The Practice and Regulations of Container Intermodal Transport

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# Table of Contents

1. **Introduction to containerizations** ................................................................. 3
   1.1 Major container trades .................................................................................. 3
   1.2 Container types ............................................................................................ 5
   1.3 Container bases ........................................................................................... 11

2. **Features of containerization** ........................................................................... 12

3. **Container Intermodal Transport Practice** ...................................................... 15
   3.1 Container Marks ........................................................................................... 15
   3.2 Selection and Examination of Containers ...................................................... 16
   3.3 Mode of Handing & Taking over of Containerized Cargo ............................. 17
   3.4 Spots of Handing/Taking over of Containerized Cargo .............................. 18
   3.5 Manners of Handing/Taking over of Containerized Cargo .......................... 18
   3.6 Main Manners of Handing/Taking over of Marine Containerized Cargo ....... 18

4. **Legal aspect of Container Intermodal Transport** ........................................... 19
   4.1 Trans-shipment – ‘through’ bills of lading .................................................... 19
   4.2 ‘Combined’ or ‘Multimodal’ Transport .......................................................... 21
   4.3 ‘Network’ and ‘uniform’ solutions ................................................................. 23
   4.4 International Convention for Safe Containers 1972 (CSC) .......................... 25
1. Introduction to containerizations

Containerization is a method of distributing merchandise in a unitized form thereby permitting an intermodal transport system to be developed providing a possible combination of rail, road, canal and maritime transport. The system is long established and was in being at the turn of the century in a somewhat less sophisticated form. It came more into use in the North American coastal trade in the 1930s when the vessels were called Van ships. Today we have seen the evolution of the sixth generation of container ships as the benefits of containerization become more attractive on a worldwide scale, thereby aiding rising living standards and facilitating trade expansion.

There are over 140 trading nations in the container business embracing 360 ports, each handling in excess of 34,000 TEUs in 2004, generating over 100,000 possible routes. Containerized cargo seaborne trade has been averaging an annual growth of 10% and reached one billion tons in 2005. Thus containerized trade is growing twice as fast as world seaborne trade. At the same time the trade matrix has widened with many new countries and cargoes entering the trade. Moreover, as the container fleet became more established, the average size of the vessel deployed increased from 21,000 dwt in 1992 to 31,000 dwt in 2005. This increased ship productivity and exploited the economies of scale.

In 2005 the world’s ports handled an estimated 390 million TEUs. Currently the world fleet of container tonnage is over 3,500 ships which generate over 8 million TEU slots while the global equipment pool totals 21.1 million TEUs. In 2006 the container ship order book stood at 1,200 units which will provide the stimulus for further expansion of 4 million TEU in a four year period. By 2010 port throughput is likely to exceed 520 million TEU with total import/export volumes rising to 122 million TEU. Elsewhere the vessel fleet is likely to total 14 million TEU. Fundamentally, there is no doubt that containerization has been largely responsible for the globalization of trade.

1.1 Major container trades

In our examination of major container trades, one must bear in mind the continuous remodelling of the container network which is one of continuous expansion through new tonnage and growth in port modernization and its infrastructure. This extends particularly to the hub and spoke network and the changing attitude of shippers favouring the container shipment. An example is the South African fruit market, where during the period November 2004 to April 2005 the container reefer market share increased by 65% to 1,800 TEU per week whilst the
specialist reefer vessel capacity remained static.

Structural factors are likely to help carriers balance supply and demand. This embraces port congestion consequent on ports failing to keep pace with container growth, trade imbalances and longer trade distances. Increased trade distances and longer vessel round-voyage durations will assist in absorbing capacity, such as the greater share of transpacific cargo moving via east coast North America/US Gulf ports rather than overland from west coast North American ports. Increasing trade imbalances that require a more than proportionate increase in capacity for a given two-way cargo volume as head-haul growth continues to outpace back-haul growth. Further factors embrace continued outsourcing of production, greater stability of east–west flows with lower-value cargo in the supply chain, and continuous merger and acquisition programmes as found in the Maersk Line. It is resulting in fewer but larger mega container operators in the global market, thereby increasing their market share and dominance. An examination of growth rates on east–west head-haul trades is found in Table 1.

The Asian export trades predicts an annual growth rate of 3% below the rate of the past five years. In contrast the Atlantic trades should produce improved performance accounting for 15% of aggregate east–west primary head-haul volumes and an even lower share of vessel demand because of their short voyage durations. Significantly they employ smaller ships than the Asian east–west trades and so provide little scope to absorb much of the new post-Panamax tonnage.

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<tbody>
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<td>Asia–northern Europe</td>
<td>10.5</td>
<td>10.6</td>
<td>10.4</td>
<td>9.7</td>
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<tr>
<td>Asia–Mediterranean</td>
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<td>23.0</td>
<td>18.1</td>
<td>10.5</td>
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<tr>
<td>Asia–North America</td>
<td>11.8</td>
<td>9.0</td>
<td>8.0</td>
<td>6.8</td>
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<tr>
<td>Asian east–west head haul</td>
<td>11.7</td>
<td>12.1</td>
<td>9.9</td>
<td>8.2</td>
</tr>
<tr>
<td>Northern Europe–North America</td>
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<td>4.1</td>
<td>6.2</td>
<td>5.3</td>
</tr>
<tr>
<td>Mediterranean–North America</td>
<td>3.8</td>
<td>2.9</td>
<td>4.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Atlantic east–west head haul</td>
<td>2.5</td>
<td>3.7</td>
<td>5.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Head haul aggregate</td>
<td>10.1</td>
<td>10.9</td>
<td>9.3</td>
<td>7.8</td>
</tr>
</tbody>
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Source Courtesy of Drewry Consultants.

Note

a Average percentage per annum.

The regional and north-south markets and east–west routes employing sub-5,000 TEU vessels are earmarked for ship capacity growth. However, the primary east–west trades to North America and Europe are more exposed to growth uncertainty. There is an imbalance between these trades and the rest of the market. It may result in the cascading of smaller and older tonnage into the secondary east–west markets and primary north–south trades, thereby spreading overcapacity around more equally. Also encourage greater focus on tonnage-intensive routes to help absorb the excess capacity. A factor which may resolve any excessive container tonnage growth without a corresponding increase in containerized shipment may be the process of arranging
the deployment of an increasingly imbalanced asset pool to cover the global spread of trade requirements. To conclude our analysis of major container trades, one must reconcile it with rising bunker costs, the political situation, the cost pressures, the slowdown in primary east–west trades, the continuous merger and acquisition strategy of container operators, the influence of WTO, and the economic forecast of Europe, US, and OECD countries coupled with the growth of China and India. A key factor is over tonnage supply as the container fleet expands by 50%, and its interface with the trade and shipping cycles. Shipping economists must continue to monitor carefully economic indicators, including exchange rates and any political tensions. Meanwhile, container operators will continue to strive to drive down costs and develop market drive–volume focused freight rate marketing strategies.

1.2 Container types

The range of container types tends to expand annually to meet the increasing market demands on this fast-growing international method of distributing merchandise. Basically the majority of containers used are built to ISO (International Standards Organization) specification thereby permitting their ease of ubiquitous use on an international scale.

Given below are details of some of the types of containers available and their salient features. Details of the dimensions of specific containers, pallet-wide intermodal containers and swapbody types are given in Table 2.

(a) **Dry freight container.** This container type is ideal for both the FCL and LCL markets. It is designed for all types of general merchandise and with suitable modification for the carriage of bulk cargoes both solid and liquid. It is available in 20 ft, 40 ft and 40 ft hi-cube sizes. Most 20 ft containers have a maximum gross weight of 30,480 kg. Additionally, there is the 45 ft hi-cube container designed to carry similar products as the 40 ft, but with 13% additional volume. It is the world’s most widely used container for the movement of general cargo and the most cost effective means of transporting non-perishable cargoes (Fig.1).

(b) **Insulated containers.** These protect against heat loss or gain and are used in conjunction with a blown-air refrigeration system to convey perishable or other cargo which needs to be carried under temperature control. Internally the containers are equipped with an aluminium T-section floor and the inside face of the doors is fitted with moulded vertical battens to permit air flow around the cargo. It is important that when cargo requiring temperature control is loaded in this type of container, an air space of approximately 7.5 mm is left over the top of the cargo to allow free air circulation. Securing points are positioned along each side of the floor, while lashing points to prevent cargo falling out are sited at the door end of the container by the corner posts. This is an ideal container for the movement of foodstuffs.

(c) **Refrigerated containers.** GE SeaCo. has the world’s largest refrigerated
container lessor fleet of over 100,000 TEUs available in 20 ft, 40 ft and 40 ft hi-cube sizes, for shipment of perishable and frozen cargoes. The reefer containers are designed to operate independently of a blown-air refrigerated system, and are filled with their own refrigeration units which require an electrical power supply for operation. Each container is capable of being set at its own individual carriage temperature. It is ideal for meat, dairy products and fruit. An increasing volume of former bulk tonnage reefer cargoes is now being containerized. The containers embrace the latest design and construction methods; hi-grade stainless steel on exterior panels; corrosive resistant hot-zinc-sprayed corten steel frame; and for added resistance, all exterior surfaces are primed and coated with thick gloss top coat (Figure 1).

(d) **Bulk containers.** These are designed for the carriage of dry powders and granular substances in bulk. To facilitate top loading three circular hatches (500 mm diameter) are fitted in some containers in the roof structure. The dry freight container (item (a)) is displacing the bulk and ventilated container (see Fig.1).

(e) **Ventilated containers.** This type of container is broadly similar to the dry freight container specification except for the inclusion of full length ventilation galleries sited along the top and bottom side rails, allowing the passive ventilation of the cargo. It is ideal for products such as coffee (see Fig 1).

(f) **Flat rack containers and platform flats.** Both these types of containers are primarily designed to facilitate the carriage of cargo of awkward, oversize and project cargoes. These units are also used as temporary tween decks for the carriage of large, indivisible loads. Such containers have a collapsible end. GE SeaCo’s fleet includes the innovative SeaDeck and Domino units, both flush-folding flat-racks. These units combine the benefits of both flat-rack and a platform flat in one unit. They have collapsible, spring-assisted end walls, which allow easier operation, enabling both wheeled and crawler equipment to be driven on to the unit during loading. A combination of two or more flat-rack containers can be used to form a temporary break-bulk space for uncontainerable cargo moved on a Port to Port basis provided the total weight and point of loading of the cargo does not exceed the static capabilities of the flat-racks. Flat-racks are ideal for trades where there is cargo in one direction and nothing in the other. The end walls are folded down and five units can be returned in one stack back to the point where the cargo is loaded. Most flat-racks are 40 ft with a maximum gross weight of 45,000 kg.

(g) **Open top containers.** This type of container is suitable for the carriage of awkward shaped indivisible or oversize cargoes which cannot bestowed in the dry freight container. It is available in 20 ft and 40 ft sizes. The units offer increased versatility over standard boxes and are designed for loading through both the top of the container and the doors. It may also be described as an open sided/open top container. Tarpaulin tilts are available to protect the cargo. The container is ideal for sheet glass, timber and machinery (Fig1 ).

(h) **Tank containers.** The growth in the volume of containerized bulk liquid hazardous and non-hazardous shipments is phenomenal and this will continue.
The Practice and Regulations of Container Intermodal Transport by Pro. Zhigang Yang

IMO regulation in terms of the container tank construction and their shipment, especially for dangerous classified cargo, is very severe. A wide range of dry bulk cargoes are also shipped in tank containers. GE SeaCo is a market leader and is one of the world’s largest tank container lessors with a modern fleet of tanks ranging from 12,000 to 35,000 litre capacities. Tank containers are ideal for the transport and storage of all types of bulk liquid and can be shipped by rail, road and sea. A range of specialists tanks are available for particular applications, such as units for the transport of food-grade cargo intended for human consumption and for the safe carriage and storage of toxic and hazardous products. Overall there are five types:

(i) The IMO type for chemicals involving hazardous cargo and a capacity ranging from 12,000 litres to 35,000 litres.

(ii) Lightweight tanks offering reduced tare weight for increased payload. Designed for a range of chemical and bulk liquids with a capacity of 21,000 litres.

(iii) Food grade tanks for edible cargo with a gross weight of 34,000 kg and tare weight of 3,300 kg.

(iv) Insulated tanks for liquids which are non-heat-sensitive with a gross weight of 34,000 kg and tare weight of 3,345 kg.

(v) Special tanks for highly hazardous liquids and gases with a capacity ranging from 12,000 litres to 35,000 litres.

Overall, the tank container offers a safe and simple method of controlling cost whilst using a recyclable resource. On arrival the tank discharge directly into the production process, saving both valuable time and costly handling and heating charges. Shippers not only save time and money, but the tank unit provides up to 35% additional cargo over drums in each ISO shipment, with wastage from drums through spillage or damage at an estimated 5% per transit. Other cost savings include the drum provision and its disposal in an environmentally conscious global society. The container is protected by an ISO frame and has stainless steel construction to aid cleanliness. To conclude our analysis, the specialist tanks include units for transport of food grade cargo intended for human consumption and for the safe carriage and storage of toxic and hazardous products.
Figure 1. Container types: (a) 20 ft platform flat, or bolster (40 ft size available) for building materials, vehicles, indivisible loads, lumber, etc. (b) 20 ft half-height with ramp end door and tarpaulin roof, for heavy loads, building materials. (c) 20 ft open top (40 ft size available) for large awkward items such as machinery, tarpaulin roof for watertight integrity, door header swings to assist loading of high items. (d) 40 ft refrigerated container with integral refrigeration machinery for chilled and frozen cargoes. (e) 20 ft spring-assisted folding end flat-rack (40 ft size available), can be provided with built-in interlocking mechanism for multiple empty transport (f) 20 ft covered container, 8 ft 6 in. high (40 ft available).
Figure 2. Container types: (g) 20 ft bulk container for grain, powders, etc. (h) 7.15 m swapbody with demountable legs, 2.5 m width for two-pallet-wide European operation. (i) 40 ft high cube 9 ft 6 in. high (45 ft also available) for cargoes that cube out. (j) 20 ft ventilated container for cargoes such as coffee and cocoa that experience condensation damage. (k) 40 ft sea deck-style combined flat-rack and platform flat (20 ft size available) for large items of machinery, construction equipment, etc. (l) 20 ft tank container for bulk hazardous and non-hazardous liquids. (Reproduced by kind permission of GE SeaCo)
Table 2. ISO container dimensions by all type.

<table>
<thead>
<tr>
<th>Container Type</th>
<th>Overall Dimensions (mm)</th>
<th>Interior Dimensions (mm)</th>
<th>Door Dimensions (mm)</th>
<th>Height (mm)</th>
<th>Breadth (mm)</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>20×8×8.85</td>
<td>5,890 x 2,290 x 2,335</td>
<td>2,335 x 1,015 x 1,235</td>
<td>235</td>
<td>235</td>
<td>2,290</td>
</tr>
<tr>
<td>Refrigerated</td>
<td>40×8×8.85</td>
<td>12,033 x 2,240 x 2,240</td>
<td>2,240 x 2,240 x 2,240</td>
<td>2,240</td>
<td>2,240</td>
<td>2,240</td>
</tr>
<tr>
<td>High cube</td>
<td>20×8×8.85</td>
<td>12,033 x 2,240 x 2,240</td>
<td>2,240 x 2,240 x 2,240</td>
<td>2,240</td>
<td>2,240</td>
<td>2,240</td>
</tr>
<tr>
<td>Bulk</td>
<td>40×8×8.85</td>
<td>11,550 x 2,240 x 2,240</td>
<td>2,240 x 2,240 x 2,240</td>
<td>2,240</td>
<td>2,240</td>
<td>2,240</td>
</tr>
<tr>
<td>Ventilated</td>
<td>20×8×8.85</td>
<td>12,033 x 2,240 x 2,240</td>
<td>2,240 x 2,240 x 2,240</td>
<td>2,240</td>
<td>2,240</td>
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</tr>
</tbody>
</table>
1.3 Container bases

The function of a container base is to consolidate break-bulk cargoes (i.e. less than full container load consignments) into full container loads. The container base may be under the management of a consortium of ship container operators, a container operator(s) engaged in the freight-forwarding business, a consortium comprising freight forwarders, road hauliers, etc., and others engaged in such business, or a local port authority. It can be situated in the port itself, the port environs, or an industrial area which can support the facility in generating adequate quantities of containerized import/export traffic through it. The container base is served by road and the larger bases often have rail facilities.

Overall the role of the container base can be summarized as a convenient point to assemble LCL cargo; to provide export packing and handling services for FCL and out-of-gauge cargo; to provide inland customs clearance local to customers’ business premises; to provide totally secure storage and packing for empty and loaded containers together with cleaning and repair services; and to offer office accommodation on the spot for container operators, freight forwarders and other maritime service companies.

The object of the facility is to consolidate break-bulk cargoes destined for the same area/country into full container loads and thereby provide a service in that area, particularly for the smaller importer/exporter. Consequently the process of stuffing (loading) and unstuffing (unloading) containers is performed at the container base. Many of the larger container bases are inland clearance depots which have the added facility of customs clearance for both import and export cargoes.

The major advantage of the container base is to provide a service to the importer/exporter situated in the base’s hinterland and relieve the port authority of local customs clearance of import/export cargoes. This latter advantage tends to reduce the problems of port congestion, i.e. containers awaiting clearance due to non-availability of documents, and enables the throughput of the container berth to be maximized. Ultimately it speeds up transit as no inordinate delay is usually experienced at the port and thereby encourages the development of international trade. Undoubtedly the number of container bases will increase as the container trades expand. The development of the intermodal transportation network is likely to grow to include sea and air. The combination of these two transportation methods offers an economical alternative, and an average journey time is cut by approximately 75% when compared with sea freight. Transport costs are reduced by up to 50% compared with pure air freight.

The air waybill and bill of lading documents are used. To aid faster development, compatible containers are being provided which go directly from the ship into the aircraft without the goods needing to be loaded. Boeing Jumbo air freighters with a payload of up to 103 tons, and capable of conveying pallets and containers are used. A number of other sea/air routes exist between the Middle East and North America, with
2. Features of containerization

The advantages and disadvantages of containerization can be summarized as follows:

1. It permits a door-to-door service being given which may be from the factory production site to the retail distributor’s store – an overall distance of may be 10,000 km.

2. No intermediate handling at terminal (port) transshipment points.

3. The absence of intermediate handling plus quicker transits permits less risk of cargo damage and pilferage.

4. Low risk of cargo damage and pilferage enables more favourable cargo premiums to be obtained compared with conventional cargo shipments, i.e. tween-deck tonnage.

5. Elimination of intermediate handling at terminal transfer points, i.e. ports, enables substantial labour savings to be realized, which in industrialized countries with high incomes per capita can realize considerable attractive financial savings.

6. Less packing needs for containerized shipments. In some cases, particularly with specialized containers, e.g. refrigerated tanks (liquid or powder), no packing is required. This produces substantial cost savings in international transport.

7. The elimination of intermediate handling coupled with the other advantages of containerized shipments, permits the cargo to arrive in a better condition when compared with conventional cargo shipments.

8. Emerging from the inherent advantages of containerization, rates are likely to remain more competitive when compared with the former conventional tonnage (tween-deck) shipments. A significant reason is that containerization is in the main a capital-intensive transport system compared with conventional liner systems, and has rationalized ports of call coupled with more intensive ship use.

9. Transits are much quicker compared with conventional cargo shipments. This is achieved through a combination of faster vessels, the rationalization of ports of call and substantially quicker cargo handling. An example is the UK–Australia service where the round voyage time has been reduced from the 20 weeks taken by conventional services 15 years ago to the five weeks (approximately) taken by container vessels nowadays.

10. Emerging from faster transits and the advantages under items (7) and (8) it encourages trade development and permits quicker payment of export invoices.
11. Containerization has permitted fleet rationalization. On average one container vessel—usually of much increased capacity and faster speed has displaced up to eight tween-deck vessels on deep-sea services. This development has been facilitated by the rationalization of ports of call and the development of the ‘hub and spoke’ container ship feeder system.
12. Container vessels attain much improved utilization and generally are very much more productive than the ‘tween-deck tonnage.
13. Faster transits usually coupled with more reliable schedules and ultimately increased service frequency, are tending to encourage many importers to hold reduced stocks/spares. This produces savings in warehouse accommodation needs, lessens risk of obsolescent stock, and reduces importers’ working capital.
14. Containerization produces quicker transits and encourages rationalization of ports of call. This in many trades is tending to stimulate trade expansion through much improved service standards. Accordingly it will result in increased service frequency which will aid trade development.
16. Provision of a through rate. This covers both maritime and surface transport cost. This factor and (15) very much aids the marketing of the container concept.
17. More reliable transits – particularly disciplined controlled transit arrangements.
18. New markets have emerged through container development and its inherent advantages.
19. Maritime containerization is a capital-intensive project and as such is beyond the financial limit of many shipowners.
20. Not all merchandise can be conveniently containerized. However, the percentage of such traffic falls annually as new maritime containers are introduced.
21. Maritime containerization has greatly facilitated the development of consolidated or break-bulk consignments. This particularly favours the small exporter unable to originate a full container load which is consolidated through a container base.
22. Containerization facilitates the maximum use of computerization in many areas, especially container control/tracking, customer billing, container stowage in the vessel, documentation processing, and so on.
23. The international maritime container network expands annually as ports/berths are modernized, together with their infrastructure. This involves the development of the dry port such as Ipoh, the development of new container berths; the relocation of container berths to accommodate larger vessels such as in the ports of Bangkok and Klang; the development of air-freight and land bridges, the development of the hub and spoke system and the new generation of container ships.
24. Containerization is a capital-intensive project and as such is beyond the financial ability of many shipowners. In many cases container services are now operated by members of the old conference groupings funding a new consortium.
Even so, the finance required is very great, for not only has a specialized ship(s) to be built but at least three sets of containers for each ship. With regard to the latter, ownership has tended to be held by container hire operators, by industrial companies and by the shipowning consortia. In all three sectors, however, there has been a good deal of leasing of containers, with the operational control resting with the lessors. The expense does not end there, for at the chosen terminals the authority has to bear the cost of providing specialized cranes, trailers, van carriers, etc., as well as strengthening quays and creating stacking space.

25. The container in itself is a high capacity carrying unit, and in consequence, exporters with limited trade are unable to fill the container to capacity, and thereby take full advantage of an economical through rate, for example from exporters’ factory premises to importers’ warehouses. This situation has been largely overcome by the provision of container bases situated in industrial areas or port environs, where less than container load traffic (LCL) is stowed (stuffed) into a container with other compatible traffic of similar destination/area.

26. In some trades a very, very small percentage of the traffic is incapable of being containerized due to its nature such as certain livestock. This does involve the shipowner in providing specialized non-container facilities on the vessel, which inflates the capital cost of the project, and sometimes results in poor utilization of such facilities on the return passage.

27. The stratification of some trades varies considerably by time of year and direction. For example, a trade may have a preponderance of perishable cargo in one direction eight months of the year, whilst in the reverse direction the cargo may be consumer goods. This situation has to be reconciled in an acceptable container type(s) for use in both directions. Additionally in some trades, as a result of imbalance, extensive reposi- tioning of containers is required. Another example is to have cargo in one direction with a low stowage factor, whilst in the reverse direction it is a high stowage factor. Such problems, although prima facie difficult, have been overcome by the co-operation of all interested parties, particularly shippers/shipowners. Technological development in recent years such as food storage/processing etc. have eased the shipowners’ problems considerably and tended to level out the, hitherto, peak seasonal nature of the traffic in some trades.

28. The container-owning company, which may be a consortium of shipowners, or container operator has a complex task in ensuring full utilization of such equipment. Most shipowner consortia have computer equipment to monitor and control their inventory of containers. The task is an international one and involves many parties to ensure strict control of the container when it is in their hands. Some method of container control is essential to ensure good utilization of the equipment in the interest of maximizing revenue.

29. In some countries restrictions exist regarding the inland movement, particularly by road, of certain containers exceeding a certain dimension/weight. This has tended to restrict the full development of the larger container, particularly the 40-footer (12.20 m), the 45-footer (13.72 m) and the 49-footer...
(14.94 m), but long-term the constraint is likely to disappear in many markets. Restrictions by canal/rail are virtually nonexistent in many countries, although by rail there may be some constraints on the use of the high cube container of 9 ft 6 in. (2.90 m).

30. Overall, a total quality service which in turn adds value to the ports/countries served.

To conclude our analysis of containerization, one cannot stress too strongly that its existence is responsible for the development of world industrial and consumer markets. It has brought enormous economic and social changes to many countries, especially less developed countries, newly industrialized countries and developing/emerging countries. Overall its efficiency, as manifest in multi-modalism of which the major leg is sea transport, is of paramount importance in the continuing development of world trade. Moreover, it has stimulated the growing development of logistics in the global market environment. In short, countries which are not on the global container network are seriously disadvantaged in their economic and social development.

3. Container Intermodal Transport Practice

3.1 Container Marks

According to ISO790—73, the following matters should be made out on the certain positions of a container:

1. **Group I**: code of container owner, serial number and checking digit

   Code of container owner, e.g. The code of COSCO’s container is COSU
   Serial number, in accordance with the regulation of GB1836-85, which is expressed by 6 numbers.
   Checking digit: (Formula-omitted)

2. **Group II**: code of nationality, code of size and code of type:

   Code of nationality, which is expressed by 3 Latin letters, indicating the registering nation of the container, e.g. “RCX” is the code of “People’s Republic of China”

   Code of size, which is expressed by 2 numbers, indicating the size of the container. e.g. “20” means the container is 20-foot-long and 8-foot-height.

   Code of type, which is expressed by 2 numbers, indicating the type of the
container, with 00-09 standing for GP container, 30-49 for RF container and 50-59 for OT container.

3. **Group III:** max gross and tare
   Max gross, also known as Max-rating gross, is the sum of tare and the max weight of cargo allowed to be stuffed.
   Tare means the self-weight of an empty container.

### 3.2 Selection and Examination of Containers

Before the stuffing of goods, the suitable container should be selected according to the sort, packing, nature and transportation requirements of the goods to be shipped. The following fundamental requirements should be met:

1. The container should tally with the standard of ISO;
2. 4 posts, 6 surfaces and 8 corners of a container should be in good condition;
3. Every jointing part should be firm;
4. Inside of containers should be clean, dry, no odor and no dust
5. The container should be watertight and light tight; and
6. The container should be certified.

### 1. Selection of a Container

When selecting a container, we should focus on the different sorts, nature, shapes, packing, volume, weight and the requirements of transportation of the goods. We should firstly think over whether the goods could be contained in the container and then whether it is reasonable in economy and suitable for the cargo.

### 2. Examination of Containers

Commonly, the examination of a container includes:

1. Exterior examination: seeing over the six exterior surfaces of the container and set a mark on the part where damage, distortion, leaking or any other damage lies, if any;
2. Interior examination: seeing over the interior surfaces of the container and finding out whether it is watertight, light-leaking, or contaminated;
3. Examination of the doors: seeing over whether the doors are watertight, the locks are intact and the doors can be opened to 270°.
4. Examination of cleanliness: seeing over whether there are remainder, rust, wet, odor or other contamination in the container and cleaning and even changing the container, if necessary; and
(5) Examination of the attachments.

3.3 Mode of Handing & Taking over of Containerized Cargo

Containerized transportation is a transport manner by which break bulk cargo, gathered into a transport unit, is carried by vessels or other transport utilities. The circulation of containerized cargo is different from traditional general cargo. They could be handed/taken over in ports, where traditional general cargoes are handled, and in land depots out of ports as well.

The containerized transportation changes the traditional circulation of general cargoes. Containerized cargoes can be grouped into two sorts, namely,

1. **FCL**

   Full Container(cargo)Load, FCL, refers to the cargo, which is loaded. Counted and sealed and also the CLP thereof is made by the shipper. It usually has only one consignor and one consignee.

   There is no specific rule governing the handing / taking over of FCL in relative international conventions or maritime laws of most countries. The carriers usually bear the responsibility, in accordance with the printed clauses on both face and back of B/L and additional clauses on the face of B/L such as Said To Contain, S. T. C, Shipper Load Count and Seal, SLCS and other UNKNOWN clauses, which means that the container should be handed/taken over with itself and the seal intact. In present shipping practice, lines mainly engage in FCL business.

2. **LCL**

   Less than Container (cargo) Load, LCL, refers to the cargo, which is loaded. Counted and sealed and also the CLP thereof is made by the CFS of carriers. Due to the small quantity of each lot of cargo, LCL usually involves several consignors and consignees as well. The carriers usually bear the responsibility that the cargo should be handed / taken over with good appear present shipping practice, consolidating companies mainly operates LCL business.

   The freight forwarder could carry on the LCL business, while his status changes. The freight forwarder participates in the LCL business, provides the prompt and high—efficient transport service for the owner of small-quantity cargo and settles the problem of transporting small—quantity cargoes after containerized liner service replace the traditional general cargo liner service.
3.4 Spots of Handing/Taking over of Containerized Cargo

Spots of handing/taking over in transport refer to the spot at which the responsibilities, risks and costs of cargo transferred between carriers and shippers in accordance with the transport contracts. Governed by the compulsory regulations in the relative international conventions and laws of most countries, carried shall not alleviate their responsibility and/or liability in the name of freedom of contract. But the expense of transport could be negotiated between the two parties. In containerized transportation, spots of handing/taking over might change as the case may be.

Ship’s rail or hook/tackle, container yards and container freight stations and other places stipulated by the two parties can serve as spots of handing/taking over. Container yard, CY, is the place where empty containers and loaded containers are handed/taken over, kept and handled from one transporting utilities to another.

Container freight station, CFS, is the place where LCL is handed/taken over, kept and stuffed/unstuffed.

CY and CFS may be at the same place.

3.5 Manners of Handing/Taking over of Containerized Cargo

According to the different spots of handing / taking over of containerized cargo, there are 16 manners thereof, namely, Door to Door, Door to CY, Door to CFS, Door to Tackle, CY to Door, CY to CY, CY to CFS, CY to Tackle, CFS to Door, CFS to CY, CFS to CFS, CFS to Tackle, Tackle to Door, Tackle to CFS and Tackle to Tackle. When it comes to different manners, the responsibilities and obligations of carriers and shippers are different and the matters the carrier dealing with and the scope of business of carriers are also different.

The above-mentioned 16 manners just exist in theory and could not be all employed in practice. We can know the relative matters of responsibility and cost between the carriers and the shippers by learning the manner of handing / taking over of containerized cargo.

3.6 Main Manners of Handing/Taking over of Marine Containerized Cargo

Under different manners, the responsibilities and obligations of carriers and shippers are different and the matters the carrier dealing with and the scope of business of carriers are also different. Containerized cargo Can be handed/taken over alongside ships like traditional cargo, FCL in CY, LCL in CFS and multi-modal
transported cargo at shippers warehouses or factories. Containerized cargo may be handed/taken over in 4 spots. So there are theoretical 16 different manners, however handing/taking over alongside ships is very rare and doing so in shippers’warehouses and factories is usually involved in multi-modal transportation. In present shipping practice, liner companies mainly engage in FCL business and handing/taking over the cargo in CY, while the consolidating companies mainly operates LCL business and hand/take over the cargo in CFS.

The often mentioned 9 manners of handing/taking over of containerized cargo in most book are Door to Door, Door to CY, CY to Door, CY to CY, CY to CFS, CFS to Door, CFS to CY, CFS to CFS. So they are not comprehensive enough. But in some books, the often mentioned are CY to CY, CY to CFS, CFS to CY, CFS to CFS. Those do not very comply with the practice. For example, if the manner of CY to CFS is applied, the carrier should receive FCL, of which the container itself and the seal is in apparent good order and conditions, at CY, but deliver the cargo intact at CFS. This manner makes the carrier bear too much responsibility, so it almost not applied.

So, in practice, the often applied manners are CY to CY by liner companies and CFS to CFS by consolidating operators.

4. Legal aspect of Container Intermodal Transport

4.1 Trans-shipment – ‘through’ bills of lading

When it is commercially inconvenient for the sea carrier to perform the entire sea voyage itself, it will arrange for the goods to be trans-shipped at an intermediate port (assuming that the contract of carriage contains a liberty to trans-ship). The contract of carriage, although unimodal, now involves two separate sea voyages, as well as warehousing at the intermediate port. The contract of carriage can provide for transshipment in one of three main ways, two of which will involve the issue of two different original sets of bills of lading.

Firstly, the carrier can undertake contractual responsibility for the entire voyage. The bill of lading that it issues on loading will be referred to as a ‘pure’ through bill. Secondly, the carrier can undertake responsibility only for that part of the voyage which it personally performs, thereafter owing only the duty of a freight forwarder to exercise reasonable care in selecting a competent on-carrier. The bill of lading issued on loading will be referred to as a ‘false’ through bill. Thirdly, the carrier can act both as principal in respect of its own carrying voyage and also as agent for the second sea
carrier. A single ‘collective’ through bill will be issued on loading. This will usually incorporate by reference the standard terms of each successive carrier in relation to that part of the contract that it personally performs.

In the first two examples, bills of lading will need to be issued once on loading, to the consignor, and again on trans-shipment, to the first carrier. The second set of bills of lading will generally evidence a contract of carriage solely between the first and second carriers. Cargo claimants wishing to sue the second carrier will have to do so in tort or bailment, as in The Pioneer Container.

Those entitled to delivery of the cargo will obtain delivery at the port of discharge by presenting the through bill to the second carrier. Even though the second carrier has not issued this document, the bill of lading that it did issue to the first carrier will usually contain a clause making delivery dependent on production of the through bill of lading. Without such a clause, problems on discharge should be avoided by making out the second bill of lading to the order of the first carrier. To avoid the risk of this negotiable document falling into the hands of someone not entitled to delivery under the through bill, the safest solution is for the second carrier to issue a waybill naming the first carrier as consignee. If the first carrier contracts with the second carrier as agent for the shipper, as may exceptionally be the case with a ‘false’ bill of lading, it will be obliged to surrender the second bill of lading on presentation of the through bill. The cargo claimant will have contractual claims against both carriers under each bill of lading in respect of that part of the contract that they have personally performed. The risks inherent in the creation of two different sets of bills of lading to cover the same shipment are a problem only for the first two types of through bills of lading. However, common to all three types of through bills are the following problems.

Firstly, to what extent are the bills of lading issued by the initial sea carrier documents of title? ‘Collective’ and ‘pure’ bills of lading probably do constitute negotiable documents, although some doubts still attach to the status of a ‘pure’ bill. This is because, although it gives continuous contractual cover, its possessory function as the ‘key to the warehouse’ is dependent on the contractual arrangements made between the first and second carriers, and the cargo claimant’s position is, therefore, less secure than if the entire carriage had been personally performed by the first carrier. The ‘false’ bill of lading is probably only a document of title as regards the initial sea leg because, in addition to the problems of constructive possession inherent in a ‘pure’ through bill, such a document confers contractual rights only as regards the first sea leg of the voyage. All three through bills, if issued by a shipowner or charterer, fall within the provisions of COGSA 1992.

Secondly, there is the problem that different liability regimes may govern the different sea legs. Under a ‘false’ through bill, the initial bill of lading may be issued in a Hague-Visby State, and the second bill, issued to the first carrier as agent for the original shipper, may be issued in a state applying the Hague Rules or the Hamburg Rules or no international convention (such as the USA). With all three types of through bill, there will be a ‘convention gap’ in the period of storage at the port of trans-shipment, unless the provisions of the mandatory convention applicable to the
first bill of lading can be extended to cover this period, as in Mayhew Foods Ltd v Overseas Containers Ltd.

Thirdly, the issuer of a ‘pure’ bill of lading will wish to extend the protection of that contract to the subcontractors it engages. To achieve this result, it will need to include in the bill of lading either a ‘Himalaya’ clause or a ‘circular indemnity’ clause.

4.2 ‘Combined’ or ‘Multimodal’ Transport

The problems associated with ‘received for shipment’ bills of lading and with ‘through’ bills of lading occur with even greater severity when the carriage involves ‘combined’ transport, in that its performance will involve at least two different modes of carriage. This discussion will assume that one of those modes involves a sea leg. It will also assume that the carrier has undertaken responsibility for the entire carriage, as with a ‘pure’ through bill.

Document of title?

The status of a ‘combined transport’ bill of lading as a document of title is in doubt for the following reasons. Firstly, it is likely to be a ‘received for shipment’ bill. Secondly, although a bill of lading that stipulates for delivery at a place inland has been held to be a document of title, doubts have been expressed as to whether a bill of lading, in which sea carriage is not the predominant component, can be regarded as such.

A further objection is that such a document is more likely to have been issued by a freight forwarder, acting as principal. It is doubtful whether such a document can confer constructive possession in the goods to which it refers when the contractual carrier has never taken them into its physical possession. However, this objection applies equally to ‘pure’ through bills of lading as regards the second sea leg, and has never been raised as an objection to the negotiability of charterer’s bills of lading. It is submitted that what matters is not the physical reception of the goods by the carrier, but its contractual capacity to control delivery by the performing carriers. This is borne out by the finding in Spectra International plc v Hayesoak Ltd that a party could become a bailee of goods, even without taking physical possession of them, by obtaining a right to give directions to the warehouseman as to their delivery. Commercially, the contractual carrier does not actually need to be able to hand over the ‘key to the warehouse’; it should be enough that he can direct the party who does have the key as to when it should be turned. If the ‘combined transport’ bill of lading is not a document of title, it may still fall within the provisions of COGSA 1992 relating to waybills. However, there is a risk that such a document may fall outside a literal interpretation of the definition of seawaybill as a document that ‘identifies the person to whom delivery of the goods is to be made by the carrier in accordance with that contract’. With a combined transport bill of lading, delivery is made against production of such a document, not on production of proof that one is the named consignee. The document itself does not, strictly, identify the person to whom
delivery of the goods is to be made, as a named consignee will be unable to claim delivery merely by being named as such in the bill.

Furthermore, there must be some residual doubt as to the extent to which COGSA 1992 can cover a contract in which sea carriage forms only a small geographical element. This doubt is supported by the definition of a ‘sea waybill’ that is contained ‘such a receipt for goods as contains or evidences a contract for the carriage of goods by sea’ (emphasis added). It is possible that the Act might be construed so as to apply only to that part of the ‘combined transport’ contract as relates to sea carriage. Given the problems of localisation of damage to containerised goods, such a construction would place a formidable evidential burden in the path of a third-party claimant who sought to rely on the Act to obtain title to sue the carrier under the combined transport document.

It is possible that the Contracts (Rights of Third Parties) Act 1999 might prove useful in overcoming these residual uncertainties as to title to sue under such documents. Section 1(1) allows a person who is not a party to a contract to enforce the contract in its own right if: ‘(a) the contract contains an express term to that effect; or (b) . . . the contract purports to confer a benefit on the third party.’ Under s 1(3), the third party has to be expressly identified in the contract either ‘by name, as a member of a class or as answering a particular description’, although it need not be in existence when the contract is entered into. In the light of these provisions, it should be a relatively straightforward matter to draft a clause that allows a third-party holder of a combined transport bill of lading to claim the benefit of that contract. However,6(5)(b) excludes ‘a contract for the carriage of goods by rail or road, or for the carriage of cargo by air, which is subject to the rules of the appropriate international transport convention . . .’. Therefore, the Act will only assist if the particular combined transport bill of lading is regarded as a contract for the carriage of goods by sea, which is outside the ambit of COGSA 1992, rather than a contract for the carriage of goods by road. Such a situation would arise when goods are unloaded from a lorry onto the ship, so taking the contract outside the ambit of Art 2 of the CMR.

**Competing conventions**

This problem may arise with pure sea carriage, as seen in the discussion of ‘through’bills. With ‘combined transport’ bills of lading, the problem is more acute, as the differences between the applicable road and sea conventions are much wider than those between the competing versions of the sea conventions. Moreover, there are an increasing number of stages covered by no convention, as can be seen in the following example.

(a) Storage of goods following reception by the combined transport carrier in Birmingham.

(b) Road carriage to the seaport, Felixstowe.

(c) Storage of goods following reception by the sea carrier.
(d) Sea carriage to Hook of Holland.

(e) Storage of goods pending collection by road carrier.

(f) Road carriage to customer’s premises in Basel.

Mandatory conventions will apply only to stages (d) (the Hague-Visby Rules, if a bill of lading is issued) and (f) (the CMR). Most of the stages will be outside any mandatory convention. The compensation payable to the cargo claimant will depend on where exactly the loss or damage occurred. Where the goods are containerised, this will often prove impossible to ascertain. Furthermore, if the shipper contracts with a freight forwarder who does not act as principal, the problem of localisation will also have a substantial impact on the question of which carrier is liable to the cargo claimant for the loss.

4.3 ‘Network’ and ‘uniform’ solutions

There is no mandatory convention for combined transport currently in force. The 1980 Multimodal Convention drawn up by the UN has not come into force and is not likely to do so. It is up to the parties to a ‘combined transport’ contract to come up with their own solutions to the problem.

A ‘network’ solution applies the mandatory regimes when applicable and freedom of contract in the ‘convention gaps’. With containerisation, a pure ‘network’ solution is impossible to work and may be modified in cases of unlocalised loss by allowing the cargo claimant to claim on the basis of the convention that is most favourable to it. A ‘uniform’ solution applies one regime, irrespective of localisation of loss. To avoid conflicts with the mandatory conventions, the contractual regime must be at least as favourable to the cargo claimant as the most favourable of the mandatory conventions. This system has the benefit of predictability, but exposes the carrier to the risk of incurring a greater liability than it can recover from its sub-carriers under the mandatory conventions governing their mode of performance.

The 1980 Multimodal Convention

Although this Convention is not yet in force, nor is likely to be brought into force in the future, its provisions merit some consideration as they may be voluntarily incorporated into contracts of carriage involving combined transport of goods. A modified version of its provisions forms the basis of the UNCTAD/ICC Rules for Multimodal Transport Documents 1992. In some respects, the CMR represents a multimodal convention in that, subject to Art 2, it continues to cover contracts for international road carriage, which also involve a sea leg and where the goods are not unloaded from the road vehicle for that leg. For this reason, Art 30(4) of the 1980 Multimodal Convention provides that such carriage shall not be regarded as multimodal carriage within the Convention ‘in so far as such States are bound to apply the provisions of such Conventions [CMR for road carriage and CIM for rail
carriage] to such carriage of goods’. The proviso does not cover carriage by road and sea, which is not subject to the mandatory application of the CMR, such as contracts of carriage that involve the unloading of the goods from the carrying road vehicle prior to their being loaded onto the carrying ship.

The 1980 Multimodal Convention applies a uniform liability regime, similar to the ‘presumed fault’ regime adopted by the Hamburg Rules, but a modified network system as regards limitation.

**Uniform liability regime**

Article 14 makes the ‘multimodal transport operator’ (mto) responsible for the goods, ‘from the time he takes the goods in his charge to the time of delivery’. Article 15 makes the mto liable for the acts and omissions of servants and agents who are acting within the scope of their employment and for those of any other person of whose services he makes use for the performance of the multimodal transport contract, when such person is acting in the performance of the contract’. Article 20 entitles such persons to rely on the provisions of the Convention if they are sued instead of the mto, thereby obviating the need to include a ‘Himalaya’ clause or a ‘circular indemnity’ clause in the contract.

Article 16 makes the mto liable for loss:

...resulting from loss or damage to the goods, as well as from delay in delivery, if the occurrence which caused the loss, damage or delivery took place while the goods were in his charge... unless [the mto] proves that he, his servants or agents or any other person referred to in Art 15 took all measures that could reasonably be required to avoid the occurrence and its consequences.

Unlike the CMR, the Convention imposes no liability for defective equipment or materials used by the carrier. The carrier would therefore be able to escape liability for loss caused by such defects if it could prove that such defects could not have been found out by the exercise of due care on the part of itself and/or the parties referred to in Art 15.

**Network limitation regime**

The Convention contains three limitation regimes. With unlocalised damage, the applicable regime depends on whether or not the contract involves carriage by sea or by inland waterways. If it does involve such carriage, Art 18(1) provides for a limitation figure of 920 SDRs per package or 2.75 SDRs per kg of gross weight of the goods lost or damaged. If such carriage is not involved, Art 18(3) applies a limitation figure of 8.33 SDRs per kg of gross weight of the goods lost or damaged. This is the limitation figure adopted by CMR, but is lower than the figure of 17 SDRs per kg adopted by the Warsaw Convention for air carriage and by COTIF/CMI for rail carriage.

Where the damage is localised, Art 19 provides for the application of the limitation regime contained in the ‘applicable international convention or mandatory national law’, provided that contains a higher limitation figure than those contained in Art 18. Therefore, Art 19 would have no application where the damage
could be shown to have occurred on a sea leg where the Hague-Visby figures are lower than those in Art 18, but would apply where the damage could be shown to have occurred on an air or rail leg.

Liability for delay is limited under Art 18(4) to ‘an amount equivalent to two and a half times the freight payable for the goods delayed, but not exceeding the total freight payable under the multimodal transport contract’

4.4 International Convention for Safe Containers 1972 (CSC)

The International Convention for Safe Containers (CSC) was adopted in December 1972 and entry into force in September 1977. It has two objectives. One is to maintain a high level of safety of human life in the transport and handling of containers by providing generally acceptable test procedures and related strength requirements. The other is to facilitate the international transport of containers by providing uniform international safety regulations, equally applicable to all modes of surface transport. In this way, proliferation of divergent national safety regulations can be avoided.

The requirements of the Convention apply to the great majority of freight containers used internationally, except those designed specially for carriage by air. As it was not intended that all containers, van or reusable packing boxes should be affected, the scope of the Convention is limited to containers of a prescribed minimum size having corner fittings – devices which permit handling, security or stacking. The Convention includes two Annexes: (a) Annex I includes regulations for testing, inspection, approval and maintenance of containers, and (b) Annex II covers structural safety requirements and tests, including details of test procedures.

Annex I sets out procedures whereby containers used in international transport must be safety-approved by an administration of a contracting state or by an organization acting on its behalf, such as a classification society. The CSC has been subjected to four amendments as detailed below:

• 1981 amendments. Adoption: 2 April 1981, entry into force: 1 December 1981 (tacit acceptance). The amendments provided transitional arrangements for plating of containers (which had to be completed by 1 January 1985), and for the marking of the date of the container’s next examination by 1 January 1987.

• 1983 amendments. Adoption: 13 June 1983, entry into force: 1 January 1984 (tacit acceptance). The amendments extended the interval between re-examination to 30 months and allowed a choice of container re-examination procedures between the original periodic examination scheme or a new continuous examination programme.

• **1993 amendments.** Adoption: 4 November 1993 (by IMO Assembly), entry into force: 12 months after being accepted by two-thirds of contracting parties. Status: seven acceptances had been received by 2004 (44 acceptances are needed for the amendments to enter into force). The amendments concern the information contained on the CSC approval plate and also amend some of the test loads and testing procedures required by the Convention.

Finally one must stress that all containers require the Australian Quarantine Certification (AQIS) for the container floor when operating in the Australasian trade. Most containers today are built to HM Customs TIR, UIC, Australian Floor, CSC and Lloyd’s or other classification society approval.

**Recommended reading**

*GE SeaCo Services Ltd, www.geseaco.com*

*Containerization International*

*IMO News Bulletin*