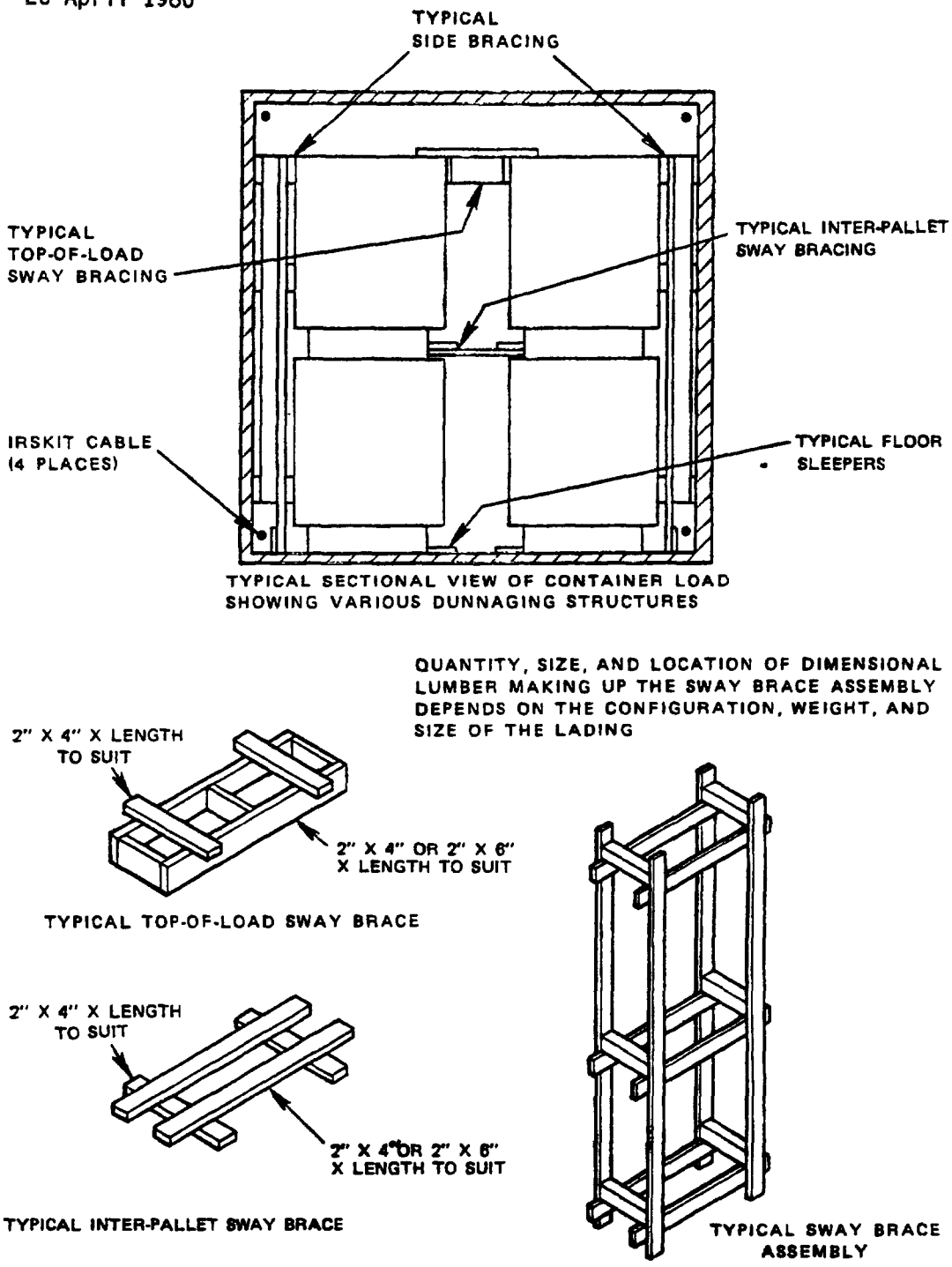


FIGURE 13. Typical sway bracing.

5.4.2.6 Sway bracing. Sway bracing is required to fill lateral void space between container side walls and to prevent lateral movement of lading while in transit. The various forms of sway bracing that may be used are: floor sleepers, between-the-pallets sway bracing, top-of-the-load sway bracing, and sway brace assemblies (see Figure 13).

NOTES
1. NUMBER AND LOCATION OF BEAMS DEPENDS ON THE CONFIGURATION AND WEIGHT OF THE LADING AND DUNNAGE (SEE FIG. 8).
2. USE NUMBER AND LOCATION OF VERTICAL LOAD BEARING PIECES AS REQUIRED TO CARRY THE FORCES THROUGH THE STRONG AREAS OF THE LADING.
3. VERTICALS MUST BE SO LOCATED AND OF SUCH A LENGTH THEY DO NOT INTERFERE WITH ANY RESTRAINT SYSTEM HARDWARE.
4. BULKHEAD MUST NOT INTERFERE WITH ANY RESTRAINT SYSTEM HARDWARE.
5. FABRICATE A BEAM BY LAMINATING EACH PIECE TO THE OTHER WITH ONE 10D NAIL EVERY 8 INCHES, STAGGERED PATTERN.

*CW = CONTAINER WIDTH (INSIDE)

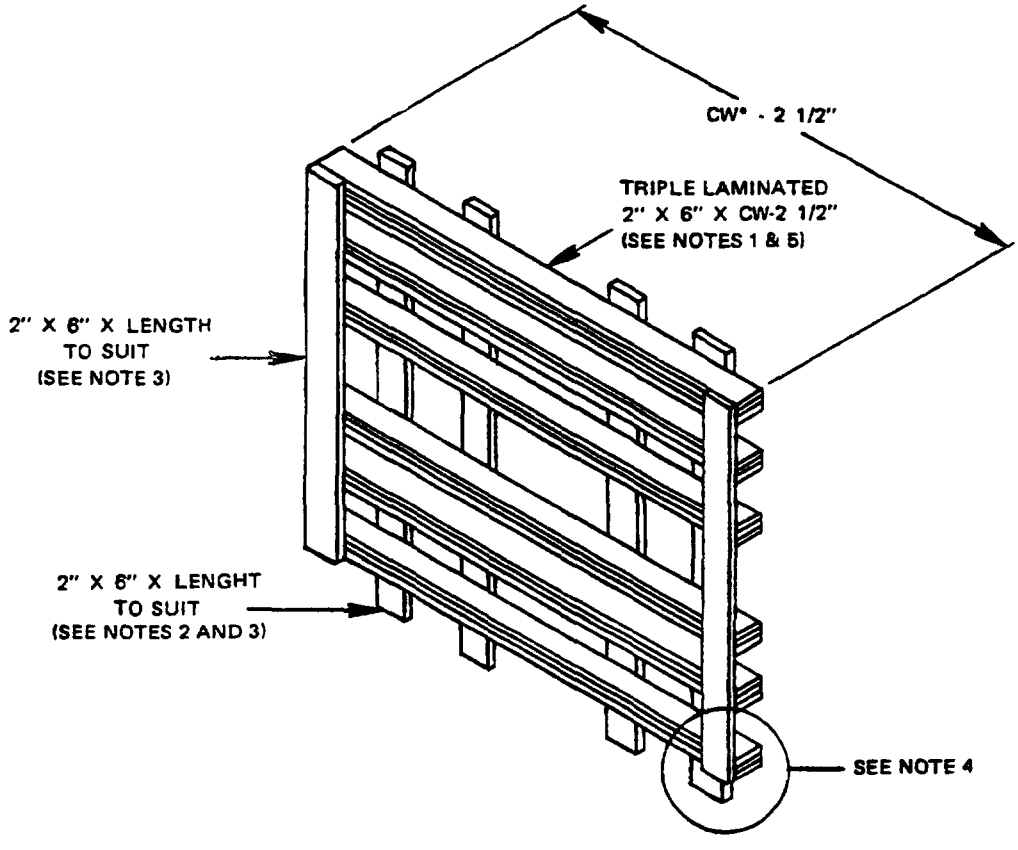


FIGURE 14A. Typical rear bulkhead with six triple laminated beams. (Maximum rated capacity-48,000 lbs.)

5.4.2.7 Rear bulkhead. The rear bulkhead retains the lading from moving toward the container doors during transit. It is held in position by the IRSKIT hardware. It is constructed with horizontal beams and verticals similar to the front bulkhead. The number and location of the horizontal beams depends on the configuration and weight of the lading being retained (see Figure 8). They must not interfere with any of the restraint system hardware. The number and location of the verticals on the side of the

NOTES

1. NUMBER AND LOCATION OF BEAMS DEPENDS ON THE CONFIGURATION AND WEIGHT OF THE LADING AND DUNNAGE (SEE NOTE 8)
2. USE NUMBER AND LOCATION OF VERTICAL LOAD BEARING PIECES AS REQUIRED TO CARRY THE FORCES THROUGH THE STRONG AREAS OF THE LADING.
3. VERTICALS MUST BE SO LOCATED AND OF SUCH A LENGTH THEY DO NOT INTERFERE WITH ANY OF THE RESTRAINT SYSTEM HARDWARE
4. BULKHEAD MUST NOT INTERFER WITH ANY RESTRAINT SYSTEM HARDWARE
5. FABRICATE A BEAM BY LAMINATING EACH PIECE TO THE OTHER WITH ONE 10D NAIL EVERY 8 INCHES, STAGGERED PATTERN

*CW = CONTAINER WIDTH (INSIDE)

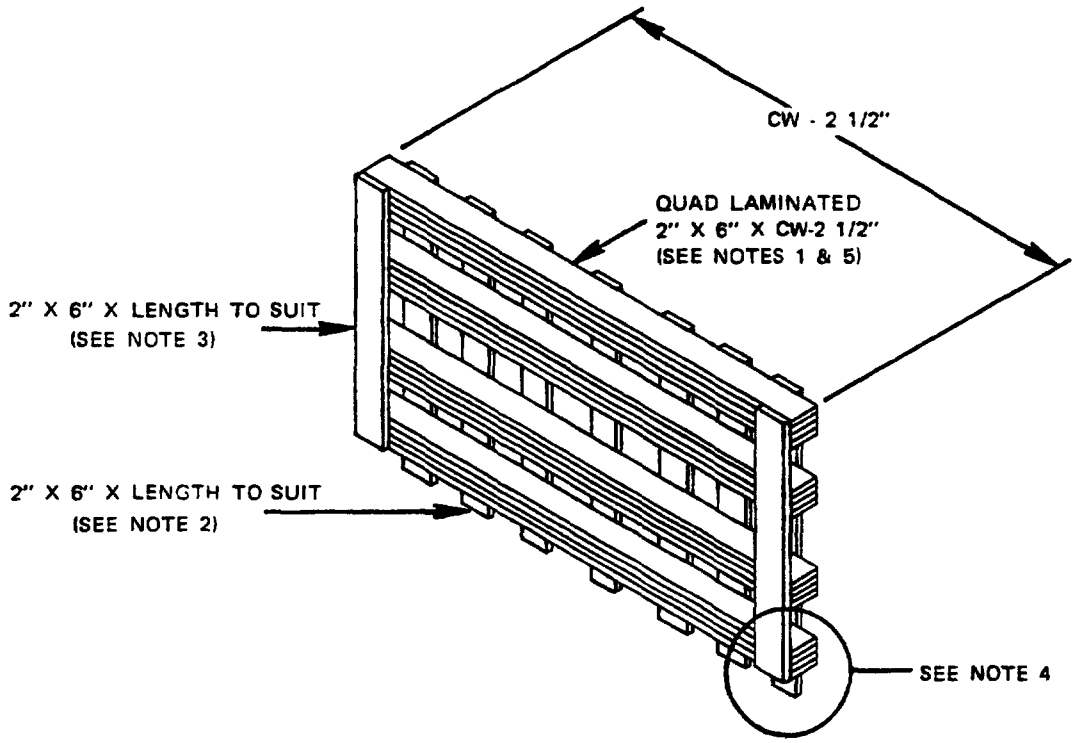


FIGURE 14B. Typical rear bulkhead with four quad laminated beams. (Maximum rated capacity-40,000 lbs.)

bulkhead facing the lading depends on the configuration of the lading (i.e., the location of the strong areas through which the forces are transferred). There are usually two verticals on the side of the bulkhead facing the doors, and they are usually located at or near the ends of the horizontal beams. All of the verticals shall be of such a length and so located that they do not interfere with any of the restraint system hardware (see Figures 14A, 14B and 14C).

NOTES
1. NUMBER AND LOCATION OF BEAMS DEPENDS ON THE CONFIGURATION AND WEIGHT OF THE LADING AND DUNNAGE (SEE FIG 8)
2. USE NUMBER AND LOCATION OF VERTICAL LOAD BEARING PIECES AS REQUIRED TO CARRY THE FORCES THROUGH THE STRONG AREAS OF THE LADING.
3. VERTICALS MUST BE SO LOCATED AND OF SUCH A LENGTH THEY DO NOT INTERFERE WITH ANY OF THE RESTRAINT SYSTEM HARDWARE.
4. BULKHEAD MUST NOT INTERFERE WITH ANY RESTRAINT SYSTEM HARDWARE.
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*CW = CONTAINER WIDTH (INSIDE)

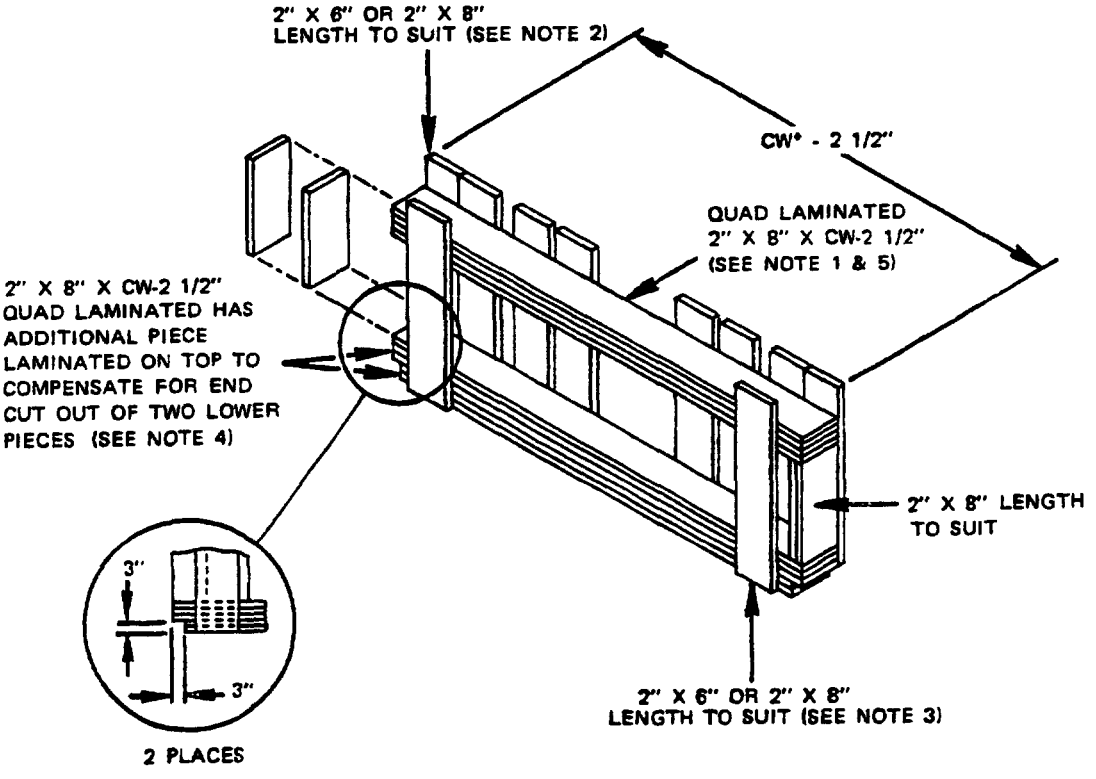

FIGURE 14C. Typical rear bulkhead with two quad laminated beams.
(Maximum rated capacity-35,000 lbs.)

5.4.3 Final IRSKIT system installation. After the container has been prepared, the preliminary IRSKIT equipment installed, the lading loaded and dunnage including the rear bulkhead is in position, the remaining IPSKIT equipment must be installed This consists of positioning the angles on rear bulkhead, threading the restraint cable assembly rods through the angle holes and tensioning with required washer and nut configurations until all the slack has been removed from the cables.

5.4.3.1 Angle installation and restraint cable tensioning. Pertinent details of the angle installation and restraint cable tensioning are as follows:

a. The angle must fit snugly against the ends of the bulkhead.

b. To assure the angles fit snugly against the ends of the bulkhead round the edges of the bulkhead by hammering them as necessary to fit the inside radius of the angles.

c. Each angle has a series of predrilled holes for the purpose of attachment to the restraint cable assembly. The single bottom hole of each angle is used for each bottom restraint cable assemble threaded rod.

d. Restraint cable assemblies must have a straight run from the anchor blocks on the forward corner posts through the angle holes without interfering with any part of the lading or dunnage.

e. Each upper restraint cable and threaded rod assembly is installed through that hole of the upper hole group of each angle which lies immediately above the top of the lading. Using this hole results in the restraining forces being applied at the location of maximum effectiveness.

f. Each bottom restraint cable assembly is secured with a flat washer and two nuts.

g. Each upper restraint cable assembly is secured with a set of spherical washers and two nuts.

h. The first nut on each rod is tightened in such a manner as to draw the rear bulkhead squarely up against the lading untill each restraint cable assembly has all the slack removed. An extended socket wrench tool is recommended for use. (see Figure 15).

i. The second nut is then tightened to lock the first nut (see Figures 16A, 16B, and 16C).

5.5 Commercial container load inspection. Load inspection shall be performed by qualified personnel as the unit loads are placed and dunnaged. Inspectors shall determine if the lading is loaded and secured in accordance with the applicable MIL-STD-1663 dash-number sheet or if no dash-number sheet exists, that lading is loaded and secured in accordance with the guidance given in this standard. Upon satisfactory inspection of the load and its dunnage, shipping documents shall be attached inside the container in an accessible location. The container doors shall be closed and sealed. Appropriate placards shall be attached to the outside of the container for the intended mode of transportation in accordance with OP 2165.

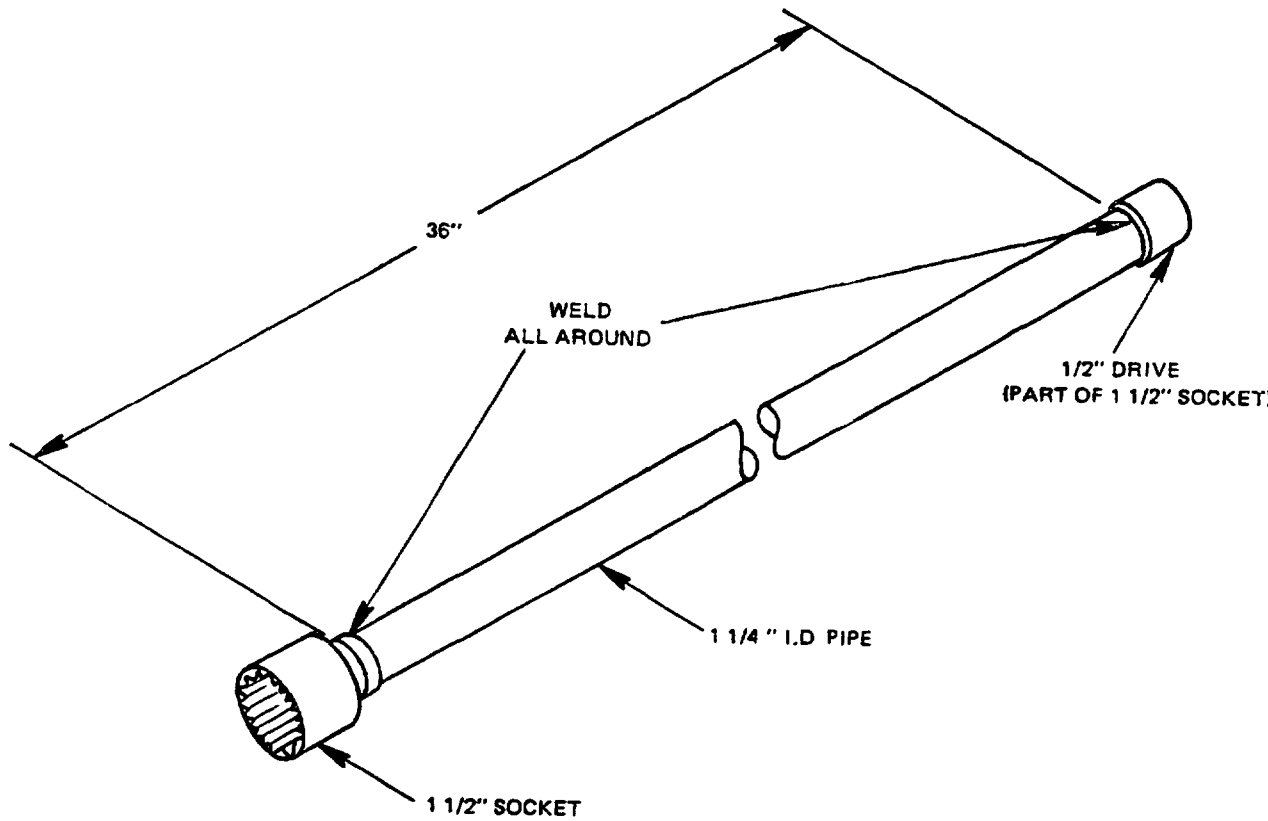

FIGURE 15. Extended socket wrench tool.

5.6 Safety precautions. An integral part of all ammunition and explosive handling operations is a consideration for the safety of personnel and property. It is the policy of the Department of Defense that its agencies establish adequate controls consistent with a safe and efficient operation. The loading, securing and dunnaging activity is responsible for ensuring that safe practices are being observed in all operations in which explosives are handled. The line of responsibility remains unbroken down to and including the person who handles the item. The Navy Transportation Safety Handbook OP 2165 and Ammunition and Explosives Ashore OP 5 contain general safety precautions.

SKIDDED UNIT

UNIT WEIGHT . . . 1904 LBS. (APPROX.)
CUBE. . . . . 34.2 CU. FT.

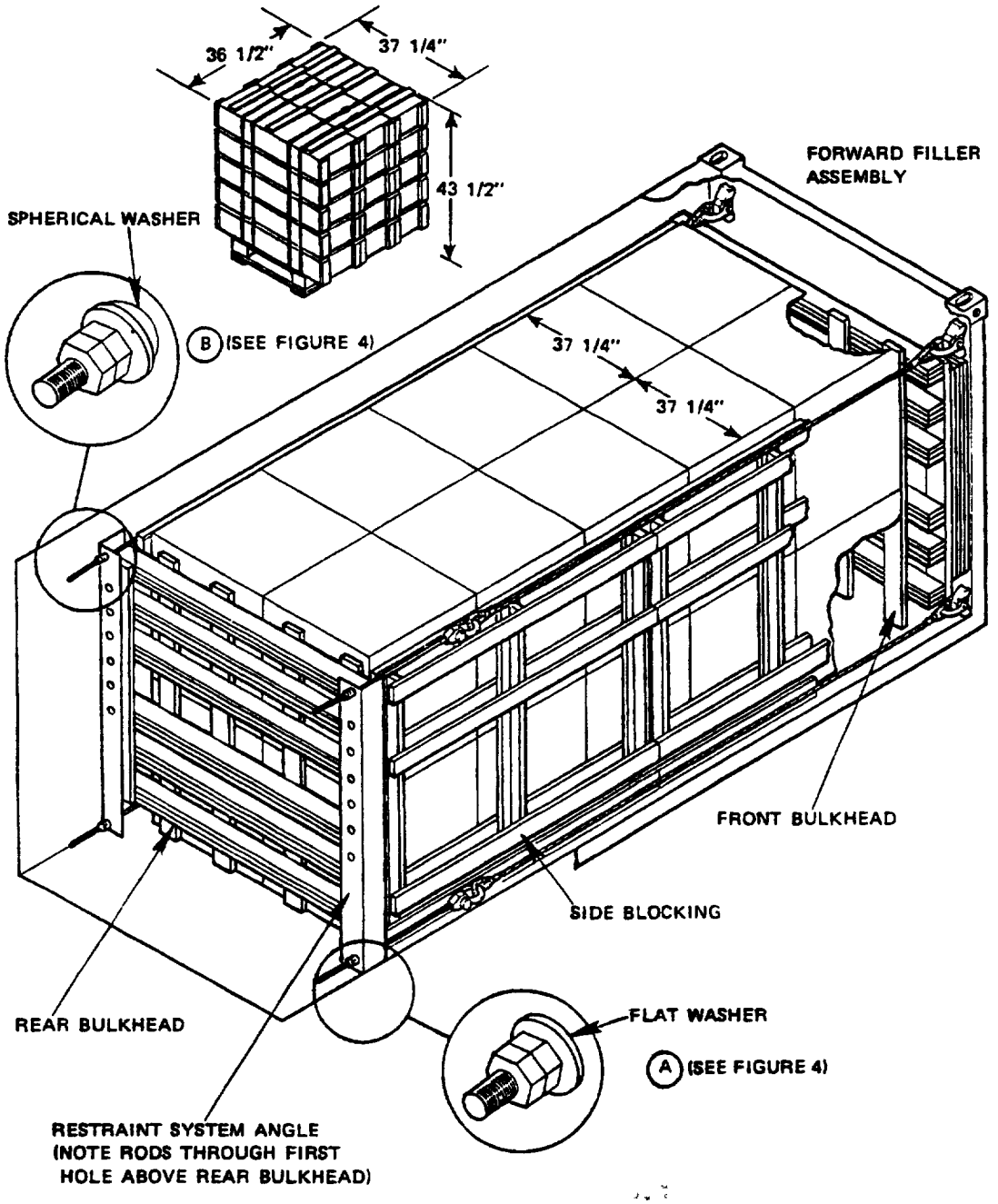

FIGURE 16A. Typical loaded 20 ft. commercial container with unit loads restrained by IRSKIT hardware and wood dunnage.

PALLETIZED UNIT

UNIT WEIGHT (APPROX) . 3089 LBS.
CUBE . . . . . 361 CU. FT
UNIT LOAD DRAWING WR-54/239

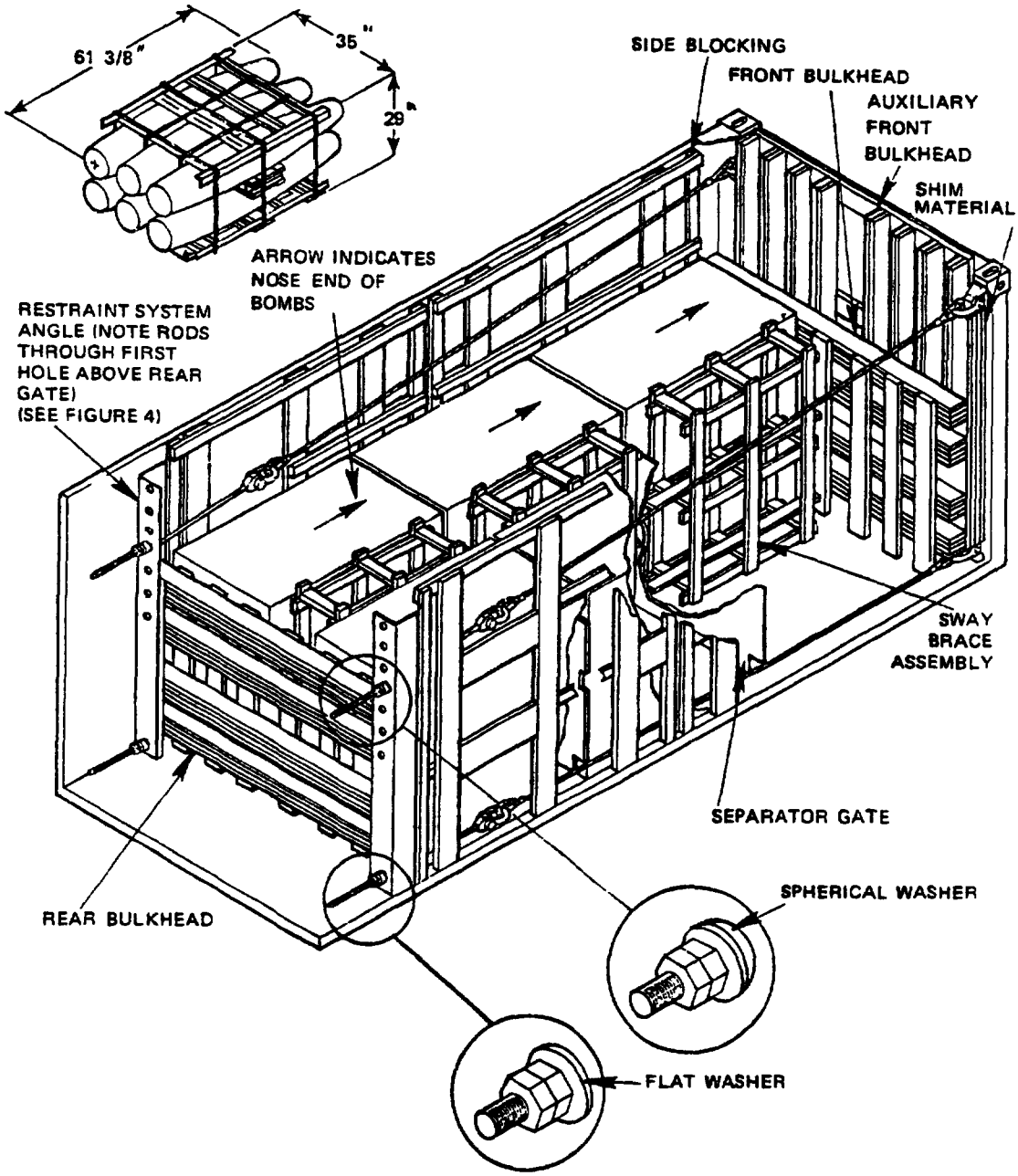

FIGURE 168. Typical loaded 20 ft. commercial container with unit loads restrained by IRSKIT hardware and wood dunnage.

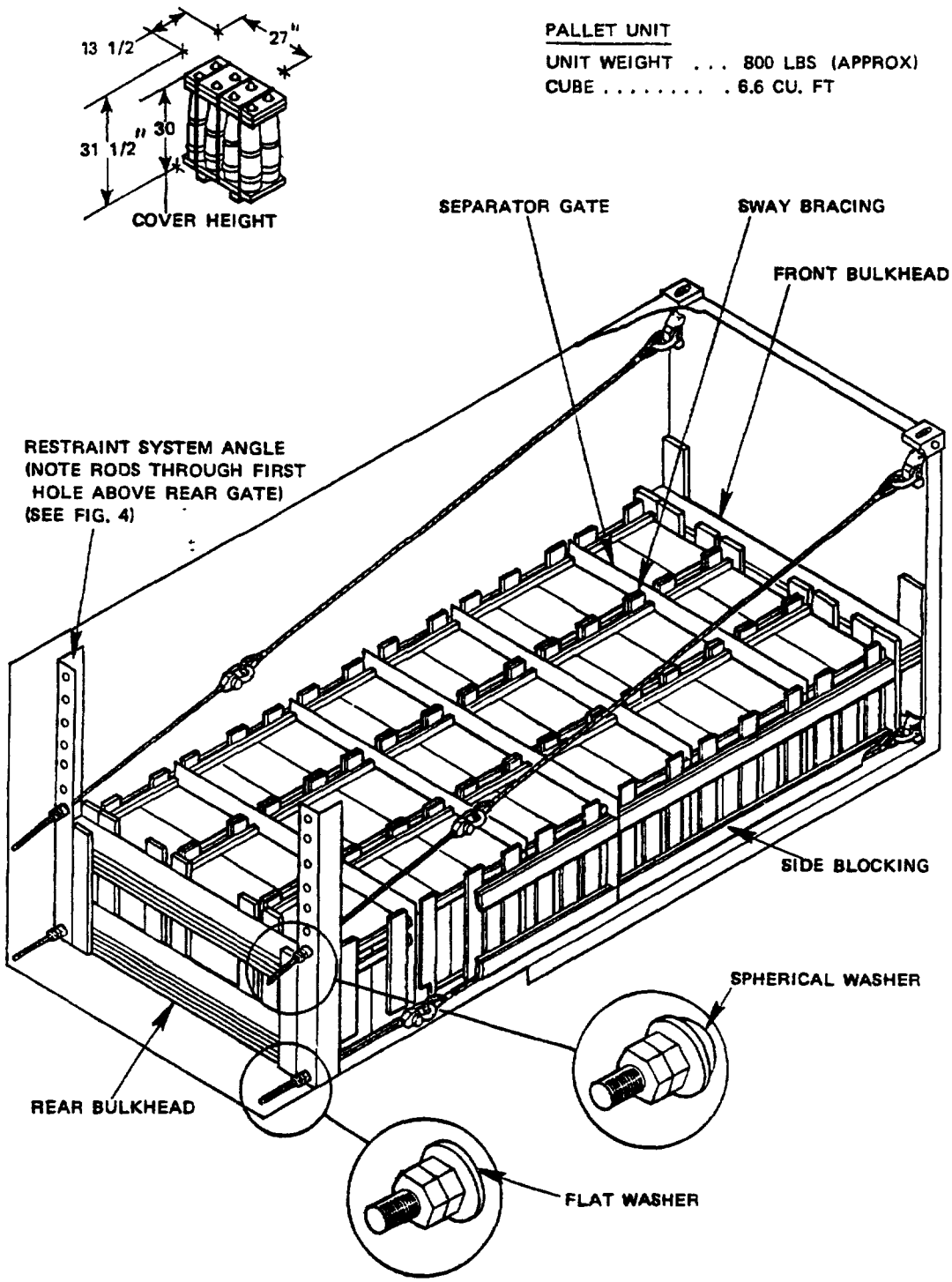

FIGURE 16C. Typical loaded 20 ft. commercial container with unit loads restrained by IRSKIT hardware and wood dunnage.

5.7 Loading equipment.

5.7.1 Use of forklift trucks. When using forklift trucks to load and unload, operating personnel shall be familiar with the safety practices for operating equipment described in OP 4098, NAVMAT P-5100, and MIL-STD-137. Industrial type trucks used for handling ammunition and explosives must be spark proof or explosion proof, depending upon the location and type of lading being handled (consult applicable sections of OP 5 and OP 4098 for approved equipment to be used in particular location). Care shall be taken to ascertain that the container floor is sufficiently strong to withstand this strain of moving a forklift truck with a concentrated load before entering. Suitable steel plates may be placed in the container to distribute the wheel load on the floor.

5.7.2 Handling equipment shall be used for the intended purpose only. MIL-STD-137 describes material handling equipment and OP 2173 describes approved handling equipment authorized for use in the handling of weapons and explosives.

5.8 Unloading procedures.

5.8.1 All IRSKIT hardware is reusable and should be retained for future use. It may be stored in and returned with the empty container provided the container is being returned to an ammunition activity for reuse. IRSKIT hardware from a number of unloaded containers may be assembled and held or shipped to a designated Navy activity. Special care should be taken to assure that small loose items such as the washers and nuts are not lost. These may be assembled to the pieces they fit or fastened to another appropriate part of the assembly. Front and rear bulkheads should be retained intact if there is a possibility of future need and if they can be economically stored or shipped to a reuse point. Large auxiliary front bulkheads for steel containers should be retained.

5.8.2 Unloading sequence.

a. Remove nuts with extended socket wrench tool (see Figure 15).

b. Remove rear bulkhead angles.

c. Remove rear bulkhead.

d. Remove any sway bracing and/or side bracing for the rear stack or bay as necessary.

e. Remove the lading from the rear stack or bay and separator gate and any other bracing when necessary.

f. Repeat above steps for each successive stack or bay until all lading is unloaded.

g. Remove front bulkhead and auxiliary front bulkhead when necessary.

h. Remove wire rope assemblies and corner attachment hardware (4 anchor blocks, 4 backup plates, and 8 screws (see Figure 3)) only if the IRSKIT hardware is not to be returned with the container.

5.8.3 When IRSKIT hardware from a number of unloaded containers are being stored or shipped IRSKIT hardware may be packed in a skidded wood box constructed in accordance with PPP-B-621.

Custodian:
NAVY-- OS
ARMY - SM
AIR FORCE - 99

Review Activities:
NAVY - OS, AS, SH
ARMY - AR
AIR FORCE - 43

User Activities
NAVY - SA , MC

Preparing Activity:

NAVY - OS

Project No. 8140-0535

Appendix A

10. QUALITY ASSURANCE PROVISIONS

10.1 Scope. This appendix covers road hazard testing, impact testing, trial shipment, and inspection of commercial container loads of ammunition and explosives.

10.2 Purpose. This appendix is intended to establish standard procedures for the following:

a. Road hazard tests of commercial container loads for unique items of lading and dunnaging methods.

b. Railway impact tests of commercial container loads for unique items of lading and new dunnaging methods.

c. Trial loadings and trial shipments of commercial container loads for unique items, new dunnaging methods, or shipments that are presenting particular problems.

d. Inspection of commercial container loads that have an approved MIL-STD dash-number sheet.

10.3 Application. When specified, the material contained in this appendix is a mandatory part of this standard.

10.4 Responsibility for commercial container road hazard tests, rail impact tests, trial shipments, and inspections.

a. The performance of commercial container road hazard tests and rail impact tests is the responsibility of NAVSEASYSCOM and WPNSTA Earle, Naval Weapons Handling Center (NWHC).

b. The performance of trial loadings and trial shipments is the responsibility of NAVSEASYSCOM, WPNSTA, Earle (NWHC), the shipping activity, and the receiving activity.

c. Quality Conformance Inspection of all commercial container loads is the responsibility of the shipping activity.

10.5 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection. First article inspection consists of those examinations and tests conducted, prior to general use, on proposed loads (inert or prototype), to ensure that the design is such that the container load is capable of withstanding the rough handling test requirements of this standard (see 10.6).

b. Quality conformance inspection. Quality conformance inspection consists of those examinations accomplished on approved loads, prior to shipment, to ensure that the lading is loaded in conformance with the approved loading plan and the methods specified in this standard (see 10.7).

10.6 First article inspection. As determined necessary by either NAVSEASYSCOM, WPNSTA, Earle (NWHC), or the cognizant regulatory agencies (U.S. Coast Guard and Bureau of Explosives), first article inspection shall consist of examining the lading and the proposed loading procedures for conformity with the existing rules and regulations together with similar previously approved commercial container loads as specified in this document; and when this conformance does not exist, the tests specified in 10.6.2, 10.6.3, or 10.6.4 apply.

10.6.1 First article sample. The first article sample shall consist of one prototype load of inert material representative of that to be shipped, placed in a commercial container as indicated by the proposed loading plan. Dummy loads may be used during the development program when inert loaded end products are not available. The dummy shall have the following characteristics identical to those of the items being simulated:

a. Envelope dimensions.

b. Weight, center of gravity, and radii of gyration in the three principal axis.

10.6.2 Commercial container road hazard test. Commercial container road hazard test shall be coordinated with NAVSEASYSCOM and WPNSTA, Earle (NWHC).

10.6.2.1 Commercial container road hazard test procedure. The sample container shall be loaded on an approved chassis and:

a. driven at 5 $\pm$ 1 miles per hour (mph) in both directions over the hazard course (see 10.6.2.2).

b. subjected in forward drive, to full braking stops on a dry, downgrade, concrete or blacktop road from speeds of 5, 10, and 15 mph and in reverse drive at the greatest possible safe speed.

c. driven at maximum safe speed over gravel, concrete, and black-top roads for a distance of at least 30 miles. Road course shall include two or more of each of the following: rail-truck grade crossings, sharp curves (at least one in each direction), and full stops (upgrade and downgrade).

10.6.2.2 Hazard course. The hazard course shall consist of approximately 400 feet of straight, reasonably level, concrete or asphalt road with appropriate turn around areas at each end. Two sets of hazards, separated by approximately 200 feet, shall be provided. Each hazard set shall consist of six obstacles placed on either side of the roadway centerline so as to strike wheels on opposite sides alternately. The first set shall be placed on 10-foot centers and the second set shall be placed on 8-foot centers. Each hazard shall produce a 4-inch vertical rise, a 6 to 12-inch horizontal travel, and a 4-inch vertical drop. (Imbedded railroad ties have proven satisfactory.)

10.6.3 Railway impact test. Impact tests shall be coordinated with Military Traffic Management Command, Naval Sea Systems Command, Bureau of Explosives and Naval Weapons Station Earle (NWHC).

10.6.3.1 Railway impact test procedure. On a reasonably straight track, free of switches, set up a minimum of five buffer cars with slack out of couplers and all brakes set. Total weight of the buffer string shall be at least 250 short tons. The specimen commercial containers (configured TOFC or COFC), adequately secured on flatcar, and loaded in accordance with the proposed method (inert loaded ordnance may be used), shall:

a. be caused to roll freely into the buffer string successively at speeds of 4, 6 and 8 miles per hour.

b. be reversed and impacted at 8 miles per hour.

c. be subject to measurement of impact speeds by accurate instrumentation and inspection to determine condition of lading before and after each impac

10.6.4 Trial shipment. A trial shipment shall be in accordance with OP 2165 and shall be coordinated with a specific designated activity,for Navy this activity is the NAVSEASYSCOM (SEA-05M13 and SEA 62T2) In addition to the above a trial railway shipment shall be coordinated with the Bureau of Explosives.

10.6.4.1 Trial shipment procedure. The commercial container shall be loaded, blocked and braced exactly as required by the load plan (inert material not required). The responsible activities shall:

a. Record the position of the lading together with the dunnage and fastenings used to constrain it (sketches or photographs).

b. Arrange for the transport of the commercial container over the prescribed route.

c. Upon receipt of shipment, inspect the lading, blocking, and bracing. Record any evidence of damage or inadequacies.

d. After unloading, the contained item(s) shall be tested or inspected to ascertain any change in its original operating or functional characteristics. Any indication of shipping damage shall be recorded accordingly.

10.6.5 Acceptance criteria. Upon completion of the required tests, there shall be no damage to the lading, dunnage or container and no movement of the lading that is likely to produce damage to the dunnage or container.

10.6.6 Test report. A report shall be prepared as a separate document or as a part of the request for approval. This report shall define all tests performed and give complete results of the tests, including any minor damage which may not be considered as cause for rejection. Photographs of the unit load before and after testing shall be made a part of this report. Additionally, photographs showing any special test setups shall also be included in the report.

10.7 Quality conformance inspection. Quality conformance inspection shall consist of the visual examinations specified by Table A-1 of each commercial container and load before, during and after loading to ensure that the container is safe for transportation of the intended load, the loading procedures are in accordance with approved standards, and the lading is loaded and secured in accordance with approved loading plans and practices. Container loads shall be examined to assure that the loading has been accomplished in accordance with the approved MIL-STD dash-number sheet. Particular emphasis shall be placed on assuring that the lading is properly positioned against the end walls and side walls of the container and that dunnage fills all void spaces, longitudinally and laterally.

10.7.1 Rejection criteria. Nonconformance with any one of the applicable acceptance criteria listed in Table A-I for corresponding examination shall be cause for rejection of the container or container loads. Minor economical repairs are permitted in order to bring the container to an acceptable level of serviceability.

10.7.2 Commercial container release. Prior to releasing the container, all deficiencies shall be corrected. Container shall be retested and pass QA inspection as outlined in 10.7.

TABLE A-I Visual Inspection of Commercial Container Loads

Examination	Applicable Paragraph/ Reference	Acceptance Criteria
Container (Empty)		
Cargo Space	5.1	The cargo space is clean. Weather seals of doors, door hinges, latches, levers, bolts, nuts and pins are not damaged, worn or loose. The roof, sides, ends and doors of the container do not have holes, tears or punctures. The container is structurally sound. The container bears approved certification markings. Interior of container is free of protrusions and floors are wood or wood covered.
Lading (Prior to Loading)		
Item Identification	OP 2165	Packages and containers are properly packed and marked in accordance with DOT and DOD requirements.
Compatibility of mixed loads		Load does not contain items that are prohibited from being loaded or transported together.
Dunnage		
IRSKIT Hardware	5.3.1	All IRSKIT hardware shall be in accordance with NAVSEA DL 5166424. It shall be complete and ready for installation.

TABLE A-I Visual Inspection of Commercial Container Loads

	Examination	Applicable Paragraph/ Reference	Acceptance Criteria
	Dunnage		
	Lumber	5.3.2	Lumber is sound, generally free from crossgrain, knots, knot holes and checks or splits which would impare the strength of the material or interfere with proper nailing. Lumber complies with MM-L-751.
	Nails	5.3.3	Nails are suitable for intended use and comply with FF-N-105.
	Strapping	5.3.4	Strapping is suitable for intended use and conforms to QQ-S-781 and this standard.
	Preliminary Container Preparation		
	Corner post holes	5.4.1	Holes are drilled in corner posts in accordance with Figure 5 or Figure 6 as appropriate.
	Restraint cable Installation	5.4.1.1	Anchor block assembly and restraint cables are properly installed.
B.	Loading Procedures		
	Personnel	OP 2165	Personnel are qualified for supervising and loading ammunition and explosives
	Safety	NAVMAT P-H1 P-5100 5.7	Safety precautions are practiced at all times by personnel engaged in loading operations.
	Load patterns	5.2.1	Load is installed in accordance with appropriate MIL-STD-dash sheet.
	Nailing	5.3.3.1	Nails and nailing are in accordance with appropriate MIL-STD-dash sheet.

TABLE A-I Visual Inspection of Commercial Container Loads

Examination	Applicable Paragraph/ Reference	Acceptance Criteria
Front bulkhead	5.4.2.1	Front bulkhead is properly constructed and installed.
Forward filler assembly	5.4.2.2	Forward filler assembly is properly constructed and installed where required.
Front auxiliary bulkhead	5.4.2.3	Front auxiliary bulkhead is properly constructed and installed where required.
Side wall blocking	5.4.2.4	Side wall blocking is properly constructed and installed where required.
Separator gates	5.4.2.5	Separator gates are properly constructed and installed where required.
Sway bracing	5.4.2.6	Sway bracing is properly constructed and installed where required.
Rear bulkhead	5.4.2.7	Rear bulkhead is properly constructed and installed.
Angle installation and cable tensioning	5.4.3	Angles fit snuggly against ends of rear bulkhead.
	5.4.3.1	Restraint cables have no interference with the dunnage or lading. Upper restraint cables are installed through proper angle holes. Restraint cables are tensioned with all the slack removed and properly secured.
Prior to Release of Loaded Container		
Placement of shipping documents	5.5	Shipping documents are attached to dunnage or some other conspicuous place before container doors are closed and sealed.

TABLE A-I Visual Inspection of Commercial Container Loads

Examination	Applicable Paragraph/ Reference	Acceptance Criteria
Marking or placarding	5.5	Appropriate placards/markings are applied to the container as required for the designated mode(s) of transportation.
Weight distribution and gross weight	5.2	Specified weight restrictions and load axle limitations are not exceeded.
Sealed outgoing container	5.5 OP 2165	Whenever a shipment of hazardous material is moved from a shipping activity to a receiving activity without being opened the container is sealed. This requirement applies to all classified shipments and container loads of class A, B or C explosives.
Seal Tag	OP 2165	When a shipment carries a security classification a waterproof seal tag is threaded onto the metal band of the seal.
Notice of seals	OP 2165	A Notice of Seals, NAVSANDA Form 4-8, is attached to the doors of the container transporting hazardous materials for which numbered seals are required.
Driver instructions (special)	OP 2165	The driver of each tractor used to transport hazardous materials has inspected the load and has been given a copy of the special instructions applicable to the load.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

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