PRIVATIZATION TREND IN MANAGEMENT AND OPERATION OF PORT AND HARBOUR

港湾の管理・運営における民営化の動向

Follow-up Investigation Team (Mexico and Panama)

Open Seminar Information

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"Privatization Trend in Management and Operation of Port and Harbour"

1. Privatization of Port and Harbour

Port and harbour facilities have been traditionally deemed as public assets. Reasons for this are because it is difficult to restrict exclusive use of facilities as represented by breakwaters and it is also difficult to obtain profits only by collecting charges from users, where such facilities comprising infrastructure required of huge investment are commissioned to private profit-making motivation, because they are the assets that are rarely supplied when compared with optimum amount of supply in a sense of standard-level community. Such reasons are the major motives for many countries and governments to directly provide port and harbour facilities and to generally allow grants-in-aid in various forms for supporting administration and management of port and harbour facilities.

Until today, importance has been placed in the process of raising funds for improvement of facilities to completion of facilities in support of port and harbour infrastructure improvement. In the process of economic development, demands are estimated to smoothly increase and loans can be paid back without problems if facilities are timely provided and efficiently used. However, marine transportation firms of the world are rapidly being reorganized in current situations where freights are being dealt in keenly competitive market and it tends to greatly depend on market demands if a port can collect sufficient cargoes to handle. Therefore, it is required to properly reflect the trends toward the improved efficiency in physical distribution of the world in the support of port and harbour improvement projects being executed in various countries.

As described above, it is necessary to establish management and operating systems for ports and harbours in the intention of realizing operation that is more efficient in correspondence to the further globalization of marine transportation services. It is also necessary to study new systems including employment of privatization and commercial operating systems. However, there may be various systems that fit to specific countries and individual countries may actually face to different problems. Diversified problems that may be encountered in privatization of ports and harbours are summarized below by picking up case-by-case examples of individual countries.

2. Operating Efficiency of Port and Harbour

2.1 Operating system of Major Ports

Table 1 shows major ports ranked in the top 20th of the world in the number of container cargoes handled. Let us describe differences in operating efficiency of individual ports

depending on the differences in management and operating systems.

There may be objections for definition of the criterion for determining "operating efficiency of a specific port," but we are describing here the efficiency of a port based on the number of container cargoes handled per unit length of berth.

Port operating efficiency = number of container cargoes (TEU) handled/total length of berth (m)

Table 1 Subject Ports for Comparative Analysis

Region	Name of Port (Container Terminal)
Asia	Singapore, Hong Kong, Kaohsiung, and Yokohama (Honmoku)
North America	Los Angeles and New York = New Jersey
Europe	Felixstowe (Trinity), Hamburg (Bushertokai), Rotterdam (Delta), and Le Havre (North Terminal)

Table 2 Relationship between Cargo Handling Efficiency and Operating system

		Cargo Handling Efficiency	Operating System (Operating Body, Restrictions if any)			Note
			Management and Operation of Berths	Operation of Terminal	Cargo Handling Services	
Asia	Singapore	1,609 (1992)	Public (Public Corporation)			
	Hong Kong	1,048 (1992)	Private firm (including HIT)			All services other than port planning are commissioned to private firms.
	Kaohsiung	764 (1992)	Public (Public Corporation)			
	Yokohama (Honmoku)	543 (1992)	Public (Public Corporation)	Private firm	Private firm	Terminal owned by the public corporation is leased to shipping company and cargo-handling services are commissioned on permission basis.
North America	Los Angeles	428 (1994)	Public (Public Corporation)	Private firms		Operation of terminal and cargo handling service are commissioned to subcontractors of shipping company.
	New York = New Jersey	254 (1994)	Public (Public Corporation)	Private firms		Cargo handling service is open to any contractors on permission basis.
Europe	Felixstowe (Trinity)	701 (1993)	Private firm (FDRC)			FDRC is owned by HIT, Hong Kong.
	Hamburg (Bushertokai)	482 (1993)	Public (Public Corporation)	Public (Statutory Company)		Operation of all terminals other than Bushertolai is commissioned to private firms.
	Rotterdam (Delta)	302 (1993)	Public (Public Corporation)	Private firms		Cargo handling service is open to any contractors on permission basis.
	Le Havre (North Terminal)	150 (1993)	Public (Public Corporation)	Private firms	Public/Private	Cargo handling service within apron is performed by the public corporation but all other cargo handling services by private firms.

(1) Singapore

The Port of Singapore is totally managed and operated by the Port of Singapore Authority (PSA) under the direct control of the Government of Singapore. All the work from the improvement of port and harbour facilities to cargo handling services is directly operated by the PSA and it can be determined that the port is substantially the national port. Through the information network called the "Port Net," the port activities are closely linked with maritime transportation, customs, and land transportation services.

(2) Hong Kong

The Port of Hong Kong that is proud of the number of containers handled ranked at the top of the world is a commercial port substantially operated by private firms. Three major firms named "HIT," "MTL" and "SL" totally manage and operate container terminals, built on reclaimed land for their own private use, after they have obtained a long-term lease of land from the Hong Kong Government Office in competitive bidding.

(3) Kaohsiung

The Port of Kaohsiung is a national port totally managed and operated by the Port Service Bureau as a national organization. The Engineering Bureau is a public corporation in its characteristics but is often deemed as a working organization. Cargo handling services are provided by workers dispatched from private labor pools.

(4) Yokohama (Honmoku)

Since major port facilities including berths are provided and leased to a shipping company by the Port of Yokohama Terminal Public Corporation as a public organization, the subject shipping company is unavoidably controlled by the terminal public corporation in operation of the terminal. Since the shipping company can be greatly affected by freight forwarders undertaking cargo handling services, different from similar cases in the Western countries, opinions and comments of such forwarders tend to affect the operation of the terminal. Joining of new freight forwarders in cargo handling services has been strictly restricted and charges and fees have also been regulated at a certain level, but such rules are being deregulated recently.

(5) Los Angeles

The City Port and Harbour Bureau as a public corporation is responsible for the improvement of major port and harbour facilities. Conversely, operation of terminal facilities and cargo handling services are often undertaken by subcontractors of shipping company as a borrower of the terminal. It is mandatory to employ cargo-handling workers from designated labor unions.

(6) New York = New Jersey

Major port and harbour facilities are provided and improved by the port authority responsible for the facilities located over the state boundary between New York and New Jersey. General system is similar to that of Los Angeles. However, joining of new agents in cargo handling services is currently restricted.

(7) Felixstowe (Trinity)

This is a commercial port totally managed and controlled by a private firm named "FDRC." The FDRC is a subsidiary firm of HIT, Hong Kong, handling freight forwarding services other than port and harbour related services.

(8) Hamburg (Bushertokai)

Port and harbour facilities are primarily maintained by the city port and harbour bureau as a public corporation or working organization. Operation of the terminal and cargo handling services are being executed by HHLA, statutory company established at the full investment of the city. Most cargo-handling workers are dispatched from private labor pools.

(9) Rotterdam (Delta)

The total system is similar to that of Hamburg. Only differences from Hamburg are that operation of the terminal and cargo-handling services are being provided by ECT, a private firm, and that joining of new agents in cargo handling services is restricted.

(10) Le Havre (North Terminal)

The Port of Le Havre Public Corporation maintains major public facilities and three private firms of GMP, CNMP, and EAT are responsible for operation of the terminal. Cargo handling services at the apron located within 50 meters away from the berth is provided by the public corporation but those at other areas by the three private firms.

2.2 Relationship between Cargo Handling Efficiency and Operating System

The following assumption can be set up from comparisons made between operating system and working efficiency of major ports mentioned above.

Assumption (a): Cargo handling efficiency can be improved as the fewer the type and the number of working bodies involved in the flow process of cargoes.

The above assumption suggests that intensified management and operation are necessary for port and harbour facilities. In Singapore, Hong Kong, Kaohsiung, and Felixstowe where cargo handling services are being provided at high efficiency, port and harbour facilities are all managed and operated by a single body, regardless the difference in the form of control organization; whether it is private or public. Conversely, in Le Havre, where working bodies are complicatedly involved, cargo-handling efficiency is inferior when compared with that of other ports and harbours.

Assumption (b): Where the type and the number of working bodies are assumed constant, cargo-handling efficiency can improve as various rules are deregulated.

The second assumption suggests that the effectiveness of deregulation can also be noticed in ports and harbours. It can be deemed that differences in cargo handling efficiency between Los Angeles and New York = New Jersey, where working bodies are similar in the type and the number, and differences between Hamburg and Rotterdam could have been produced by the existence of regulations that strictly control the joining-in of new agents.

2.3 Meaning and Effects of Privatization for Port and Harbour Improvement Projects

Under the current situations where physical distribution efficiency is being improved all over the world, consolidation and intensification of working bodies with public sectors involved can rapidly progress from now. Effects of intensified management and operation by a single body can be expected but it is not clear if differences in efficiency can be produced by difference in

the type of organization; public or private. However, it can be presumed that deregulation will bring more favorable results if maintenance and operation are commissioned to private sectors.

That is, discussions should not be made in the way that separates intensified management and operation of port and harbour by a single body. Even PFI and BOT, it is not desirable to apply them to excessively limited extent. That is, it is desirable that upstream and downstream portions of flowing cargoes that have been taken in as much as possible be applied to the extent that exceeds the past extent of port and harbour administration services. If projects are strategically commissioned to private sectors, regulation by the government should be limited to a minimum extent.

3. Responsibilities of Public and Private Sectors

3.1 Typical Pattern of Port and Harbour Administrators

Responsibilities to be borne by public and private sectors can be classified as shown below by the typical pattern of port and harbour administrators.

Table 3 Typical Pattern of Port and Harbour Administrators

Responsibility / Pattern of Port and Harbour Administrator	Infrastructure Improvement	Port and Harbour Management	Operation and Services
Comprehensive Type [1]	Public sector	Public sector	Public sector
House Owner Type [2]	Public sector except for partially private sector	Public sector	Private sector
Private Owner Type [3]	Private sector	Private sector	Private sector

1) India, Sri Lanka, Thailand, Vietnam, Singapore etc.
2) United States, European Countries, Hong Kong, Japan etc.
3) England, New Zealand, Brazil etc.

✧ Typical Pattern of Infrastructure Improvement by Public Sector

Privatization Level

High ↓ Low

- Issues only permit for development.
- Improves only major facilities such as navigation routes, breakwaters, and roads.
- Executes land reclamation and improves also berths and yard pavement.
- Improves all port and harbour facilities including cargo handling equipment.

✧ Typical Pattern of Unified Private Sector Members for Providing Services

- Provides various services including invitation of shipping companies, security of consignors, and performance of cargo handling services with the terminal leased from the authority.

✧ Work Description of Port and Harbour Management

- Procedures related to permit for entrance and clearance, allocation of berths, and collection of entrance fees.
- Maintenance and repair of port and harbour facilities.
- Establishment and maintenance of navigation support facilities.
- Safety management of port and harbour facilities.
- Execution of various services including customs, entrance and clearance checks, and quarantine inspection for the government.

3.2 Form of Joining of Private Firms

Private firms are normally allowed to join in operation and development of port and harbour facilities in the following seven forms.

(1) Management Contract
(2) Lease
(3) Concession
(4) Joint Operation
(5) Built-Operate-Transfer (BOT)
(6) Joint Venture
(7) Public or Stock Floatation

Table 4 Forms of Privatization

Privatization Level	Privatization Form	Role of Individual Sectors		
		Ownership	Management/Operation	Financial Risk
High	Management Contract	Public	Public/Private	Public
↑	Lease	Public/Private	Public/Private	Public/Private
|	Concession	Public	Private	Private
|	Joint Operation	Public	Private	Private
|	BOT	Public→Private	Private	Private
↓	Joint Venture	Public/Private	Private	Private
Low	Public or Stock Floatation	Private	Private	Private

(1) Management Contract

This is a form of contract taken by port public corporations to commission services of terminal operation and management of holding assets to private firms for a given period in order to improve work efficiency and productivity with excellent capacity and know-how of private firms.

(2) Lease

There are two cases for this form of contract. One method is that public corporation pays charges to private firm for the lease of cargo handling equipment and machinery owned by private firms. Another method is that private firms fulfill missions with real estate leased from public corporation.

In either cases, borrower takes responsibility of providing required services and maintaining properties leased from counterpart.

(3) Concession

This is a form of contract taken by public corporations to transfer responsibility of operating and maintaining port and harbour facilities to private firms for a long period of 15 to 30 years. Since the ownership of facilities is held by the port public corporation and actual operation and maintenance of facilities are performed by private firms, the corporation and obtain profits from the operation of facilities. Conversely, private firms are required to pay concession to the public corporation.

Through this form of contract, work efficiency can be greatly improved with responsibility and authority fully transferred to private firms.

(4) Joint Operation

This is a form of contract that allows capital investment for both the public corporation and the private firm to provide port services in cooperation for a given period. Profits produced from the operation are distributed to the public corporation and the private firm in proportion to the amount of investment.

(5) BOT (Built-Operate-Transfer)

BOT is a form of contract that issues permits to private firms to provide port services for a given period and that allows capital investment for the private firms to the services to be provided. This form of contract is characterized that all properties are returned to public corporation upon expiration of contract period. The private firm is required to pay charges including royalty to the public corporation.

(6) Joint Venture

This is a form of contract that allows capital investment to a local public corporation both by the public corporation and the private firm to fulfill missions for an unlimited term. This form of contract can be classified into the following two types.

1) An independent joint venture company is newly established.
2) A subsidiary company is established under the government-owned public corporation.

(7) Public or Stock Floatation

The both terms mean privatization and are the most advanced form of contract. The term "public floatation" means sales offer of holdings at stock market. All responsibilities for providing services are transferred to public firm. The term "stock floatation" means that all holdings are sold to private sector. Actual examples in the world show that the most holdings are retained by the government of the stockholder.

4. Privatization of Ports and Harbours in England

4.1 General Description of Current Port and Harbour System in England

(1) Management Body

There are more than 300 ports and harbours including fishery ports today in England. The management body can be classified into the three categories shown below by the type of ownership of port and harbour.

(1) Trust Ports

Separate laws to be applied to individual port and harbour administrators were legislated at the Parliament. According to these laws, a board in legal form of committee style was established. Most board members are appointed by the Minister of Transport. There are now 114 ports and harbours of such style. The Conservative Party at that time set up a new system that further promotes privatization of trust ports, based on 1991 "Ports Act" after the successful privatization of the Associated British Ports.

(2) Company Ports

This is a port owned by a public company that offers stocks to the public or statutory company established based on private statute. The basic principle of management and operation is not different from that of general companies. The company is managed and operated with importance placed on obtaining profits for stockholders.

Such ports and harbours are privately owned but are required to observe ports acts legalized by the government.

Typical company ports and harbours include the Associated British Ports, Mersey Docks and Harbour Company, the Forth Ports, Clydeport, Bristol Port Company, Tees and Hartlepool, and Felixtowe.

(3) Municipal Ports

Municipal ports are owned and operated by local authorities. Typical examples include Portsmouth and Ramsgate but the number of such ports is very limited.

(2) Participation of Government

Management of ports and harbours in England has specific features that no grants-in-aid of the central government is given to any ports and harbours as a rule, regardless of the type of ports and harbours. Navigation and dredging work within each individual port and harbour district are supposed to be executed at the authority and responsibility assigned to the port and harbour administrator, and no intervention nor grants-in-aid is made by the central government as a rule.

It is worthy to observe that such port and harbour policy of the central government of England is unique. Competition between different ports and harbours is very keen in England and that between major ports and harbours of the East Coast and those of European Continent, in particular. Under such situations, equal fittings have not been established between ports and harbours in European countries receiving grants-in-aid from the government and those of England receiving no grants-in-aid from the government. It can be presumed, therefore, that it may be very difficult for England to beat European ports and harbours in competition. In fact, one of the main missions of England representative presented at the LAPH was a political proposal to offer immediate abolition of grants-in-aid given to European ports and harbours from different governments. In this regard, it is understood that England is special and it seems that no other countries may agree with England proposal.

4.2 Development of Privatization and Current Situations

(1) Privatization of Nationalized Ports — Establishment of ABP

Privatization of ports and harbours in England inaugurated with the establishment of the Associated British Ports (hereafter "ABP") in February 1983, based on 1981 Transport Act. Until that time there had been nationalized ports controlled by three different organizations composed of the British Transport Docks Board, the British Waterways Board, and the British Railway Board. The main management body is the British Transport Docks Board (BTDB) that had controlled 19 different ports and harbours. The ADP was established as a statutory company to undertake management of 19 ports and harbours that had been under the control of BTDB in 1981 based on the Transport Act.

Until 1983 the BTDB had been a statutory company established by the Statutory Law. Its activities had been limited to the services directly related to ports and harbours, but the ABP newly established is a subsidiary company of ABP Holdings PLC. Since the ABP Holdings PLC is a totally private firm, the ABP is now allowed to freely act in business over the restriction directly related to ports and harbours.

(2) Legislation of 1991 Ports Act and Privatization of Trust Ports

Upon the success of the ABP, movement toward the privatization of other trust ports began. Under such trends, the Conservative Party legislated the Ports Act in 1991 to open a way to privatization of trust ports.

Under thus law, five ports of Teens and Harlepool, Clyde, Forth, Medway, and Tirbury as a part of the Port of London were sold to private firms, respectively, and privatization was established by the private firms procured such ports.

The above law assigned the authority to the Minister of Transport to give instructions to all ports and harbours having annual sales of over five million ponds to enforce privatization. In 1995, the Conservative Party Administration issued orders at the authority assigned to three ports of Dover, Alpswich, and Tyne to sell those ports to the related Trust Board. The Trust Boards responsible for management of those ports was evenly negative for the privatization of their own ports.

Under the law, there are no changes in the system to issue orders for privatization by selling trust ports. However, it is said that the present administration instead of the Conservative Party Administration will not enforce privatization unless trust ports desire so. It can be noted that changes are appearing in evaluation of port privatization in England for the six years after the enforcement of the Ports Act in 1991.

4.3 Evaluation of Port Privatization in England

Movement of privatization of ports began with privatization of the ABP is now being reevaluated in positive or negative ways in England 15 years after its initial movement.

(1) Positive Evaluation

(1) As the result of privatization, free decision-making rights have been given. More in detail, freedom of developing multiple businesses and financing has been given. It has become free to make real estate investment and facility development in adjacent areas of port and harbour.

(2) With the freedom of financing it has become possible to make a large-scale investment to provide high quality services, such as oil terminal and Ro/Ro terminal, in response to demands of specific customers.

(3) It has become possible for the port and harbour management body to entrust freight transportation service to special contractors in competition and to improve efficiency of freight transportation service.

(4) According to the privatization, stock price significantly rose by publicly listing of stocks.

(5) Expenditures reduced from public sector have greatly contributed to the balance of national budget.

(2) Negative Evaluation

(1) Against the intention of the government, sales price of trust ports was set too low compared with market price and competitive bidding was not made for the sale. Therefore, only former trust board members made a big profit when stock prices sharply rose later.

(2) Private firms purchased ports from the trust board took over the regulations and controls related to ports and harbours and navigation, established by the trust board. It was noted that such private firms executed the great authority taken over not only to accelerate competition but also often to limit competition.

4.4 Problems that may occur when existing port is privatized

Based on experiences in England, problems that may occur in privatization of existing ports have been summarized as shown below.

(1) Since port and harbour administrators are primarily assigned with a great authority to execute official controls and possibility for abusing such an authority is very high when the authority is transferred to an individual, such problems should be solved in advance as problems occurring at times such an organization is privatized.

(2) Much more in privatization process of public properties that could be jointly owned by people, support for such a policy cannot be expected even how much such an action is rationalized from high possibility of specific individuals who desire to make a big profit.

(3) The management top of privatized port and harbour tends to plan merging or purchasing as immediate effects on the increase of assets or the rise of stock prices in order to respond to impatient requests of stockholders expecting for a short-term profit making. It can be pointed out that the market can possibly be monopolized and controlled by specific management tops consequently.
It cannot be determined that there are no possibilities for the policies established to promote competition and to provide higher standard services by privatization can conversely increase monopolistic strength and to decline competition.

5. Port and Harbour Development of Developing Countries

Reviewing the challenges to privatize ports and harbours in England and evaluation of the results, the privatization appears to be resulted in to control competition instead of accelerating it. Accordingly, it is apprehended that the privatization may adversely affect on the dealings or port users and public benefits. It may not be accidental that most excellent ports and harbours making big profits in the world is the house-owner type as shown in Table 3. In other words, the government is involved in management in such ports and harbours as a landowner or as a controller. Accordingly, it becomes possible to introduce efficiency of private firms into cargo handling service and to ensure public benefits for customers, stockholders, and general users.

Meanwhile, for new port and harbour development projects to start from now, existence of such problems may not be disregarded but port and harbour development completely led by private firms should also be considered as one of choices. For new development, it can be presumed that the government may not raise sufficient funds. In such cases, BOT system that allows development progress by private financing that is switched to public funds after a certain period may also be one of effective choices.

Based on the statement above, the following proposal is presented here for development, management and operation of ports and harbours in developing countries.

(1) Project master plan should be developed by public sector for new port and harbour development project..

(2) The authority to regulate the use of port and harbour should be executed by public sector from the view of observing public welfare.

(3) Infrastructure improvement, including breakwaters and dredging of navigation courses, should be executed by public sector as practicably as possible from the view of ensuring fair utilization of port and harbour facilities. It is desirable that the ownership of facilities be held by public sector.

(4) It is desirable that construction and operation of terminal facility including cargo-handling equipment be commissioned to private sectors to improve cargo-handling efficiency.

<REFERENCE>

Concession Development at the Ports of Balboa and Cristobal, Panama

Permit for development of port and harbour functions, improvement of facilities, and management and operation of facilities at the Ports of Balboa and Cristobal located at the both ends of Panama Canal.

Suspended rights to develop areas located within jurisdiction district of both ports (Diablo District [Balboa Port] and Telfer Island [Cristobal Port]).

The project body organized by Panama Ports Company (PPC) and Hon Kong International Terminal Company, subsidiary of Hong Kong Internation Terminals (HIT) was approved by the resolution of the Panama Diet on January 16, 1997, and the resolution was published in the official gazette on January 21, 1997.

<General Terms and Conditions of the Concession Contract>

(1) The extent of contract shall be limited to the permit for development, improvement, and management and operation of ports and harbours at the Ports of Balboa and Cristobal, and the 15-year reserved rights of development of districts located in adjacent areas of ports and harbours, to be developed in the future.
(2) The contract shall continue for 25 years from the effective date of contract and shall be automatically extended for the next 25 years.
(3) Annual basic payment from PPC to the Government shall be US$22,200,000 and variable payment shall be 10% of the total income.
(4) The Government will hold 10% of stocks possessed by PPC. The Director-General of ANA will take office as Director.
(5) PPC shall submit plans of investment and development to the Government. PPC must make an investment of US$50,000,000 at least for the first five years.
(6) The Government shall terminate employment contract with APN employees. Compensation for retired employees shall be lent from PPC at the upper limit of US$30,000,000, free of interest.
(7) The Government will furnish ocean transportation service, traffic control, CIQ (customs, immigration, and quarantine inspection), and other public services as required. Labor cost shall be borne by PPC.

INTRODUCTION OF COMPUTER SYSTEM FOR PORT OPERATION AND ADMINISTRATION

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Chapter 1. Preface

1-1 Background

It is already over 30 years since marine containers were introduced as a means of transport to the field of international trade. Now, container transport networks are spread all over the world and containers are being handled at more than 600 ports in the world. Marine transport statistics show that the number of containers handled in the world rose from 29,000,000 TEUs in 1993 to 37, 250,000 TEUs in 1996, an increase of about 1.28 times.

It is forecast that horizontal international specialization will move ahead between developed and developing countries reflecting the recent trend forward borderless trade in the physical distribution sector, which will result in a further increase in the volume of transport, especially of marine containers. It is apparent therefore that the expansion of port facilities, particularly that of container terminals, and efficiency in the port administration and management at major ports in the world will be more and more seriously demanded by users, namely shipping companies, exporters and importers.

Container terminals (van pools included) are usually vast in size and used as public facilities with very few exceptions. As they are abundant in containers, loaded or empty, which are owned or controlled by various shipping companies, it is essential to have all the containers well in hand. Container inventory control is conducted to grasp all the details (i.e. container number, whose container it is, location or address in the yard and its status, etc.) of every container in a terminal.

In 1960's, the start-up decade of container transport, inventory checking was done by assigned clerks writing/rewriting in container numbers on black (or white) boards on which the design of the container yards was drawn. As container yards expanded in size and the number of containers handled increased, this black board system became inapplicable and was replaced by the card system where assigned clerks, not a few in number, kept track of containers by assorting them with cards in accordance with the container number, yard address, shipping company, each time their location (address) or status changed. Although this card system is still alive at some container terminals in developing countries, it cannot comply with the increase of containers in step with the worldwide development of container transportation. It has been proved from experience that as the number of containers stored in a single container yard (or van pool) exceeds approximately 3,000 TEUs, the above-mentioned blackboard or card systems becomes unreliable. It is, therefore, often the case at busy container terminals in developing countries that shipping companies make inventories themselves as the inventory control by the container terminal operators is very often not dependable.

Whereas the situation is as above, the container transport has shown a remarkable increase in volume and the development of computers, on the other hand, has been astonishing too; it is attributable especially to the appearance of hardware operatable in normal offices at normal temperature that container terminals started to be equipped with computers more rapidly than before. And now, computers are extensively utilized not only for container inventory control but for many purposes such as container yard planning, container loading/unloading control, container delivery control, etc. Studies are being made to further automate terminal operations including unattended operations of container handling equipment.

Generally, data processing in container terminals is done continuously, day and night, to make it possible to grasp the situation of containers in real time and keep the port users advised. As it is not possible to keep track of data only through human hands, making use of computers is indispensable and its cost-effectiveness is expected to be remarkably high.

Furthermore, container transport has not been limited to transport by sea but has spread to transport by land, i.e. by rail or by truck, all over the world, to build up and expand the container transport networks. And thanks to the growth of communication networks, the introduction of advanced technology and the jumboization of container ships, what we call "mass transportation" is now possible and will become more and more the mainstream. As ships' berthing schedules are now mostly on a fixed-day-of the-week basis, it will be essential for port administrators to make the maximum use of port facilities by controlling all the information ranging from ships' arrivals, unloading/loading of cargoes, to ships' departures.

For ships' safe navigation and shortening the time of ships' stay within the harbor, it is also compulsory to maximize the accuracy and efficiency in unloading/loading operations of ships calling the port. It is very important, therefore, for port administrators to obtain all the information required for ships' operations from shipping companies or their agents at the earliest possible moment and to utilize it for accurate and efficient operations. Data processing by computer is indispensable in this regard too.

All the above lead us to conclude that the introduction and positive utilization of computers are inevitable in the fields of physical distribution in the port area, especially in the field of container transport.

Incidentally, as for customs clearance, the port administrators are not able to computerize the business field by themselves. Close cooperation with customhouses,

banks, associations of exporters/importers and customhouse brokers will be required. It is also expected that customs clearance will switch over to EDIFACT (Electronic Data Interchange for Administration, Commerce and Transport) , which is studied among nations all over the world under the guidance of the United Nations, and eventually become a paperless transaction as part of complete electronic commerce.

1-2 Purpose of this textbook

With the background being as mentioned above, containers handled in developing countries have been increasing so much that Japan is requested more than ever to submit technical cooperation to those countries in installing computer systems within their container terminals.

This textbook has been prepared, in response to the request of those developing countries, to instruct their port administration personnel in installing computers for the physical distributions in the port area, especially for container operations, to match with their local situation.

The contents of this textbook deal with the general administration and management systems in effect in advanced ports and the port administration offices there. Those systems introduced here are, therefore, being adopted by the corresponding sections and departments of those offices. Explained here plainly for beginners are the points to be kept in mind beforehand in installing computers in each of the various job fields. As for EDI, which is implemented at the most advanced ports, only its concept is introduced for reference in Chapter 6.

1-3 Composition of this textbook

The correlation chart of the whole physical distribution system in the port area is as shown in Figure 1-1. The flow chart in accordance with the passage of time from ship's arrival to her departure is shown in Figure1-2, wherein you will know which job field each of the items in Chapters 2 and thereafter corresponds to. Figure 1-3 shows the conceptual chart of computer utilization as seen from the viewpoint of the port administrators placed in the center.

Figures 1-4 to 1-7 show the job flows in the export/import fields per type of ships, i.e. container ships or conventional type of ships.

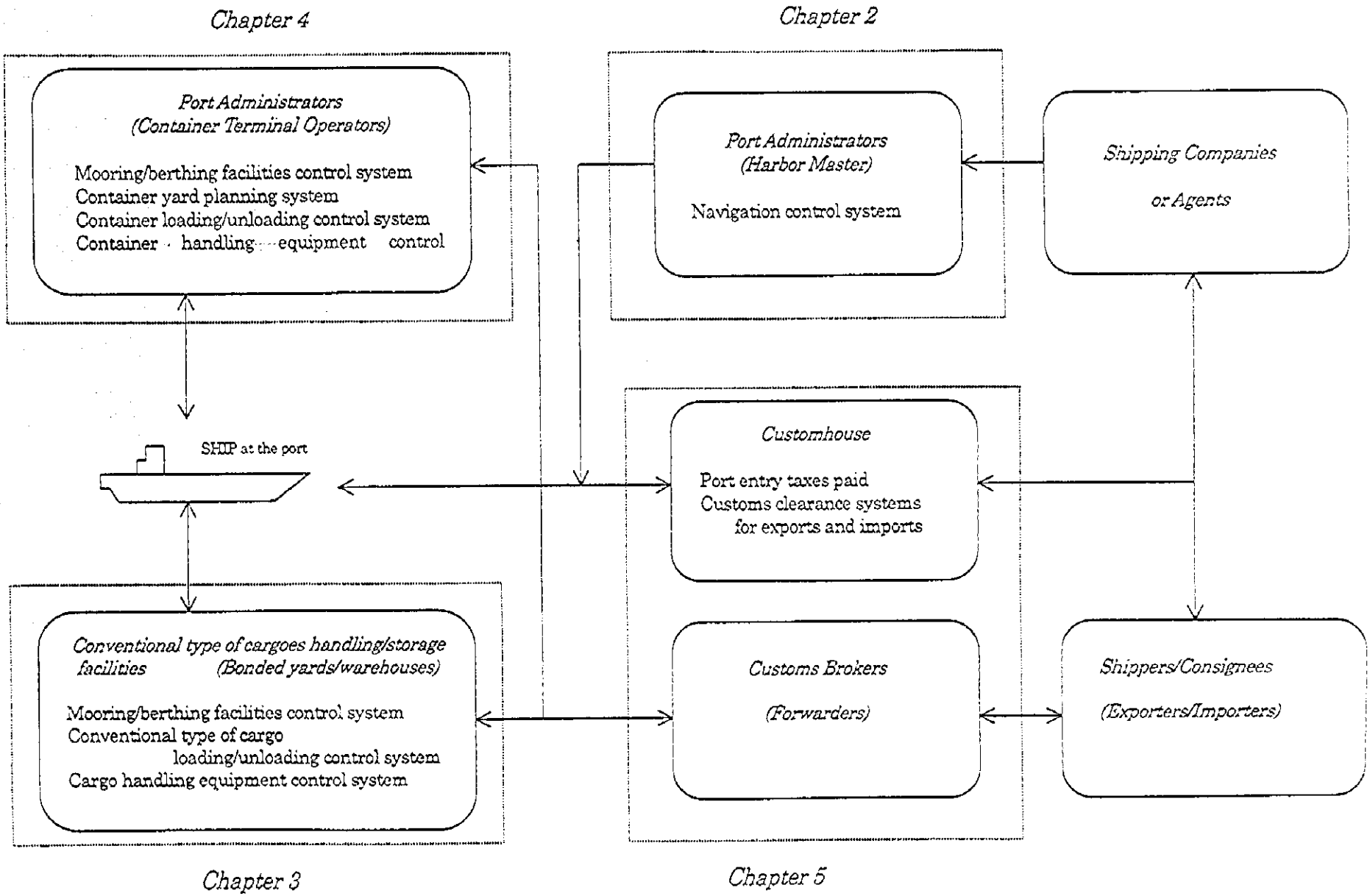


Figure 1-1 Co-relation Chart – the whole port distribution systems in the port area

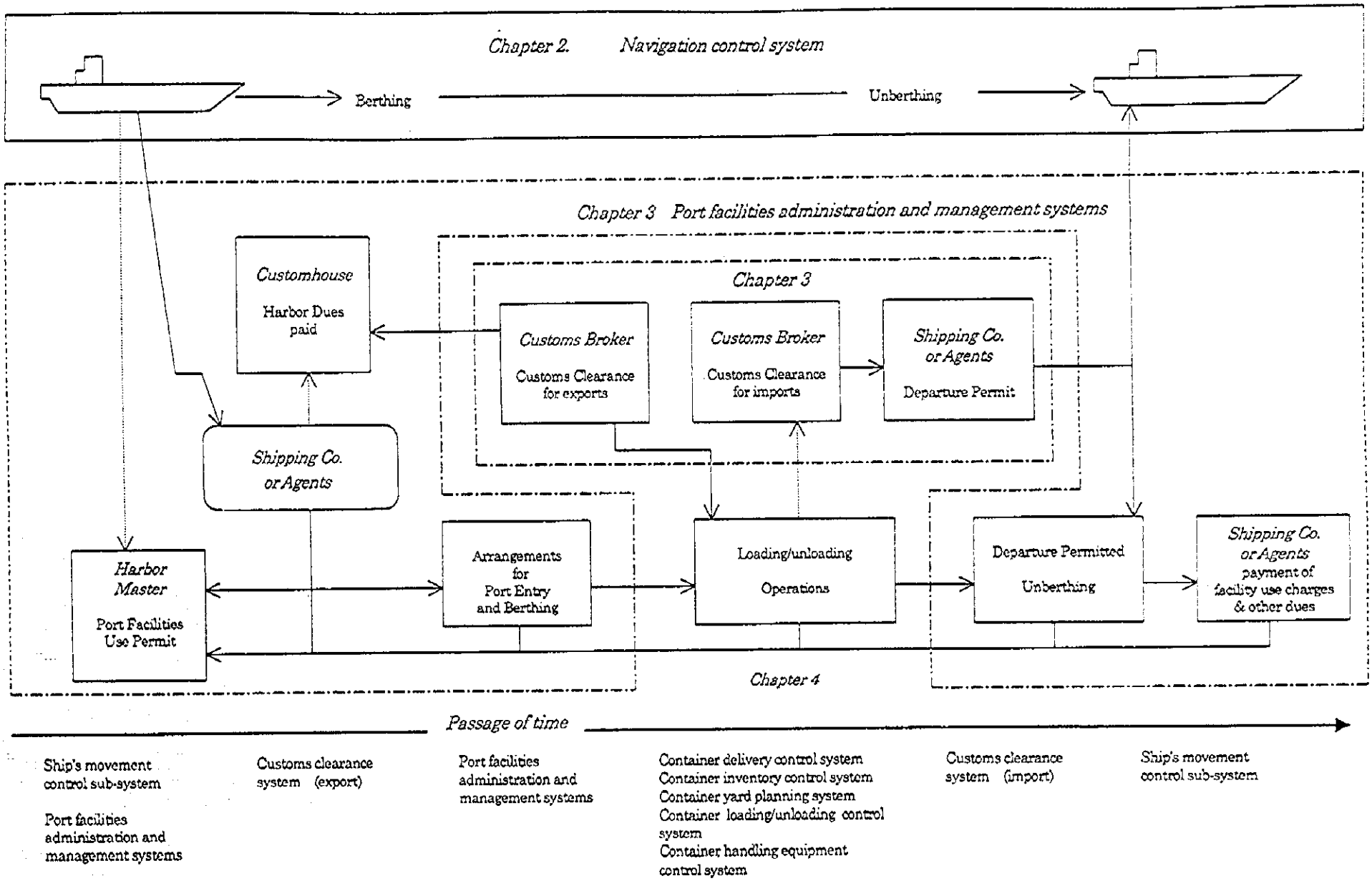
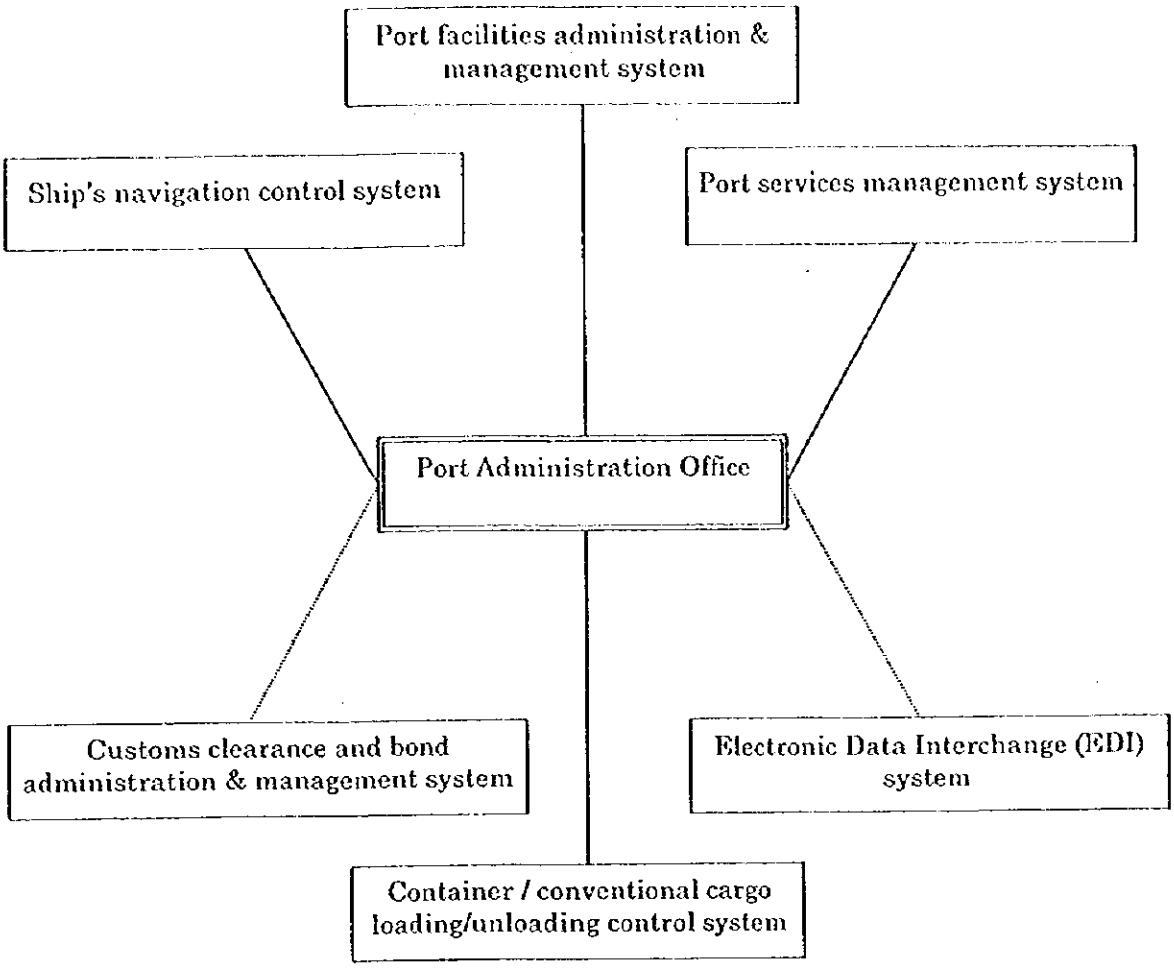


Figure 1-2 Flowchart – Port distribution in the port area & Ship's movement control system



Port administration office being the only party in charge

Other authorities and parties concerned being involved too

Figure 1-3 Conceptual chart of computer utilization from the viewpoint of port administrators

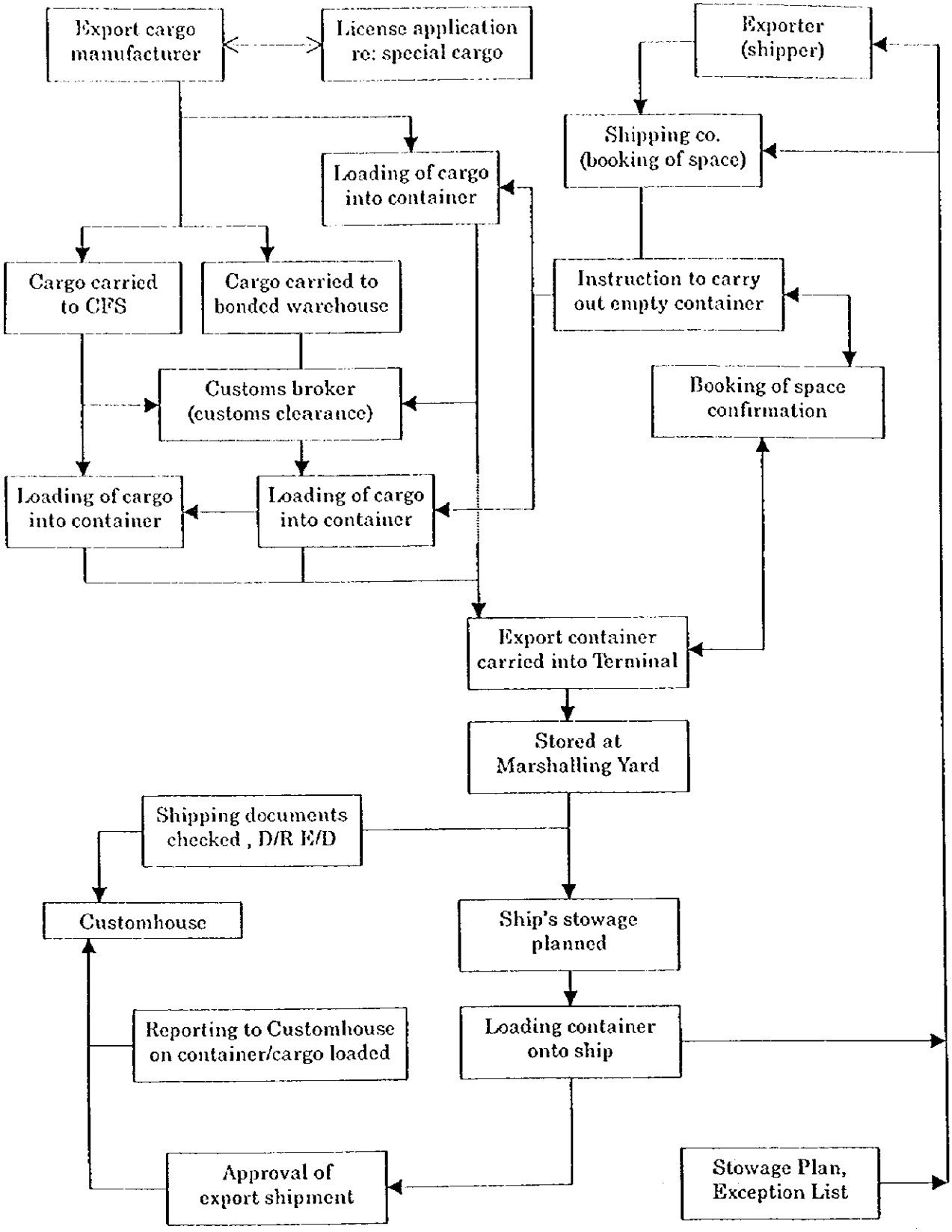
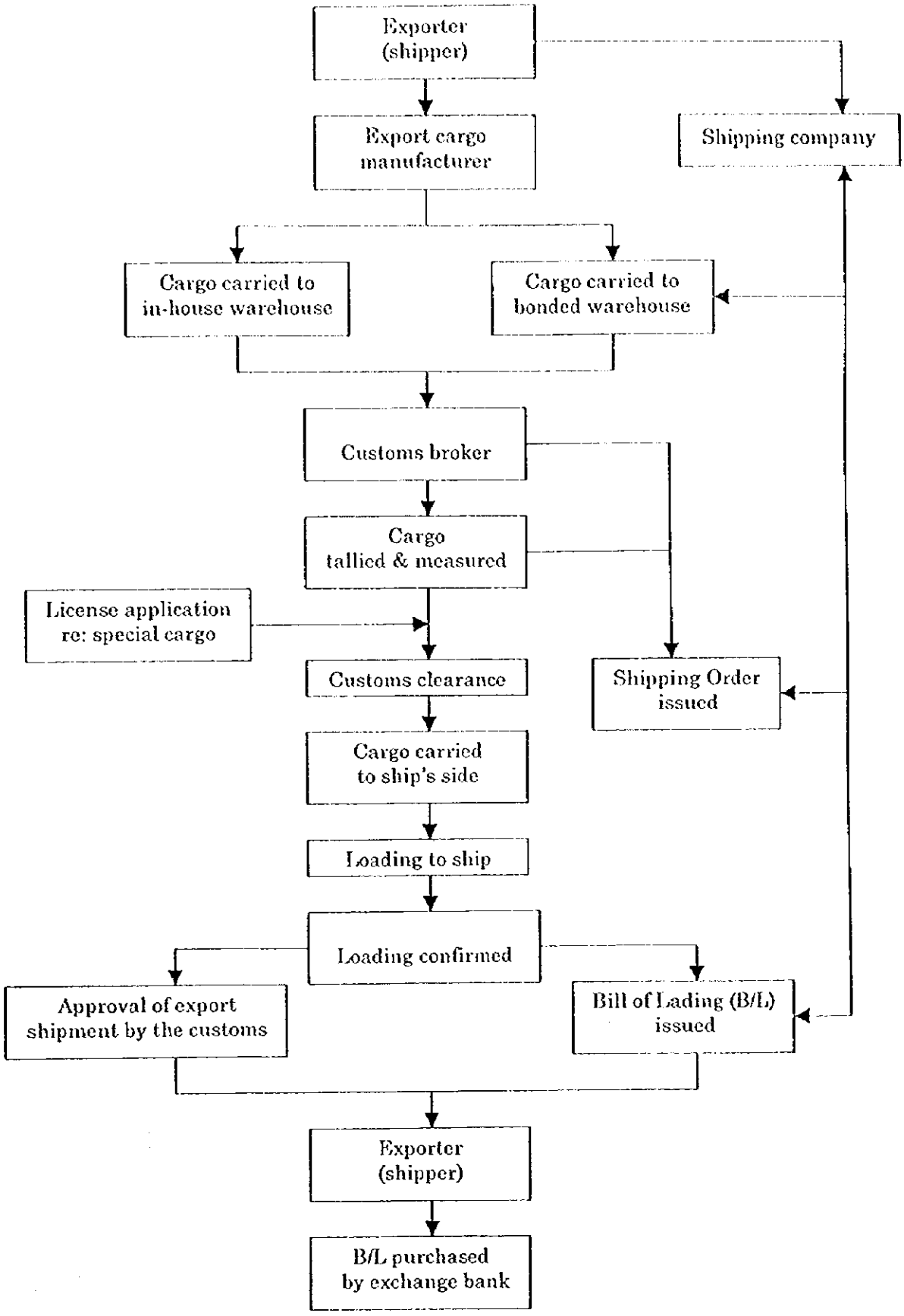


Figure 1-4 Job flow -- Export by container ship


Exporter (shipper)
Export cargo manufacturer
Shipping company
Cargo carried to in-house warehouse
Cargo carried to bonded warehouse
Customs broker
Cargo tallied & measured
License application re: special cargo
Customs clearance
Shipping Order issued
Cargo carried to ship's side
Loading to ship
Loading confirmed
Approval of export shipment by the customs
Bill of Lading (B/L) issued
Exporter (shipper)
B/L purchased by exchange bank

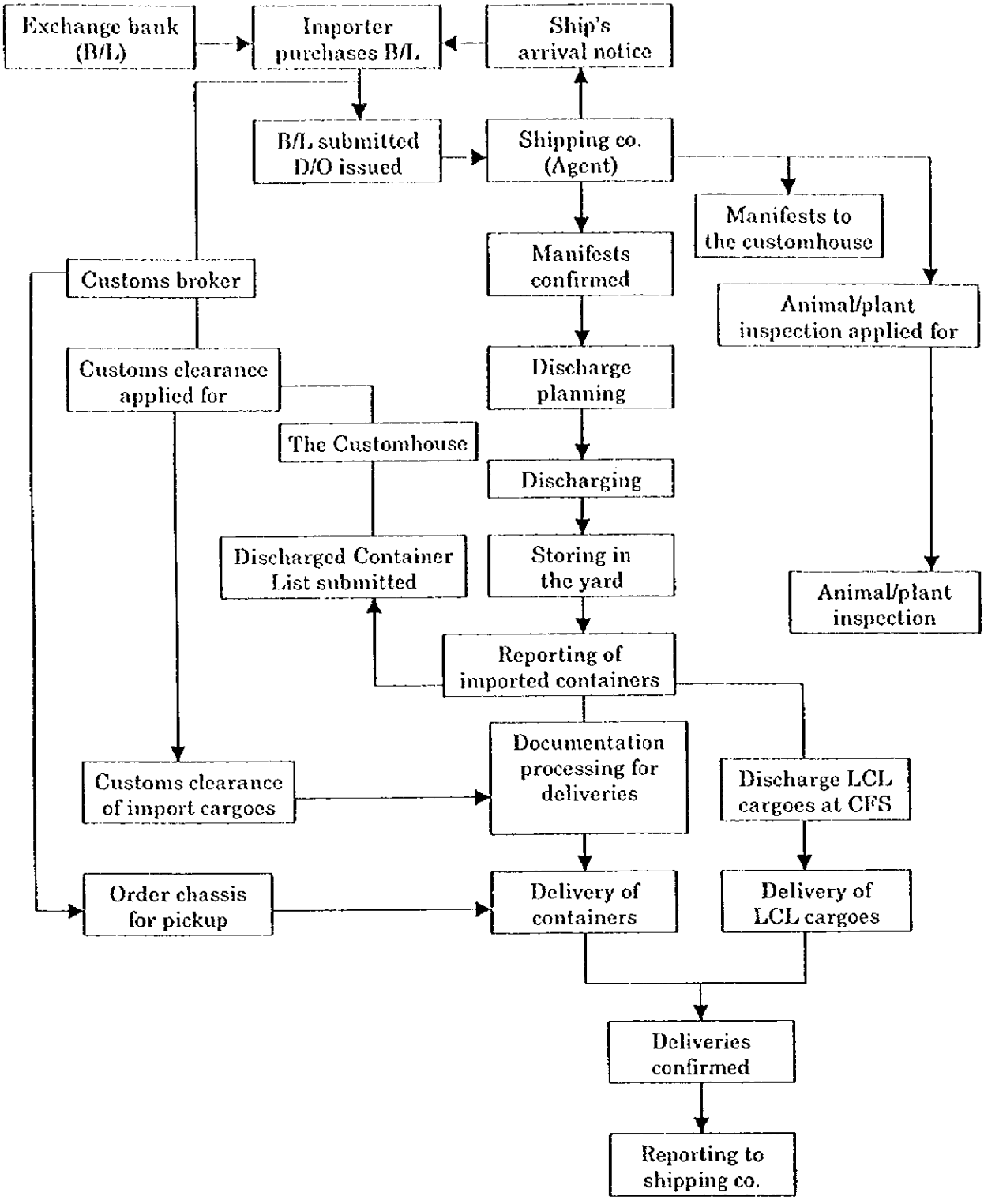


Figure 1-6 Job flow -- Import by container ship

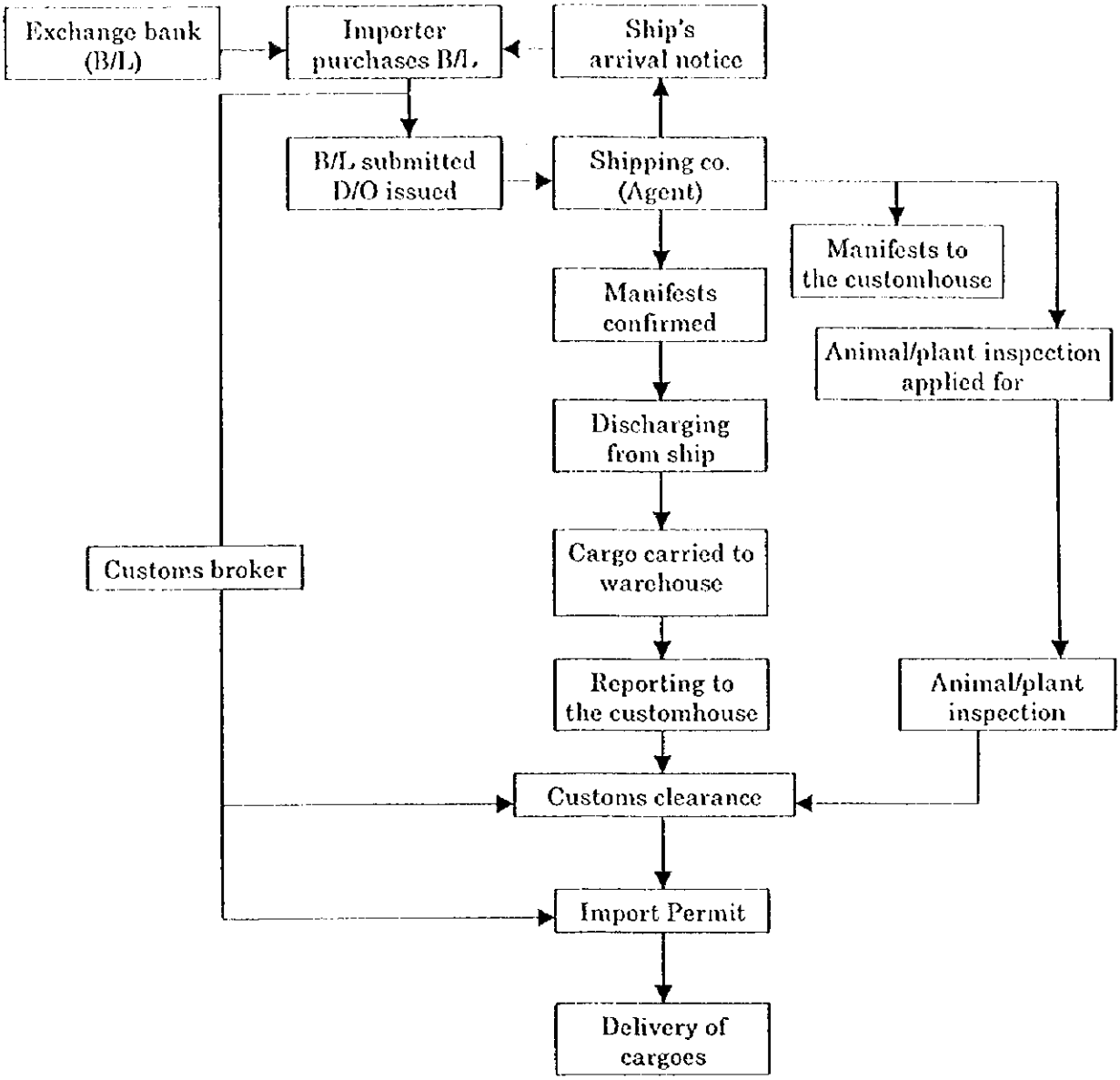


Figure 1-7 Job flow -- Import by conventional type of ship

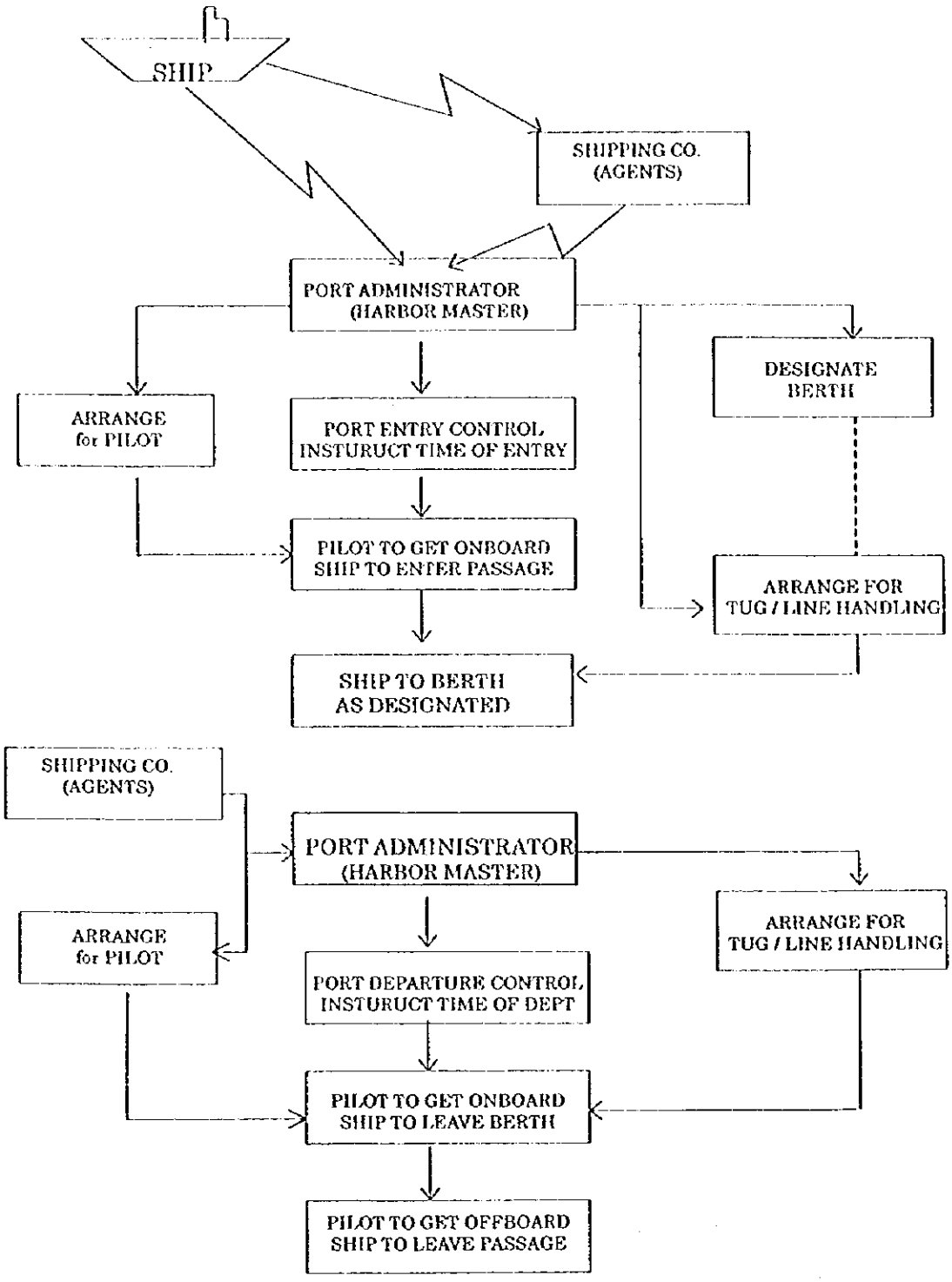


Figure 2-1 Navigation control system

2-1 Navigation control system

In order to secure ships' safe navigation through narrow channel(s) to the harbor area, it is essential for the harbor administrators to control ships' navigation in accordance with the international Marine Collision Prevention Law and relevant domestic rules and regulations, which will lead not only to prevention of accidents at sea but also to effective utilization of the port facilities.

Explanations:

(1) When ships are entering harbors or sailing through narrow channels, it is normal practice for the port administrators or harbor masters to administer ships' movements , which is the most important job for the safe navigation of ships calling there.

Ships' arrival control nearby the entrance to the harbor, usually congested in a bottle-neck situation, has conventionally been processed mostly by human hands as follows:

The master of an arriving ship advises the port administrators (harbor master's office) of her estimated time of arrival (ETA) at the entrance and the latter informs the former of the ships' entry order which is decided after checking other ships' ETAs, ships' size, types of ships, kinds of cargoes, etc.

(2) Recently, safe navigation supporting devices have been developed by combining highly efficient radar systems and computers, for efficient and speedy control of the increasing number of calling ships. They are utilized at ports of advanced shipping countries for safe navigation control and effective utilization of port facilities without being adversely affected by poor visibility or other climatic conditions.

Not only for berthing control and administration, these advanced systems are also designed for a series of related port job fields ranging from arrangements for pilots, tugboats and other services for ships' arrivals and departures to collection of port charges.

(3) Information necessary for navigation control is as follows:

1) Information related to navigation rules and regulations

① Obligation of sailing within the designated passage

It is compulsory to designate the maximum size of ships exempt from navigation control and obligate ships exceeding it to sail within the

designated passage.

② According to the international Marine Collision Prevention Law, ships are to sail on the right side of passage only and are basically prohibited from sailing across the passage.

③ Ship's speed is to be limited to a proper level to be determined in light of the configurations of the harbor and the depths of water along the passage.

④ Ships are to be prohibited from casting anchor or lying at anchor in the passage.

⑤ Fishing is to be prohibited within the passage.

2) Information to be submitted by ships entering the port

For safety of ships and their navigation, ships are to inform the port administrators (harbor master's office) of the following:

①Ship's name and her gross tonnage

②Overall length of the ship

③Ship's drafts (fore and aft)

④Quantity of dangerous cargoes onboard per type

⑤Destined ports

⑥Estimated time of arrival at the entrance to the passage

⑦Ship's call sign

⑧Whether or not a pilot has been arranged for

⑨As for a tugboat, the distance up to the rear end of what is tugged

⑩Others as necessary

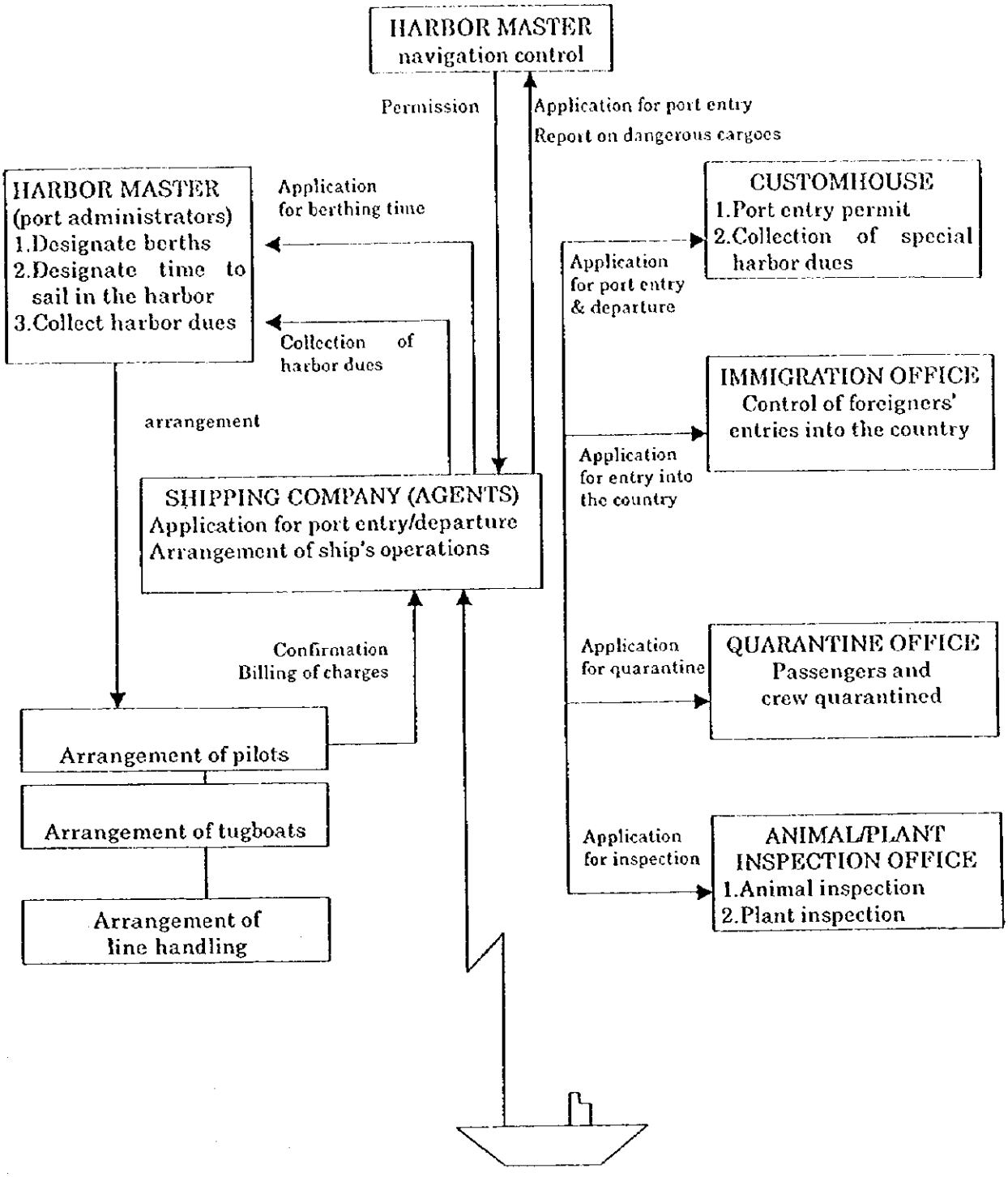


Figure 3-1 Conceptual chart of applications to authorities and permissions therefrom

3-1 Port facilities administration and management systems

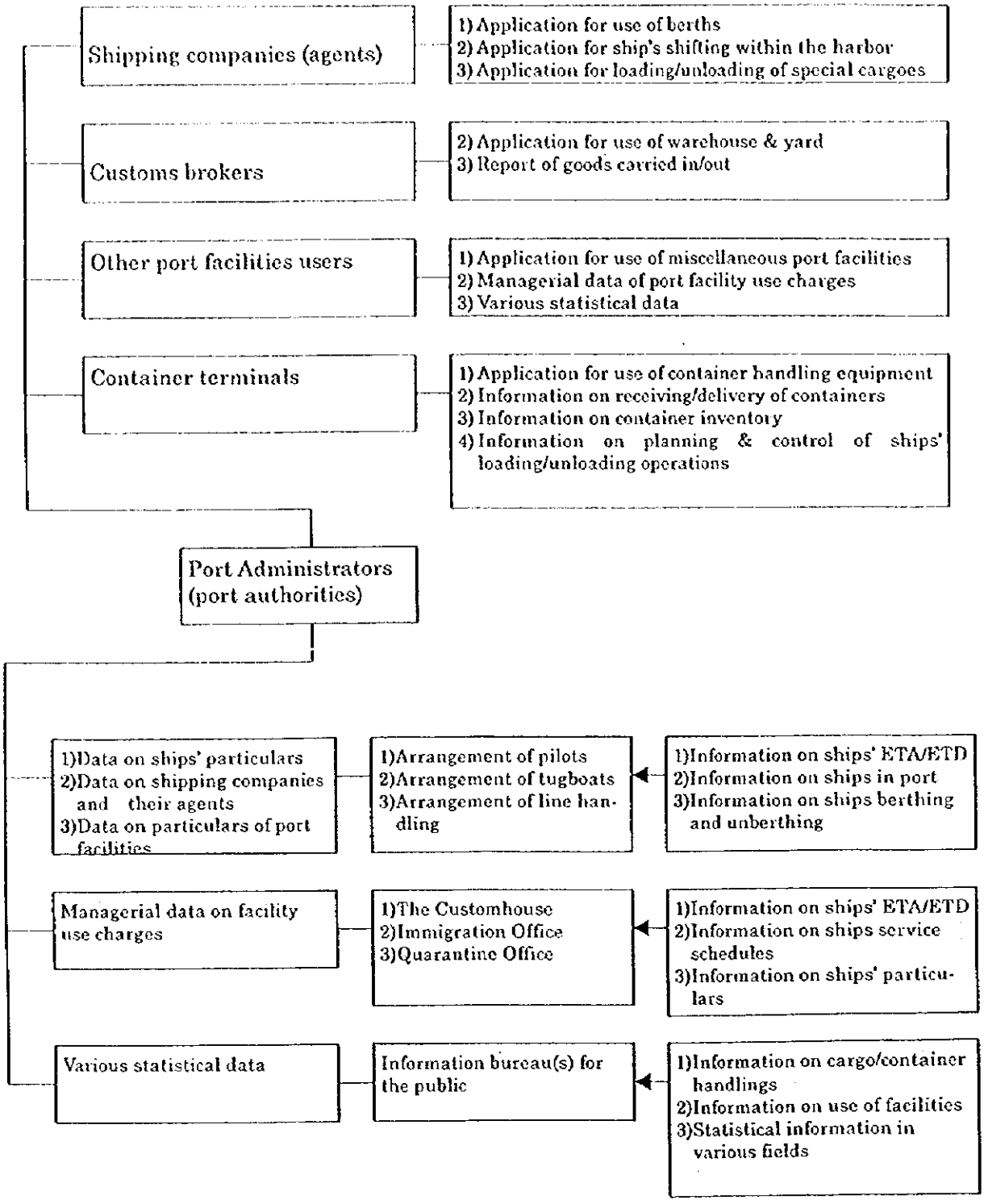


Figure 3-2 Flow of information in the port facilities administration and management systems

As the port facilities are ordinarily for common use by private companies such as shipping companies (or their agents), customs brokers, and so forth, it is important to establish systems for processing data necessary for administration and management (or proper utilization) of the facilities, collecting charges for use, processing various kinds of information for statistics, etc.

Explanations:

(1) Changes in situations surrounding the port operations, irrespective of whether in ports of advanced shipping countries or in small-sized ports of developing countries, have been so remarkable in both social and economic aspects that a variety of requirements for port facilities administration and management have been arising. Thus port facilities have been improved and expanded. For much better utilization of them, it is now necessary to innovate them to form more efficient ports with good hardware and software combined in harmony. To meet those requirements, the port administrators are implementing many plans, of which the most important is said to be computerization of their port administration and management jobs.

(2) As mentioned above, behind the introduction of computers in the port businesses lies a change of direction in attaching importance from the expansion of hardware to the completion of software, in other words, toward improvements in "quality" as a whole port complex.

Thus to cope with incapability of catching up with the increasing volume of transport in processing the administration and management jobs, it is becoming a very important task to perform more speedily and more efficiently the loading/unloading operations, receiving/delivery of cargoes and processing clerical work through the overall modernization of port businesses.

In order to improve efficiency of the port business as a whole, which is considered to constitute the trunk business of a nation, computers will surely be indispensable.

(3) It is practical and desirable to implement computerization of clerical work related to physical distribution in the port area not in a rush but step by step as shown below as an example:

Steps to computerization (an example):

Phase 1 Computers are firstly used for the following purposes:

1) To keep records of use of the port facilities (processing in batches)

2) To keep track of collection of charges for use of the facilities

3) To make and analyze statistics

Phase 2 Computers are secondly used for the following purposes:

1) To allocate the port facilities in advance such as mooring berths, warehouses or yards whereto cargoes are to be carried in and so forth

2) To simplify the procedures to be followed before and after the use of facilities

3) To keep track of and make sure of the actual use of facilities without delay

4) To make arrangements for collection of charges without delay

Phase 3 Computers are, at a final stage, used for the following purposes:

1) To establish an on-line network of computer terminals connecting each of the offices often scattered in the port area, to make the following possible:

2) To keep track of and make sure of the actual use of facilities *in real time*

3) To process clerical work *in real time*

4) To make arrangements for collection of charges *in real time* (when necessary)

This type of computer system is essential in container terminals operated and /or administered by the port administrators.

3-2 Lineup of the port facilities management and operation systems

The whole system is comprised of the following five system groups:

Grouping	Sub-systems	Jobs covered

1. Ships' arrival/departure control system

(1) Ships' movement control sub-system

1) Ships' arrival/departure control

2) Berth allocation and control

2. Warehouse & yard control system

(2) Port facilities management and operation sub-system

1) Warehouse & yard use permission

2) Warehouse & yard use processing

(3) Cargo handling management sub-system

1) Container receiving/delivery

2) Conventional type of cargo receiving/delivery

3. Handling facilities & equipment control system

(4) Handling facilities & equipment control sub-system

1) Control of place of discharge from barges

2) Handling equipment use permission

3) Truck-scale use permission

4) Electrical apparatus use permission

5) Use permission of boats for various works etc.

4. Collection of charges control system

(5) Billing of special charges subsystem

1) Billing of port dues

2) Billing of facility use charges

(6) Application for payment subsystem

Issuing of application for payment

(7) Receipt and depositing sub-system

1) Processing of payment received

2) Depositing of cash received

5. Statistics control system

(8) Monthly statistics processing sub-system

Preparation of monthly reports

(9) Annual statistics processing sub-system

Preparation of annual reports

3-3 Outline of the sub-systems

(1) Ships' movement control sub-system

- processes the schedules of use , issuance of use permits and the actual use results of ships' mooring facilities, submits information about the same to parties concerned, and prepares related data for administration
- processes the schedules of ships' movements within the harbor and the actual movements, submits information about the same to parties concerned, and prepares related data for administration

(2) Port facilities management and operation sub-system

- processes the schedules of use , issuance of use permits and the actual use results of port facilities, submits information about the same to parties concerned, and prepares related data for administration

(3) Cargo handling management sub-system

- processes the information about cargoes and containers received or delivered at above facilities, submits information about the same to parties concerned, and prepares related data for administration

(4) Handling facilities & equipment control sub-system

- processes the schedules of use , issuance of use permits and the actual use results of handling facilities & equipment (including place of discharge from barges, truck-scales, electrical apparatus, boats, etc.), submits information about the same to parties concerned, and prepares related data for administration

(5) Billing of special charges sub-system

- processes the billing of port dues, facility charges, etc., submits information about the same to parties concerned, and prepares related data for administration

(6) Application for payment subsystem

- prepares and issues applications for payment of the above-mentioned port revenue

(7) Receipt and depositing sub-system

- checks receipt of money with the corresponding billing and keeps track of the balances due of the above-mentioned port revenue, and prepares related data for administration

(8) Monthly statistics processing sub-system

- prepares statistical *monthly* data based on the information obtained by each of the above systems

(9) Annual statistics processing sub-system

- prepares statistical *annual* data based on the information obtained by each of the above systems

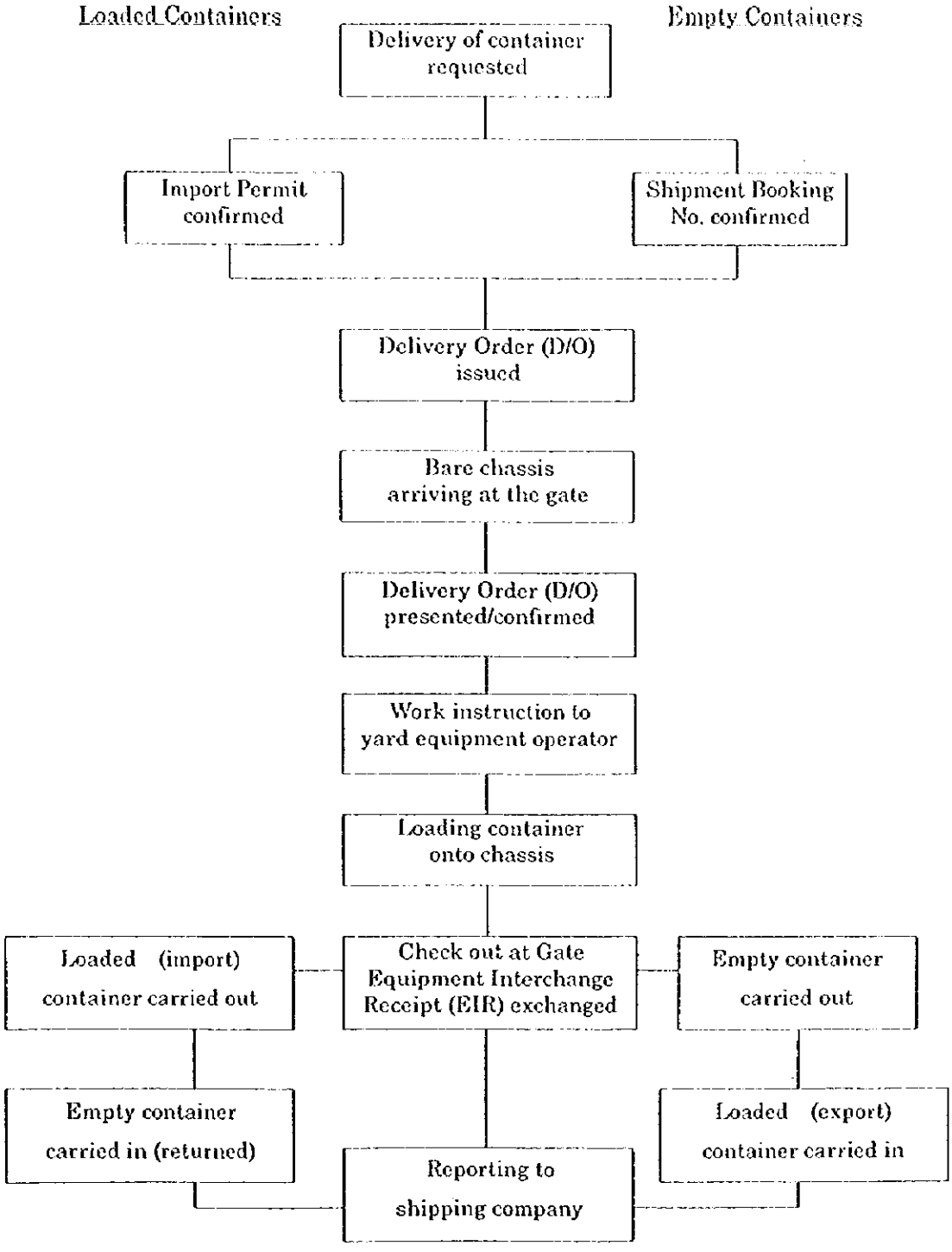


Figure 4-1 Delivery of Containers

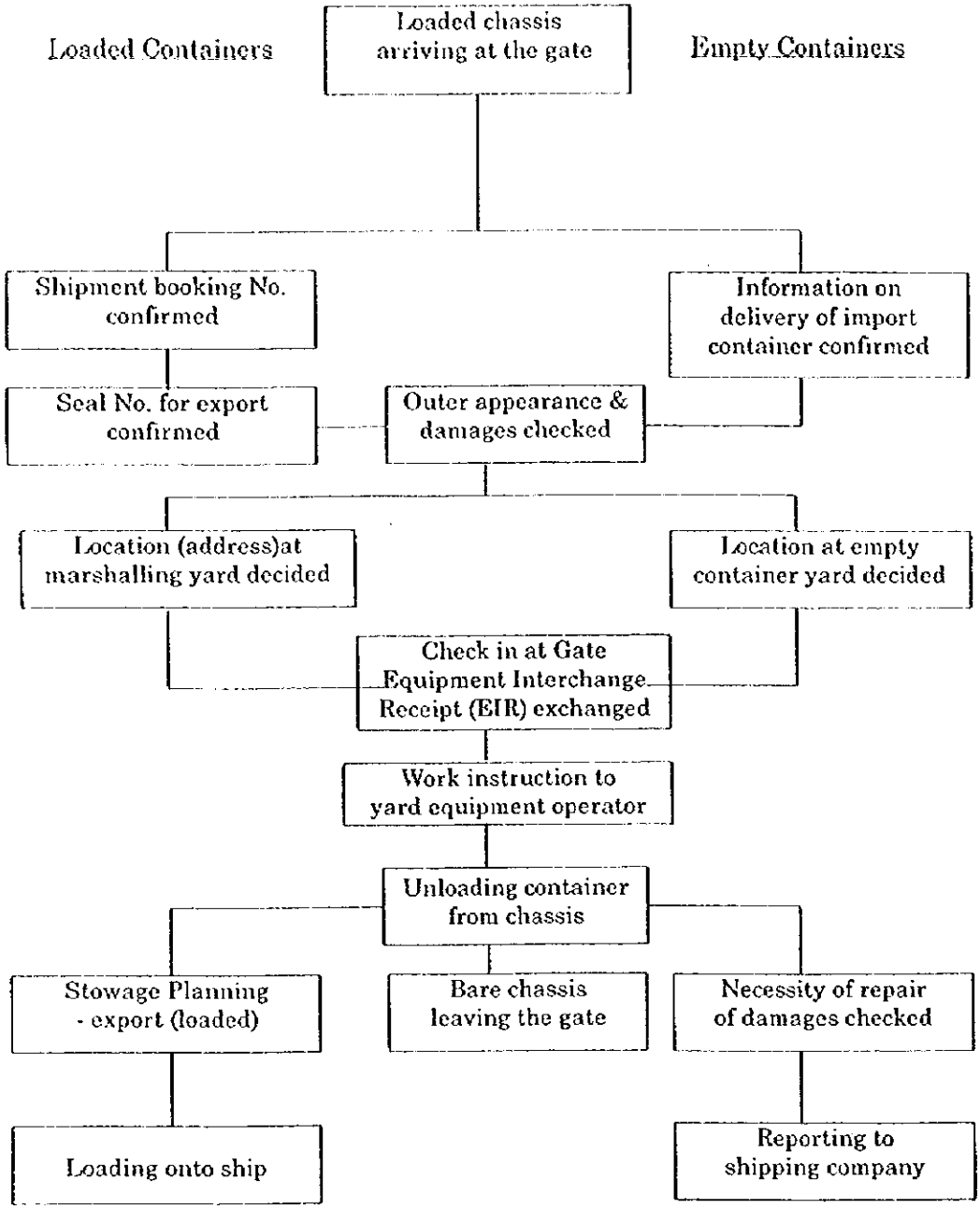


Figure 4-2 Receiving of Containers

4-1 Container delivery control system

The container terminal gates where containers are received and delivered fulfill the most important functions in the operations of a container terminal . Containers and/or chassis pass the gates basically on the following five occasions:

① To carry in loaded export containers

② To carry out empty containers to be loaded with export cargoes outside

③ To carry in bare chassis to pick up loaded import containers or empty containers

④ To carry out loaded import containers

⑤ To carry in empty containers being returned after import cargoes unloaded outside

When received or delivered, containers need to be checked both on the documents and on the outer appearance, including whether damaged or not and the seals attached. And it is at the gates that incoming containers are checked first and outgoing containers last. The gates are said to be the first place within the terminal where computers should be installed, as the processing of data there will greatly affect the whole yard planning as well as the efficiency of the whole operations in the yard.

Explanations:

(1) Containers carried out of or carried into the container terminal pass through the gates where their outer appearance, whether they are damaged or not, container numbers and seal numbers are all checked with documents carried with the truck/chassis drivers. Thus the gates are the place to fulfill the most important functions, as being where the terminal's responsibility starts (for incoming containers) and ends (for outgoing containers).

As for incoming export containers, it is to be decided at the gates on the information brought in where they should be placed in the marshalling yard

for the most efficient loading operations. As for outgoing import containers, instructions, based on the information in the Delivery Orders, are to be given at the gates to both the truck/chassis drivers and the yard equipment operators as to the exact container locations so that the containers may be efficiently loaded onto the chassis for delivery. When outgoing import containers pass through the gates, it is very important to visually check both whether they are damaged and whether the ID numbered seals are attached in order without being broken or replaced.

(2) Information to be checked when containers pass through the gates

1) Incoming loaded export containers

- Name of ship and Voyage No.
- Container no., its size and type
- Final destination and the discharging port
- Weight of the container
- Carrier(shipping company)'s name
- Special cargo inside

  e.g. the designated temperature in case of a refrigerated container
  IMO Code for a dangerous cargo

2) Outgoing empty containers

- Container no., its size and type
- Shippers' name
- Place where cargoes are to be loaded (name of factory or warehouse)
- Carrier(shipping company)'s name

3) Incoming bare chassis to pick up containers

- In case of a loaded import container, whether permitted by the customs
- In case of an empty container, whether in accordance with the carrier's instruction
- Shippers' or consignees' name

- Place where cargoes are to be loaded or unloaded (name of factory or warehouse)
- Carrier(shipping company)'s name

4) Outgoing loaded import containers

- Name of ship and Voyage No.
- Container no., its size and type
- Whether permitted by the customs
- Place where cargoes are to be unloaded (name of factory or warehouse)
- Carrier(shipping company)'s name
- When (day) the container is expected to return empty

5) Incoming empty containers being returned

- Container no., its size and type
- Carrier(shipping company)'s name
- Place where cargoes were unloaded (name of factory or warehouse)
- Trucking company's name

4-2 Container inventory control system

It is the most important job to make a trustworthy inventory of containers of various shipping companies stored in the container yard. Keeping track of those containers precisely by their kinds (types and sizes) is the fundamental requirement for efficient operations of a container terminal.

Explanations:

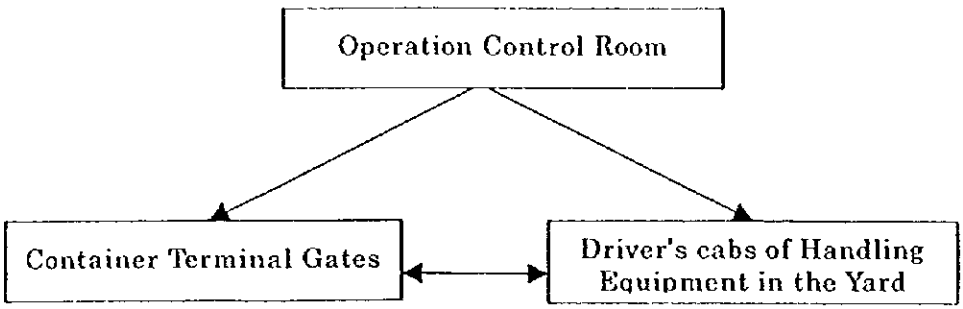
(1) For inventory control purposes, it is required to keep a journal of containers in the yard primarily assorted by the following categories:

① By shipping companies
② By sizes and types
③ As for loaded containers, by ships and by destinations
④ As for empty containers, by whether damaged or undamaged

(2) It is desirable that those containers should be assorted also physically in the yard to be grouped in the same categories to the full extent.

In order for the grouping to be highly precise, it is important to process each passage of containers in real time at the terminal gates. To further heighten the accuracy in inventory control and the efficiency in processing, an on-line system is required to link the following three spots:

1) the terminal gates which are the only checking points in the terminal ,
2) the operation control room, where they are monitoring not only the operations of the handling equipment in the yard but the whole operations in the yard,
3) the driver's cabs of the yard equipment, where they are actually operating those machines in the yard.



Network of Information in the Container Terminal

(3) Necessary information to be input at the container gates

1) Incoming loaded export containers:

- Name of ship and Voyage No.
- Container no., its size and type
- Final destination and the discharging port
- Weight of the container
- Carrier(shipping company)'s name
- Special cargo inside (dangerous cargoes, refrigerated cargoes, etc.)

2) Outgoing loaded import containers:

- Name of ship and Voyage No.
- Container no., its size and type
- Customs permit no. (terms of permit)
- Destination where cargoes are to be unloaded)
- Carrier(shipping company)'s name
- When (day) the container is expected to return empty

3) Incoming empty containers:

- Container no., its size and type
- appearance of container (damaged or not, degree of damage)
- Carrier(shipping company)'s name
- Trucking company's name (importers' name)

4) Outgoing empty containers:

- Container no., its size and type
- Shipment Booking No.
- Destination where cargoes are to be loaded (factory or warehouse)
- Trucking company's name (exporters' name)
- Carrier(shipping company)'s name

Containers passing through the gates fall basically into the above four categories with very few exceptions. Making an precise inventory of containers, with their locations being shown together, becomes possible through checking at the gates the documents carried with the truck drivers with the actual containers, inputting the data in real time, and updating them whenever necessary.

4-3 Container yard planning system

In planning the layout of containers in the vast area of the yard, containers need to be assorted into the three groups of export containers, import containers and empties, with each group further divided by sizes and types, as also mentioned in the preceding item for inventory control,.
Especially as for export containers, they are to be assorted more in detail for efficient ship's operations. As for import containers, too, transhipment containers need to be assorted separately from others, by the second ships and by the final destinations of containers.

Explanations:

(1) At many modern container terminals, computers are being utilized with the container inventory control system and the programmed yard employment system linked together. Container yard planning greatly affects the efficiency of handling operations both alongside the ships and in the yard; export containers, especially, must be laid out in the yard in consideration of their planned stowage locations onboard. Although the layout of containers in the yard is affected to some extent by the types of handling equipment used in the terminal, containers are usually stacked in tiers, wherein it is important for heavier containers to be stacked in higher tiers with lighter ones in lower tiers. The reason is that onboard a ship, contrary to the tiers in the yard, heavier containers are to be stowed lower and lighter containers higher, which is the most important for her safe sailing at sea by enabling her to keep her weight balance in the hull good enough to retain her strength of stability.

(2) The layout of import containers is to be planned primarily in consideration of the efficiency in ship's discharging operations. But it should also be noted that importers usually come to pick up containers only at their convenience (not the terminal's), often causing rehandling of containers in the yard to dig out their containers stacked in lower tiers. Thus it is also important to take necessary measures for minimizing the rehandling

operations, subject to what kinds of import cargoes are discharged there at the port. It will be included among those measures to plan the import containers to be stacked (or laid out) in B/L numbers' sequence and/or in the sequence of expected delivery dates, if known beforehand by making best efforts to obtain information as early as possible from shipping companies.

(3) As for the layout arrangements of container yards for empties, it is essential to assort them at least by sizes, types and whether damaged or undamaged.

In case the terminal is equipped with facilities to repair containers, it will also be necessary to assort and lay out damaged containers by the degree of damages and even in consideration of time and money needed to repair them.

(4) Functions (or sub-systems) necessary for the container yard planning system:

① Container yard overall control system

② Export container receiving/layout system

③ Import container layout/delivery system

④ Empty container receiving system

⑤ Empty container delivery system

⑥ Damaged container repair & management system

Above functions are necessary for the container yard planning system to work well. As the basic information required for this system is input either when containers come in through the gates or when containers are discharged from the ships, it is not necessary to input the same information at other times again (and again). Once the data have been input in the computers, it is only necessary to update them as and when necessary.

(5) The factors to decide the actual layout of export containers are not always the same but change depending on the ship's sizes, the number of calling ports, etc. Therefore it is important for good planning of the yard layout to obtain the shipment booking prospect, i.e. the scheduled numbers of containers by discharging ports, from shipping companies or their agents as early as possible.

With regard to the grouping of containers by weights, containers should be assorted into 3 to 4 categories, i.e. heavy, medium, light-weight and/or empty containers. As the distribution patterns of container weights vary to some

extent from sea route to sea route, it is suggested that the past actual data of shipments be studied for a more precise yard planning.

4-4 Container loading/unloading control system

Port calling schedules of container ships commissioned in the international container services are now generally on a weekly basis. In order to maintain their schedules, it is more strongly required of the container terminals to make their loading/unloading operations much more speedy and efficient and shorten the time of ships' stay in a port. Computers, therefore, should also be utilized for the planning of operations, including the allocation of the gantry cranes, in order to achieve a stable high average production in the loading/unloading of ships.

Explanations:

(1) In the loading/unloading operations of a ship, it is common to discharge import containers first and load export containers into the space vacated. As two or more gantry cranes are used very often, ship's loading/unloading in such cases must be planned so that an equal number of containers as possible may be handled (loaded or discharged) with each crane used. In this connection, it must be noted that the handling of containers in the neighboring hatches with two gantry cranes at the same time is not possible in most cases, with the width of one crane interfering with the operation by the other.

Also, as for the loading of export containers, plans are to be made in concert with the lineup of containers grouped by weights, destinations and sizes according to the yard planning system. Furthermore, with regard to containers loaded with refrigerated or dangerous cargoes, the international rules and regulations concerned should also be taken into account in planning the loading operations.

(2) Functions (or sub-systems) necessary for the container loading/unloading control system:

① Container unloading operation system
② Container loading operation system
③ Container rehandling system
④ Gantry crane allocation system
⑤ Hull strength calculation system

Above functions are necessary for the loading/unloading control system to work well. It is common practice to prepare beforehand unloading/loading sequence lists where containers are listed in the unloading/loading sequence. They are prepared based on the information necessary for the operations, which are to be obtained beforehand from shipping companies so that the loading/unloading operations may be started on the ship's arrival. The information required to prepare the sequence lists is the data on all the containers loaded on the ship at all her preceding ports of call.

(3) Such information is transmitted by EDI at some advanced ports and by facsimile at other ports. The contents for the terminal to be informed of are basically as follows and are summarized in the form of the "Terminal Departure Report" (TDR) to be prepared at the previous port:

1) Name of ship and Voyage No.

2) Time of departure from the previous port

3) ETA (estimated time of arrival) at this port

4) Details of containers loaded onboard
- Container no., its size and weight
- Port of loading and port of discharge

5) Details of special containers

- Designated temperature for a refrigerated container
- IMO Class for a dangerous cargoes

6) Ship's load draft at the time of departure from the previous port and estimated draft at the time of arrival at this port

(4) After the loading completed, the Stowage Bay Plans, where the results of the whole stevedoring operations at this port are shown, need to be prepared and submitted to the ship's master or the shipping company (or their agents). They are, basically, documents to be prepared by the terminal operators, as done with computers by the operation departments of advanced container terminals, while at most container ports in developing countries they are being prepared by the shipping companies' agents instead.

The information to be shown on the Stowage Bay Plans is as follows:

Container prefix	Size of container
Container No.	
Loading port	Discharging port
Weight of container	Special cargo(es)
Stowage location onboard	

4-4 Container handling equipment control system

The handling machines used at container terminals are diversified in types, numbers of them, their manufacturers, etc. It is important to take charge of those machines, make a schedule of inspections and repairs of them, make an inventory of their spare parts and supply them in proper timing, for which purposes computers are also to be utilized. Furthermore computers are often playing an important role in the allocation of those machines for the most efficient terminal operations,.

Explanations:

(1) The typical types of container handling equipment used in the container terminals are as follows:

① Gantry cranes
② Transfer cranes
③ Straddle carriers
④ Reach stacker
⑤ Top lifters
⑥ Tractors/trailers
⑦ Fork lifts

(2) The operation systems now in use at container terminals are classified into the following four types, with only few exceptions:

① Transfer crane operation system (Rubber tire-mounted cranes / Rail-mounted cranes)
② Straddle carrier operation system
③ Reach stacker operation system
④ Forklift (top lift) operation system

Above systems are selected in consideration of the sizes of container yards,

their shapes, the volumes of containers to be handled, the ratios of transhipment containers (versus containers exported from or destined to the port), etc., while the typical lineups of equipment per one gantry crane are as follows:

Operation system	Type of equipment	Number of units
① Transfer crane operation system:		
	Gantry crane	1
	Transfer crane	2 (subject to change depending on transhipment ratio)
	Tractor/trailer	5 (subject to change depending on the size of terminal)
② Straddle carrier operation system		
	Gantry crane	1
	Straddle carrier	3 (subject to change depending on transhipment ratio)
③ Reach stacker/Top lifter operation systems		
	Gantry crane	1
	Reach stacker/Top lifter	1
	Tractor/trailer	3

Note: These two systems are usually adopted at small-sized van pools or at small-scale terminals mostly to stevedore small-sized ships.

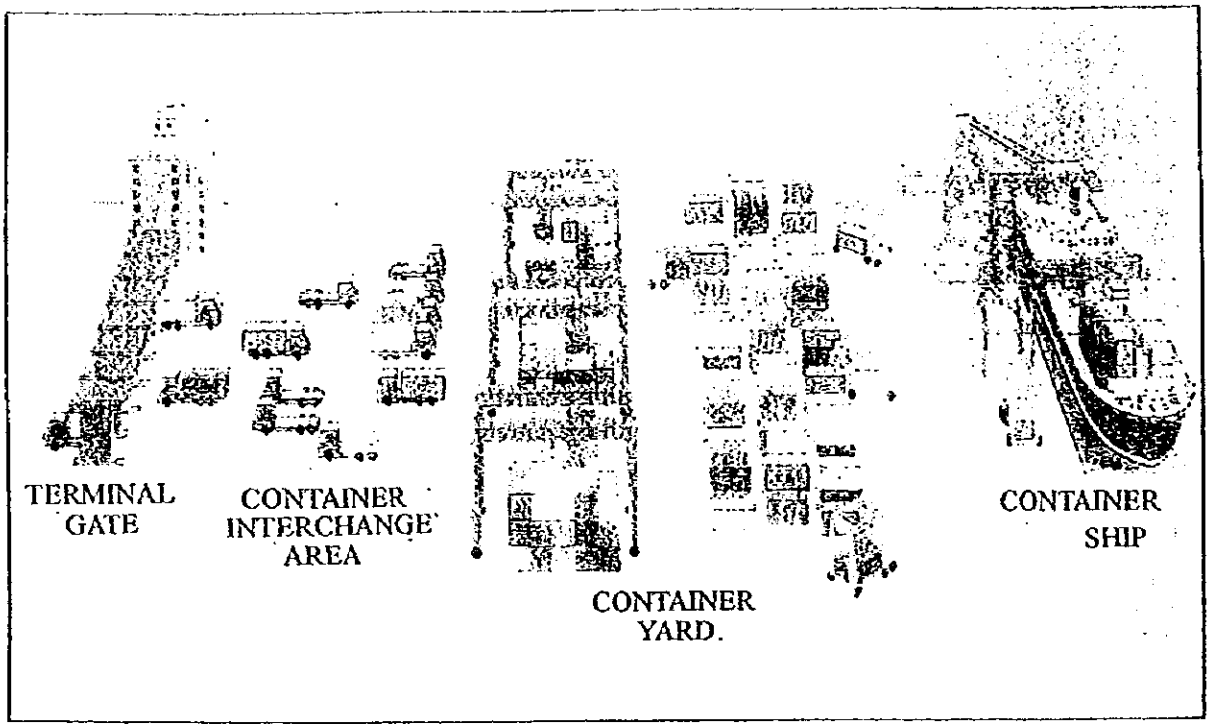
With these combinations of handling machines, it might normally be possible to achieve the efficiency of over 20 containers per hour in case of the above ① and ②, and approximately 15 containers per hour in case of the above ③. The actual efficiency, however, varies from port to port or country to country, and some countries require that technical instructions be given them for the improvement of their efficiency.

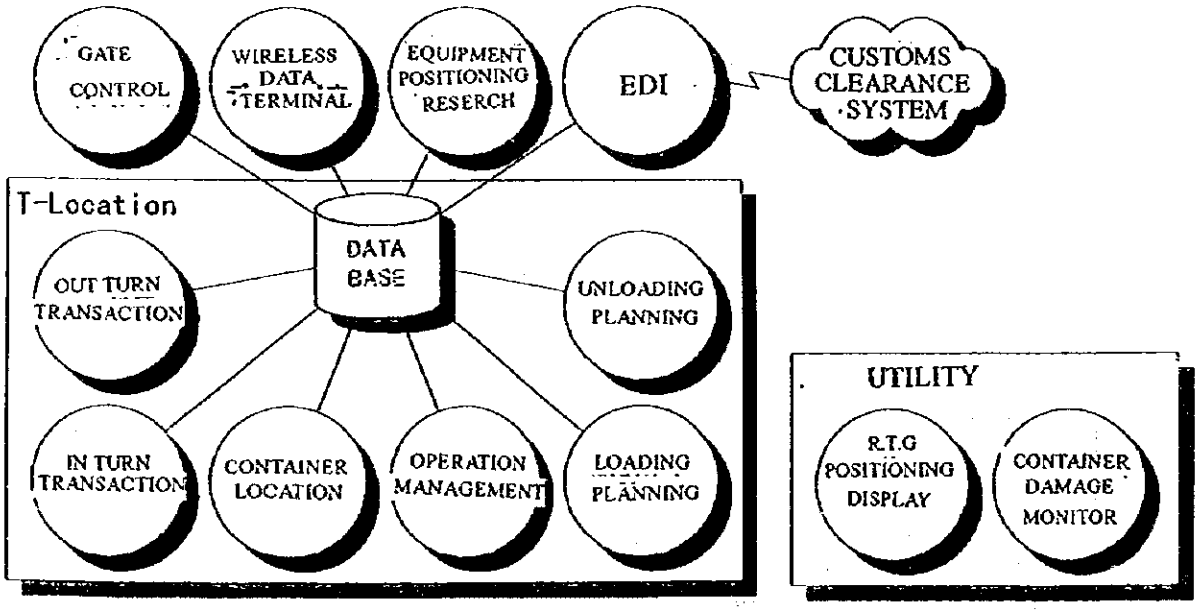
(3) So as to maintain the handling machines in a good condition at all times, it is essential to inspect them at fixed intervals such as one(1), six(6) and twelve(12) months. It is one of the most important jobs in managing a container terminal to prevent breakdowns during the ships' loading/unloading operations.

The numbers of items to inspect periodically change depending on the intervals but generally increase as the machines advance in years. Periodic inspections of each machine are to be made according to schedule in order to minimize the adverse effects on the terminal business. With respect to the handling equipment mounted with rubber tires, it is to be noted that as tires on the driving axles wear out much faster than those on the trailing axles, they need to be periodically exchanged with each other so that both wear out equally, for which purposes also computers play an important role.

(4) Even the same types of machines in the same terminal might be products of different manufacturers. The more types of machines and the more numbers of them are used in the terminal, the more kinds of spare parts need to be stocked for their repair and maintenance. In order to maintain each piece of the handling equipment in good condition, it is necessary to keep a proper stock of such a wide range of spare parts and supply them as necessary. But as it is difficult to do so by hand, making use of computers becomes essential.

CONTAINER TERMINAL MANAGEMENT SYSTEM

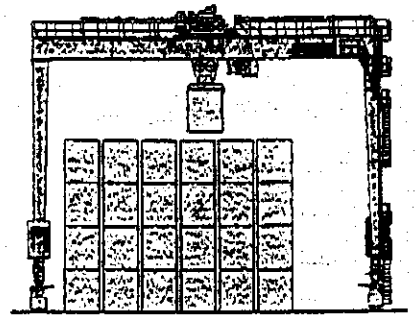


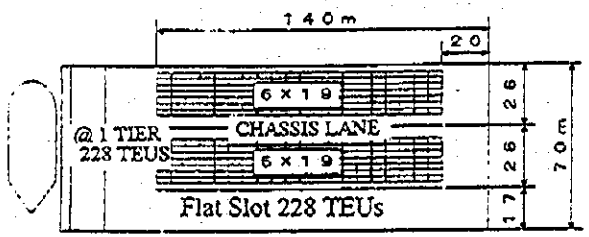


COMPARED BY KIND OF CONTAINER HANDLING EQUIPMENT

1. Efficiency of Container Storage in Yard (On Condition Terms : 140m x 70m)

(1) Transfer Crane

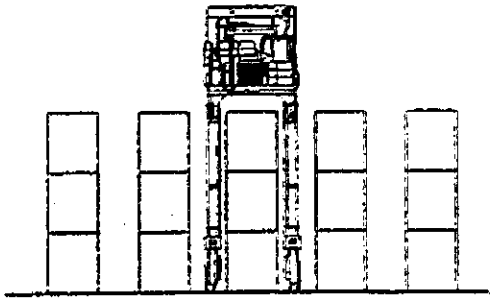


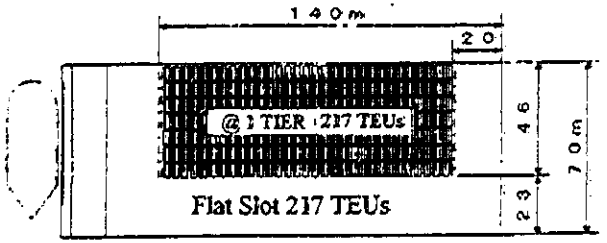


Max Storage 912 TEUs/4 Tiers

Efficiency of Storage 100%

(2) Straddle Carrier

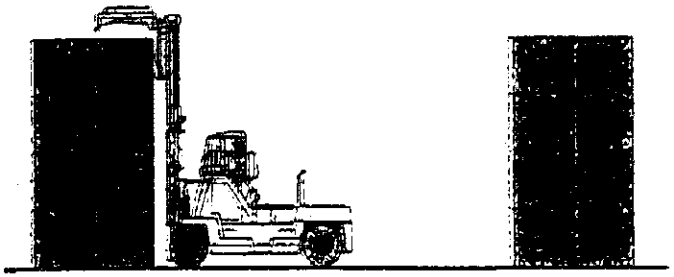


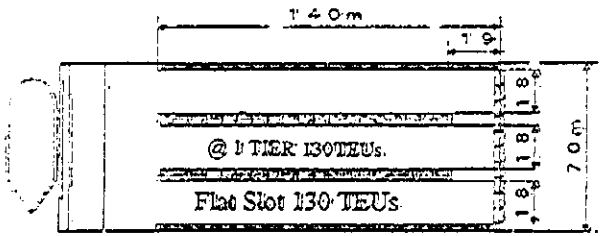


Max Storage 651 TEUs/3 Tiers

Efficiency of Storage 71%

(3) Top-Lifter





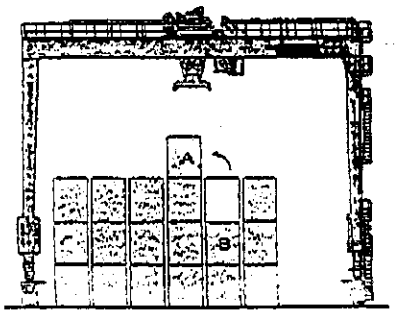
Max Storage 520 TEUs/4 Tiers

Efficiency of Storage 57%

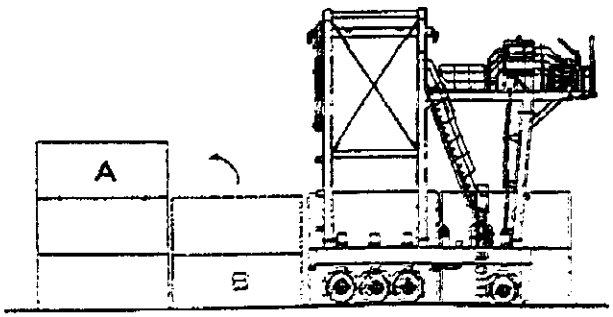
2. Container Re-Handling Time

("B" Container = Released container / "A" Container = Re-Handling Container

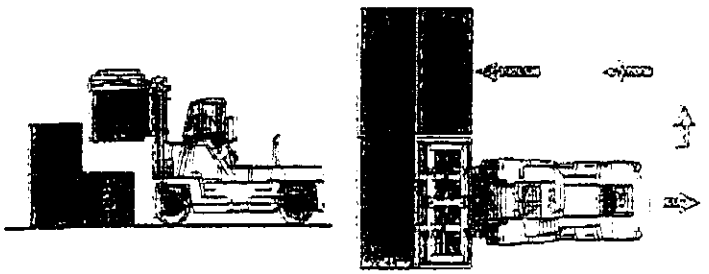
30 sec



60 sec



90 sec



Movement Top-Lifter

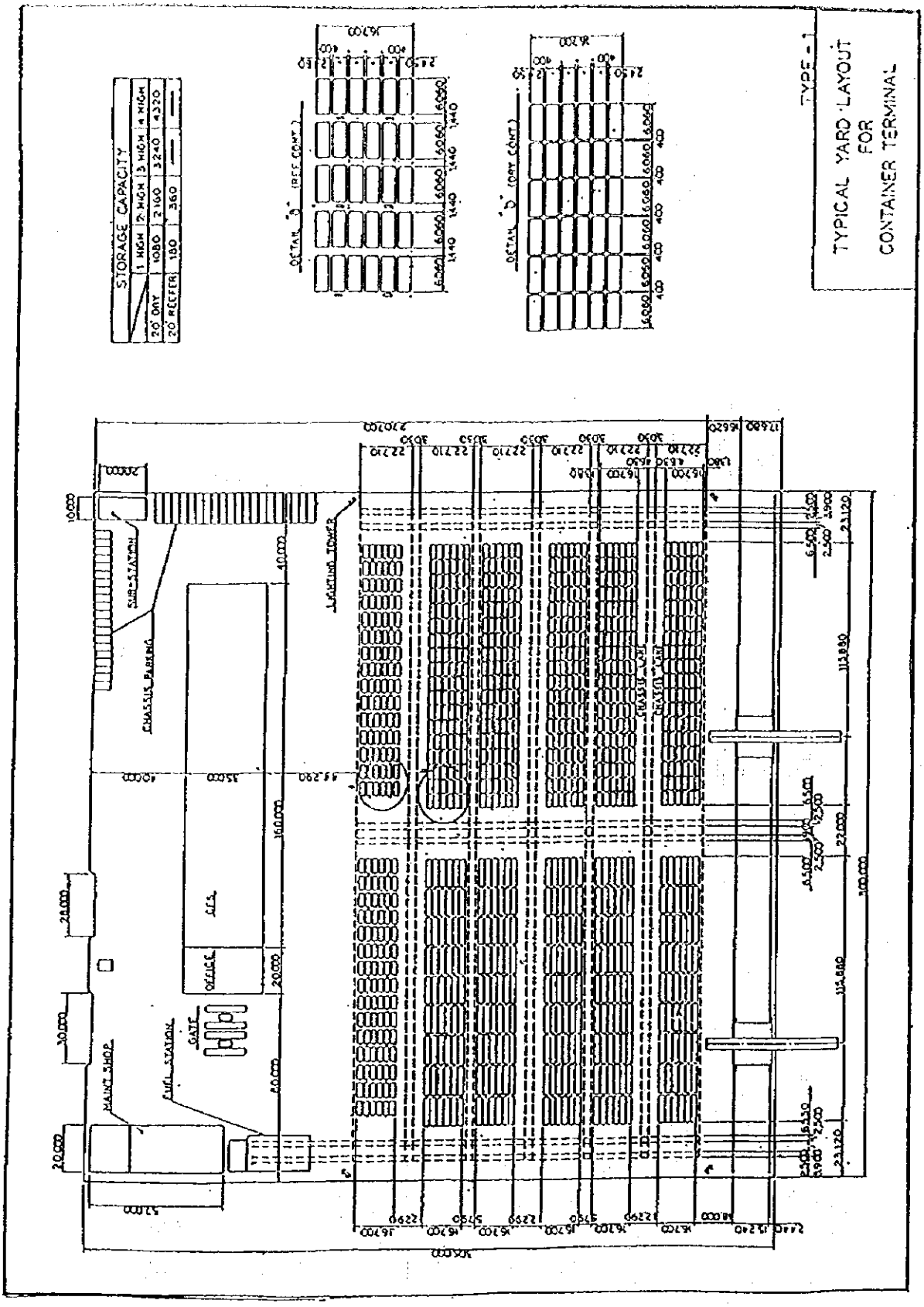


Fig 4-7 General Lay-out of Container Terminal
Operated by Transfer Crane (RTG)

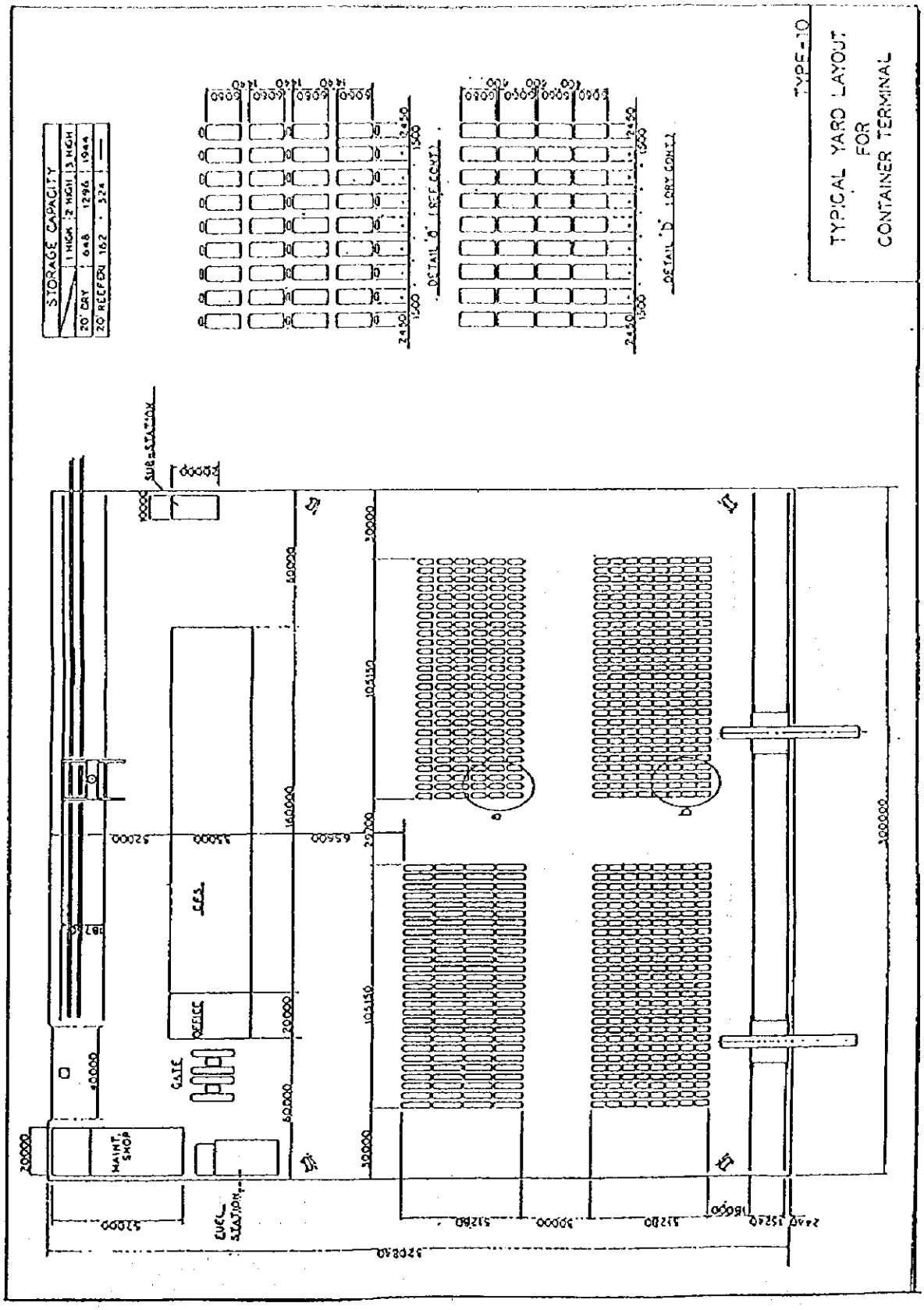


Fig 4-8 General Lay-out of Container Terminal
Operated by Straddle Carrier

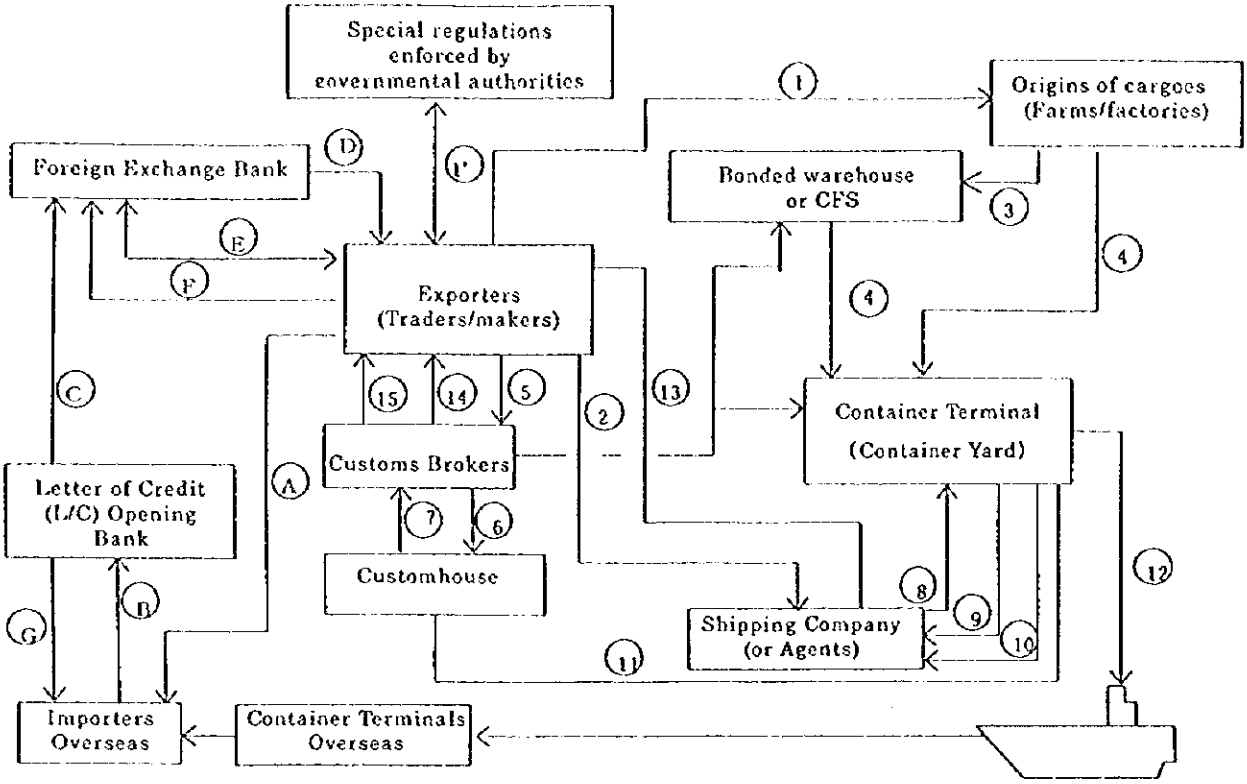


Figure 5-1 Shipment of Export Containers (cargoes)

A Sales contract

B Apply for L/C to be opened

C Opening of L/C

D Notifying of L/C opened

E Confirmation of Export Declaration

F Purchase B/L

G Importer to purchase B/L (from the bank in their country)

① Order goods for export
② On special cargoes, exporters apply for and obtain export license from authorities in charge
③ Have cargoes carried in to the bonded warehouse (for temporary storage)/CFS.
④ Have export containers carried in to the Container Terminal
⑤ Submit Shipping Instructions to Customs Brokers
⑥ Submit Export Declaration (E/D)
⑦ Issue Export Permit
⑧ Give Information on booking
⑨ Report Export containers received and ship's loading results
⑩ Dispatch shipping documents (including details of special containers)
⑪ Export Cargo Loading Permit
⑫ Loading operations
⑬ Issue B/L
⑭ Return documents processed
⑮ Bill various shipping charges

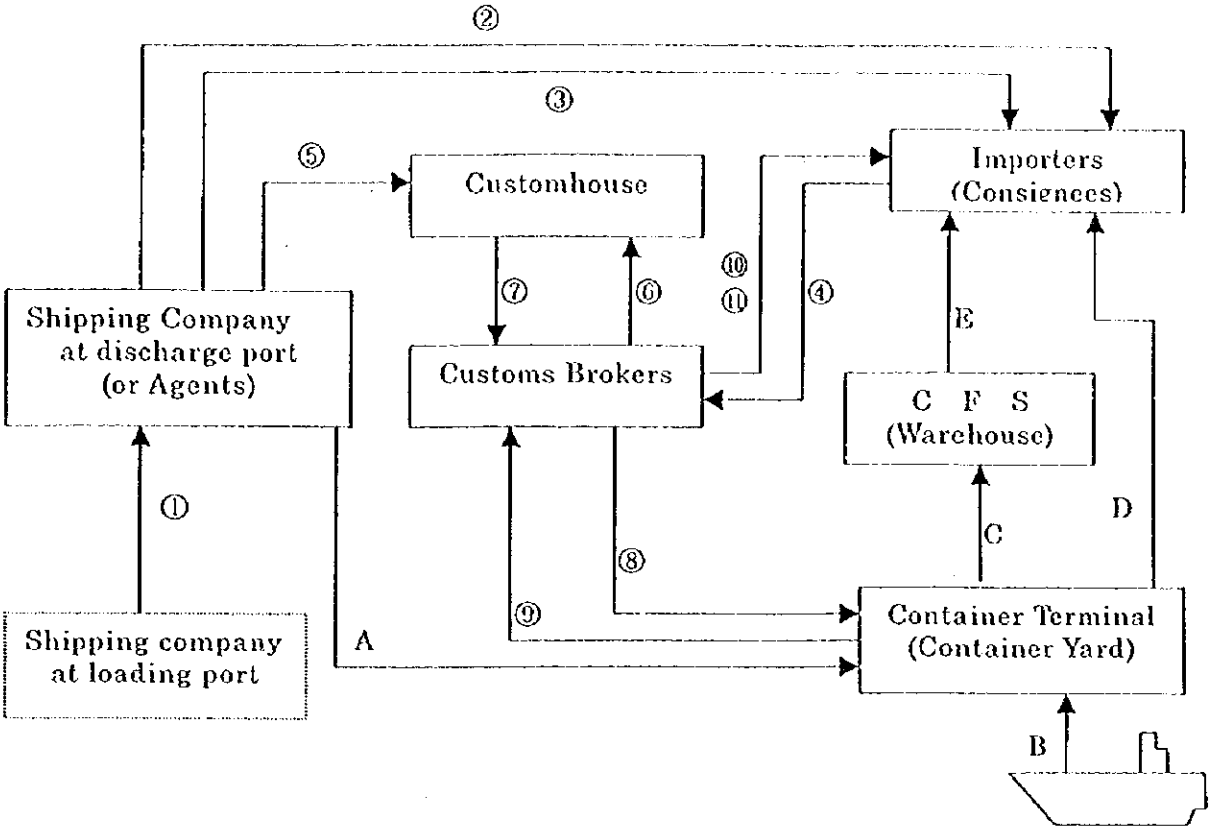


Figure 5-2 Discharge of Import Containers (cargoes)

① Particulars of cargoes/containers loaded
② Arrival Notice (shipping co. to importers)
③ B/L exchanged with D/O (Delivery Order) .
④ Submit D/O and documents for customs clearance, i.e. Invoice, Packing List, etc.
⑤ Submit Shipping Manifests to the Customs
⑥ Submit Import Cargo Customs Declaration
⑦ Issue Import Permit
⑧ Submit Import Permit and D/O
⑨ Issue EIR (Equipment Interchange Receipt)
⑩ Return documents processed for customs clearance
⑪ Bill various shipping charges

A Dispatch documents necessary for discharge (shipping co. to the terminal)
B Discharging operations
C Move import LCL containers to CFS
D Deliver FCL containers
E Deliver LCL cargoes at CFS

5-1 Customs clearance system for exports, imports and containers

In step with the cargo volume traded internationally, the volume of documents for customs clearance has been increasing and the processing of them has been growing more and more complicated to the extent that the labors and costs being consumed for customs clearance cannot be left untouched any longer. Just as in other industries seeking for higher accuracy and efficiency, computers need to be utilized in the physical distribution industry in the port area to minimize the labor and costs in processing documents.

Explanations:

(1) The volume of goods traded internationally has been increasing year by year. Especially, the increase of that by marine containers has been conspicuous in step with the development of horizontal international specialization and the expansion of the networks of container service routes, which now link approximately 650 ports in the world. Therefore the number of business transactions to clear customs has been greatly rising in all the nations, irrespective of advanced or developing countries.

Customs clearance is required both for exports and imports. Although the ways of processing are slightly different from country to country depending on their domestic circumstances, the basic tasks of the customhouses are to examine whether the export/import prices are properly fixed and to collect the customs duties they impose for the purpose of protecting their domestic industries, etc.

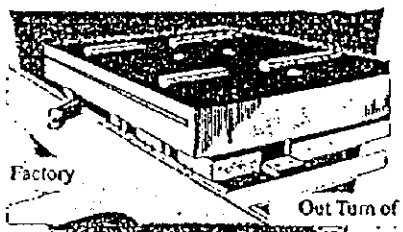
As the items traded internationally are now so diversified as to make the processing very complicated, advanced countries and some of developing countries have introduced computers to process their customs clearance speedily, while many others are expected follow suit.

(2) The first step to computerization in this field will be to link the hardware with the software and have the customhouse staff stand by to take care of both of them organically. Even this elementary way, where manpower is partly indispensable, would help to save time and labor to a noticeable extent.

In the future, it will be necessary to implement more speedy and accurate processing by setting up an on-line computer system linking each computer terminal at the authorities concerned, exporters/importers, customs brokers, banks, etc. within the country.

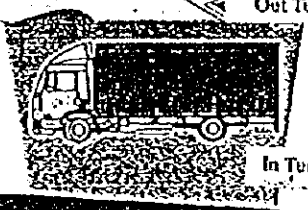
OUT LINE OF EXPORT CARGO DECLARATION SYSTEM

CARGO FLOW

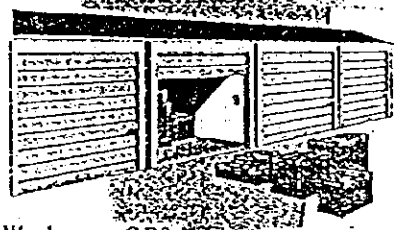


Factory

Out Turn of Export Cargo



In Turn Cargo



Bonded Warehouse or C.F.S.

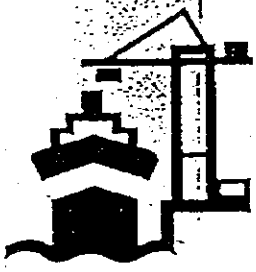
Staffing Export Cargo

Out Turn Export Cargo

Container drayed to Container Terminal

Bonded Container Yard

Out Turn Registered on bond Ledger



Export Container Loading to ship

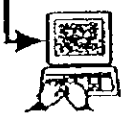
Ship Leaving

CORRESPONDING

APPLICATION FOR
EXPORT LICENSE

PROCESSING OF EXPORT CARGO
REGISTERED ON BOUNDED LEDGER

CONFIRMATION OF CARGO
IN TURN TO WAREHOUSE



SUBMISSION OF EXPORT CARGO
DECLARATION
APPROVAL OF EXPORT CARGO
DECLARATION

CONFIRMATION OF
EXPORT CARGO OUT TURN

TRANSMITTAL OF EXPORT CARGO
STUFFING DATA

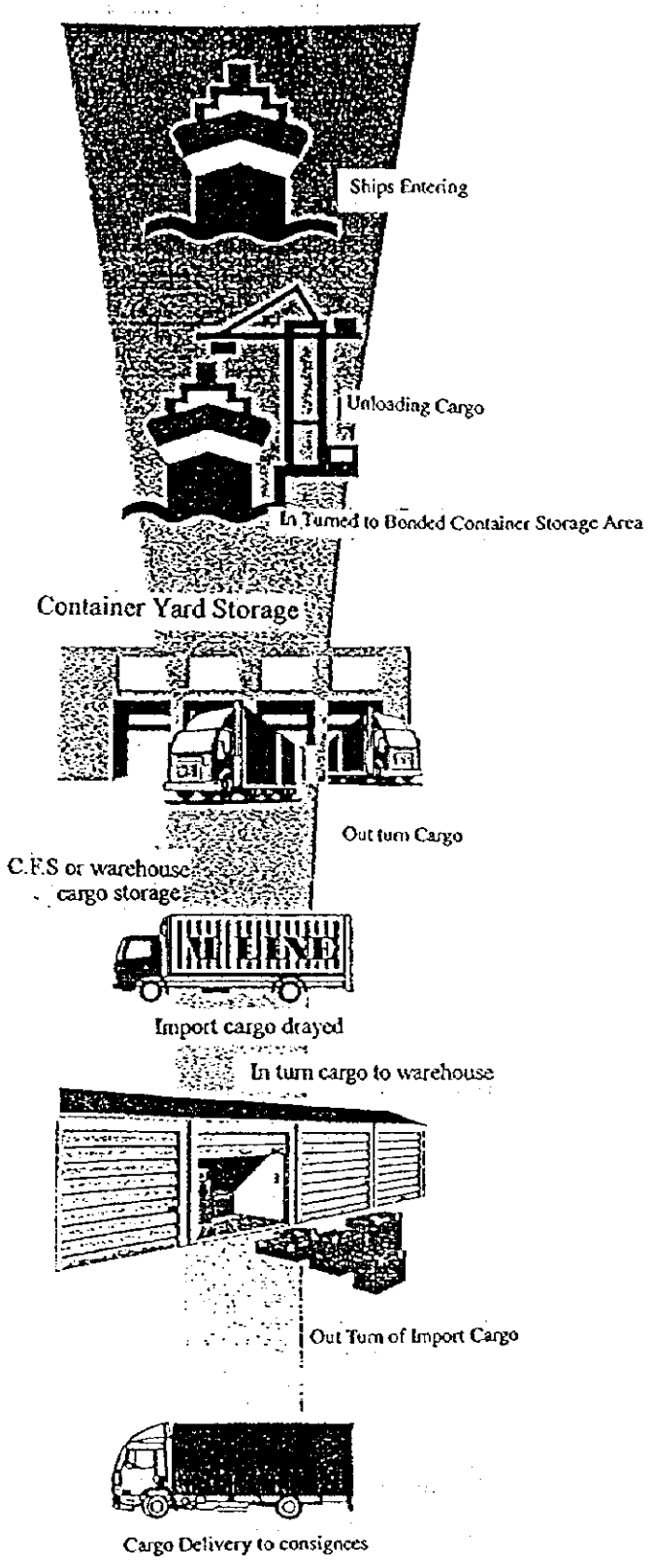
CONFIRMATION OF EXPORT CARGO

CONFIRMATION OF CONTAINER
LOADING TO SHIP

APPLICATION OF SHIP LEAVING
PERMITTED OF SHIPS LEAVING

OUT LINE OF IMPORT CARGO DECLARATION SYSTE

CARGO FLOW



CORRESPONDING

SHIPS ENTRING NOTICE INFORMING
SHIPS SCHEDULE AND MANIFEST DATE

APPLICATION FOR SHIPS ENTRY

Tonnage Due

SUBMISSION OF
CARGO MANIFESTS

INPUTTING OF
UNLOADING CARGO DETAILS

APPLICATION FOR BONDED
CARGO TRANSPORT
DECLARATION!
OF BOUNDED CARGO TRANSPORT

INQUIRY OF OUT TURN CARGO

CONFIRMATION OF
OUT TURN OUT TURN CARGO

CONFIRMATION OF
IN TURN CARGO!

INQUIRY OF
IMPORT CARGO DETAILS

APPLICATION FOR IMPORT PERMIT
IMPORT TAXATION
ISSUANCE OF IMPORT PERMIT

INQUIRY OF
IMPORT CARGO DETAILS

CONFIRMATION OF CARGO DELIVERY

Chapter 6 Concept of EDI (Electronic Data Interchange)

(1) A variety of documents or data are now being sent in a variety of ways ranging from old-fashioned ways by human labor, such as sending people on an errand or sending mails, to a comparatively new way by facsimile, etc. This EDI (electronic data interchange) is the most advanced way to interchange electronic information (digital data) interactively.

(2) Advanced countries in respect of electronic information processing popularly transmit information instantly with their computers at both ends connected on the telephone line, in order to save the time and labor to prepare paper documents and send them by mail, facsimile, etc. EDI is planned not to send data only one way but to exchange them interactively; In selling/ purchasing goods for example, the buyers just input the data into their computers omitting preparations of paper documents to order while the sellers process the same data to issue their statements of delivery , debit notes, etc.

(3) Communicating with many parties concerned becomes possible by linking a network of computers. This method functions not only for sending data but also for transmitting the senders' comprehensive will to the recipients. Using the widely accepted common terms (often called protocol), EDI makes it possible to exchange the necessary information related to the business transactions among the computer terminals linked by the network of communications. EDI, in other words, is the network of communications intended to make business transactions as paperless as possible by taking the place of the traditional way of communication by paper documents.

6-1 Matters to be standardized for the introduction of EDI

(1) The most important thing in implementing EDI is to standardize the formats to be used. If the participants in the network did not comply with "the common terms agreed on among parties concerned" and the formats needed for output were different from terminal to terminal in the network, the EDI would never work efficiently by causing the "numerous terminal phenomenon" where a tremendous number of lines are required to be installed.

When a single standardized format is used in common by all the participants, it becomes possible to interchange information among them with only one line installed per computer terminal. If they have a standard format to be used in common, it becomes possible to interchange electronic data by installing the corresponding format conversion software, no matter how many participants the data need to be interchanged with.

Such a standard format agreed on is called "the EDI standard" or "the business protocol standard".

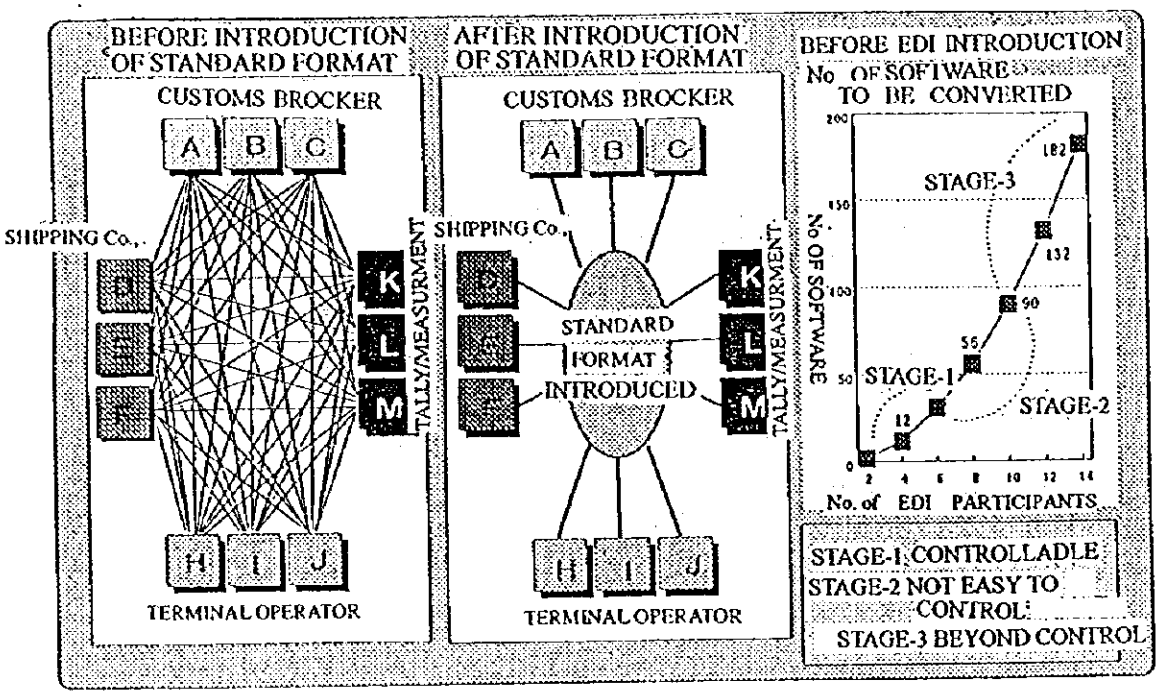


Fig 6-1 Standard of Software Introduction Out Line

(2) In addition to the standardization of formats, another important matter in exchanging business information by EDI is to standardize functions of the data concerned, including regulations on connections of computers to the network and the operations thereof, terms of business transactions by EDI, etc.

The standardization in this respect is classified into the following four sectors of contracts:

① Basic business contract (on contract terms)
② Business manual contract (on business operations)
③ Data expression contract (on how to indicate data)
④ Data transmittal contract (on how to transmit data)

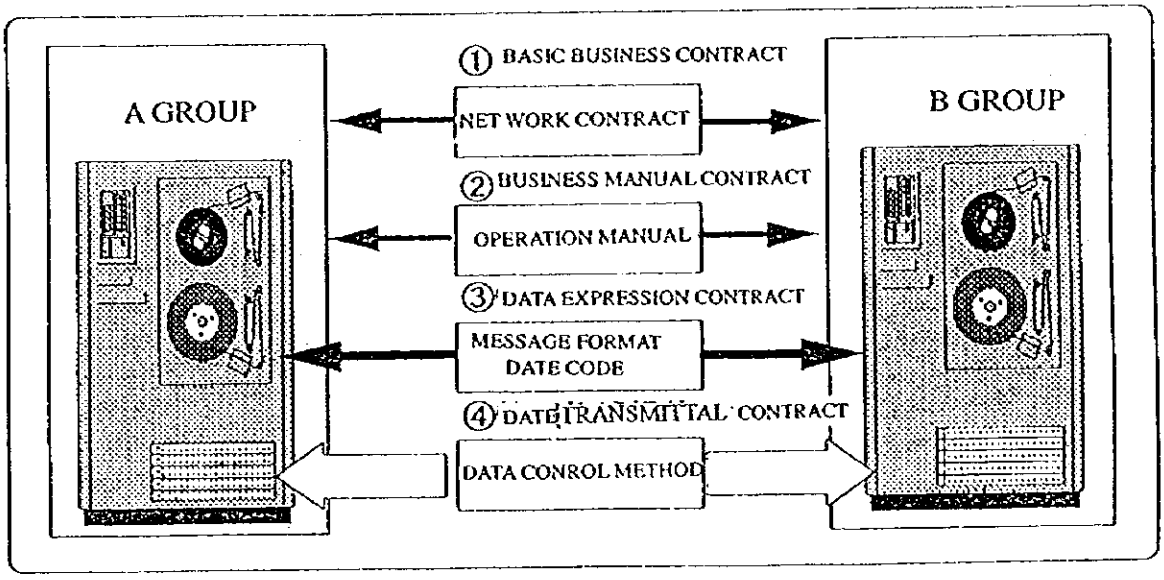


Fig 6-2 Standard of 4 Levels EDI system Out-Line

Reference -1 Ready-made software for container terminal operations

(1) Container Terminal Operation System (Japan)

1) YPCS (Yard Plan Computer System)

Contents:

Container Loading and Unloading System

Container Maintenance and Repair System

Container Inventory Control system

Spare Parts Inventory System

Ships Bay Stowage Planning system

Reefer Container Monitoring System

2) VP/YP (Vessel Stowage Planning /Yard Planning Work Stations)

Contents:

Break-bulk Cargo Handling System

Ships Mooring Monitoring System

Ships Trim and Stability Calculation System

Container Terminal Management System

Container Yard Planning System

3) YOCS (Yard Operation Computer System)

Contents:

Yard Equipment Data Communication System

Yard Equipment Control System(Position Reporting System)

Performance Monitoring System

Computer Added Lofting/Container Loading System

Container Terminal Management System

(2) Container Terminal System (Japan)

Contents:

Container Yard Storage Control System(Container Inventory System)

Container Terminal Gate Activities System

Container Yard Re-Handling System

Container Unloading/Loading Control system

Container Terminal Documentation System

Container Terminal Management System

(3) COSMOS N.V. (Belgium)

CTCS (Container Terminal Control System)

Contents:

SHIP = Advanced Ships Planning System

SPACE = Container Yard Management System

TRAFFIC = Transporter Flow Control System

(4) NAVIS CORPORATION (USA)

1) SPARCS (Graphical Planning and Control for Container Terminal)

Contents:

Container Yard Planning System

Container Tracking Flow System

Container Inventory Control System

Marine Information Service System

Ships Bay Stowage Planning System

Ships Trim and Strength Calculation System

2) EXPRESS (Comprehensive Information Management for Container Terminal)

Contents:

Cargo Booking Control System

EDI/E.Mail Data-Base System

Export /Import Documentation System

Hazardous Cargo Handling System

Container Inventory Control System

Marine Information Service System

Port Management System

Ships Bay Stowage Planning System

Container Terminal Management System

(5) HPC (Hamburg Port Consulting Gmb H)

CTIS (Container Terminal Information System)

Contents:

Cargo Booking Control System

Container Loading/Unloading Control System

Container Repair/Maintenance System

Reefer Container Management / Monitoring System

Container Terminal Management System

Yard Planning System (Reservation of Yard Slots)

Gate Transaction Control System

(6) CMC Limited (India)

1) MACH SHIPS PLAN

Contents:

Container Loading/Unloading and Crane Working Planning

Ships Hull Strength Calculation System

Ships Bay Stowage Planning System

2) MACH YARD PLAN

Contents:

Container Yard Management System

Container Yard Location System

(7) Total Soft Bank Ltd. (Korea)

1) CATOS

Contents:

Ships Management System

Container Yard Planning system

Container Terminal Gate Transaction System

2) CAPS

Contents:

Container Cargo Booking Control System

Container Loading/Unloading Stowage Planning System

Ships Stability Calculation System

Terminal Departure Report (TDR) EDI Data-base System

Reference -2 Container terminal information transmittal system

The information transmittal systems currently in use at container terminals are the following four, some of which are used to detect the locations of the handling equipment in the terminals, in addition to exchanging information:

(1) Radiotelephone (handy talkies) system

This communication system with radiotelephones had been used since the start of container transport, in which communication is only one way at a time. After the number of containers increased and the development of electronic communication devices made a remarkable progress, this system ceased to be the major means and has only been used as a supplementary means of communication at ordinary container terminals. It is still popularly used, however, at small-scale container terminals and van pools and more extensively by drivers of marine container trucks.

(2) Mobile radio terminal on vehicle system

In this system, the mobile radio (receiver/transmitter) terminals installed on vehicles are connected with the host computer in the operation room, though partly off the line. Information is exchanged in real time through the radio terminals on vehicles or the handy terminals carried and operated by the workers in the yard. While the output power is low, the range performance covers the whole terminal area with the help of a network of antennas spread all over and linked with coaxial cables, etc.

As this type of equipment is being developed and made by not a few manufacturers of many countries, this system is expected to be widely introduced to various physical distribution facilities before long.

(3) Mobile telephone system (PHS = personal handy phone system)

This is a communication system with mobile telephones using weak radio beams, which are converted from the commonly used type of mobile telephones. As their range performance is a radius of approximately 100 meters, antennas need to be installed on lighting poles, etc. as necessary in order for this system to be used at vast container terminals. This system is extensively used as the information transmittal system at small-scale container terminals and warehouses. As the initial investment costs for the system are low, it is expected to be more popular at

inland depots, van pools, etc.

(4) GPS - Global Positioning System

By installing the GPS receivers on the handling machines, they can be radiolocated in real time. However, the GPS receivers are different in their prices and accuracy from model to model. It is also to be noted that there might be dead ground (or blind spots) within the terminal where radio wave is hindered from reaching the receivers by huge handling equipment and/or a high stack of containers in the yard. In order to solve these problems and get rid of the fading or dead spots, it is necessary to set up antennas as necessary, as well as to have a separate system for communication secured to transmit handling orders to the equipment operators. This GPS is not adopted at many terminals yet with the initial investment costs being higher than that for other systems. But as the size of normal container terminals become larger and larger, this system, which tends to be introduced in a short time without public engineering works accompanied, is expected to prevail at existing container terminals too.

Note: GPS- Global positioning System is a world wide radio-navigation system formed from a constellation of satellites and their ground stations. GPS uses these satellites as references points to calculate accurate positions. GPS receivers are small integrated circuits and are also economical. They are now being found in people's cars, boats, planes and laptop computers.

Reference - 3 Guide to terms for international shipping and container transport

B/L (BILL of LADING)

A document specifying the terms of transportation contract between the shipping company and the shippers/consignees, being one of the negotiable instruments by which the shipping company undertakes that they have received the cargo from the shippers and will deliver same to the consignees at the designated discharge port.

BAY PLAN (Container Stowage Plan)

A sheet of plan per hatch showing in a sketch how containers are stowed there onboard, where shown are such details as container no., loading/discharge ports, container weight, kind of special cargoes, etc. for each stowage location.

CABOTAGE

Generally, it means a coastal shipping or domestic coastal trade, while commonly used in the meaning of "protection of domestic shipping companies" against foreign ships' entry in the field, referring to the public international laws regulating that each nation can reserve its domestic coastal shipping right for ships registered with the country.

CELL GUIDES

L-shaped steel structures installed onboard so that the four corners of a container may slide smoothly along them when lifted up or down in ship's operations

CORNER CASTINGS (container corner fittings)

Corner fittings on the top and bottom of each corner post of a container, which are used when the container is lifted up or down in ship's operations or when lashed in case stacked in tiers

CSC (INTERNATIONAL CONVENTION FOR SAFE CONTAINERS)

An agreement among nations for safety of containers, in which it is regulated that containers five years old must be inspected regularly every 30 months or less thereafter, as in the Ships Safety Act in case of Japan

C F S (CONTAINER FREIGHT STATION)

A cargo handling warehouse usually located within a container terminal (in many cases), an ICD or inland container depot, etc., where cargoes less than a container load are vanned/devanned or consolidated/assorted.

C I F (Cost, Insurance and Freight)

One of the terms of pricing in foreign trade, at which the cost, insurance and

freight constitute the price to settle
Note: C & F means the cost and freight, where the insurance is excluded from CIF.

C K D (Complete Knock-Down)
A common name to call a group of car (& truck) manufacturers' cargoes comprising half-assembled products and parts to be supplied to their factories overseas for assembling cars or trucks there

CLP (Container Load Plan)
A document showing the details of cargoes loaded in a container such as name of commodities, number of units, their weight, etc.

COFC (Container On FlatCar)
A mode of service transporting containers directly loaded on railroad flatcars to inland delivery points, which is being replaced by the DST (Double Stack Train) services now increasing in number.

C. Y. (Container Yard)
A yard to store containers, usually meaning a yard for empty containers with a yard for export/import loaded containers being called a marshalling yard

DANGROUS CARGO LIST (dangerous cargo manifest)
A manifest listing dangerous cargoes loaded onboard in accordance with the internationally accepted regulation of IMO Codes

D/O (DELIVERY ORDER)
A document by which the shipping company instructs the terminal operators, etc., who keep the specified cargoes in custody, to deliver them to the consignees or the bearer of the document

D/R (DOCK RECIEPT) (cargo receipt)
A document to be issued to the shippers to acknowledge receipt of export cargoes at the container terminal (for cargoes in container) or CFS (for LCL cargoes), the format of which is usually almost identical with that of a B/L

D F (DRY FREIGHT CONTAINER)
A closed type of general container made of steel or aluminum to carry general cargoes other than refrigerated cargoes, bulky machinery, liquid and other special cargoes.

DST (DOUBLE STACK TRAIN)
A mode of transport of marine containers in the USA and Canada, wherein containers are double-stacked on shipping companies' special railroad cars. A train is usually made up of 15 to 28 cars, with 10 forty-foot containers being loaded per car.

ETA (Estimated Time of Arrival, usually said of a ship)

ETD (Estimated Time of Departure, usually said of a ship)

EXCEPTION LIST

A document listing irregular-shaped cargoes and/or cargoes loaded in irregular conditions onboard such as damaged containers, mostly for use at discharging operations

FCL (Full Container Load)

Cargoes not less than a container load in volume; They are loaded into one or more containers by exporters at their own account and delivered to the shipping company at a container terminal (ICD or inland point included) designated by the carrier.

FEEDER SERVICE, by FEEDER VESSEL

A mode of service transporting containers by a feeder vessel to/from major ports on the trunk sea roads where large-sized mother vessels call regularly from/to minor ports off the trunk roads. Feeder vessels, most of whom used to be smaller ships with a loading capacity of less than 500 TEUs, are becoming so much larger in size that many of them have a capacity of over 1,000 TEUs.

FOB (FREE ON BOARD)

One of the terms of pricing in foreign trade, at which the goods are passed over from the exporters to the importers at the time they are loaded onboard, with the costs incurred till then being included in the price while the freight and insurance to be incurred thereafter are paid by the importers, who, in turn, have the right to nominate the ship to load.

HIGH-CUBE CONTAINER

The name given to a container 9.5 feet high, usually 40 feet long, while most of 40 foot containers are 8.5 feet high. A part of containers in service mainly on the sea roads to/from the North America are now 9.5 feet high and 45 feet long, and it is legally permitted within the USA to carry longer containers, i.e. 48 feet or 53 feet long.

I C D (INLAND CONTAINER DEPOT)

An inland point of connection or physical distribution depot at an inland point in container transport networks off the sea ports, where there are storage facilities for containers and cargoes with customs clearing functions. It is, therefore, also called a "dry port".

IMO (International Maritime Organization)

A substructure of the United Nations for the consultation of inter-governmental maritime affairs, formerly known as IMCO until 1982

INTERMODAL TRANSPORT

A mode of transport wherein cargoes are transported to a final destination by two or more means (modes) of transport

ISO (International Organization for Standardization)

L/C (Letter of Credit)

A document issued by a bank, usually in the importers' country, as per the importers' request, by which the issuing bank guarantees payment of the invoice value of shipment when shipping documents are presented to them

LCL (Less than Container Load)

Cargoes less than a container load in volume, which are usually consolidated with other LCL cargoes in a container when transported

LO/LO (Lift On/Lift Off)

A general mode of container loading/unloading in ship's operations, wherein containers are lifted onto/off the ship either with gantry cranes installed on the quay or with the ship's cranes

MANIFEST

A document listing particulars of cargoes onboard a ship, prepared by loading/discharging ports. Those for cargoes to be discharged at a port are submitted to the customhouses, the port administrators, etc. there at her calling.

MLB (Mini Land-Bridge)

A mode of combined mutimodal transport, wherein containers discharged on the West Coast of the USA are carried mainly by railway to the East Coast, East Canada and the Gulf area in the south, or vice versa

NVOCC (Non-Vessel Operating Common Carrier)

A carrier who does not operate ships itself but charters part of ships' space from ship operating other carriers and takes the responsibility of carriage of goods by issuing their own Bs/L

OFF DOCK CFS/CY

A bonded facility functioning as a CFS/CY, located off the port area, where containers and cargoes are received, stored and delivered to supplement a container terminal in the port area

PANA MAX TYPE

The type of ships whose size is the maximum to be able to pass the Panama Canal, or more exactly, 32.2 meters wide and 275 meters long at most. Nowadays larger ships called "post Panamax type" are being built and operated on the routes bypassing the canal.

PNW (Pacific North-West)

The area ranging from Oregon, Washington to the western Canada, the sea roads to/from which are among the major container routes in the world

PSW (Pacific South-West)

The area in California, the sea roads to/from which are among the major container routes in the world

PREFIX CODE

Letters put before numbers to constitute container identification numbers, by which the parties controlling each container, such as the owners or long-term charterers, are identified

REEFER CONTAINER LIST

A document listing the details of reefer containers by the loading and discharge ports, including the designated temperatures and attentions to be made during the transport

RO/RO (Roll On/Roll Off)

A mode of container loading/unloading in ship's operations like ferryboats', wherein containers are hauled onto/off the ship by heavy vehicles, forklifts, etc. through openings on the ship's side(s) or at her stem or stern

SEA AND AIR (combined through transport)

A mode of combined multimodal transport by sea (ship) and air (airplane)

S/I (Shipping Instructions)

A document by which the shippers instruct their customs brokers to arrange the customs clearance and the shipment of the export goods; Nowadays they process necessary data electronically with their computers linked together on the line

TEU (Twenty Foot Equivalent Unit)

A unit used in counting containers in terms of 20 foot containers, in which one 40 foot container is counted as 2 TEUs. Likewise in case containers are to be counted in terms of 40 foot containers, one 20 foot container is counted as 0.5 FEU (Forty Foot Equivalent Unit).

TIR(Transports Internationaux Routiers)

An agreement on international transportation by land, made between European countries and the USA. In accordance with TIR, approved structures of containers, if duly sealed, are allowed to pass the borders without being inspected by the customs or being taxed by them.

TOFC (Trailer On Flat Car)

A mode of service transporting containers loaded on trailers (chassis), as they are, on railroad flatcars to inland delivery points

TRANSHIPMENT (often abbreviated to T/S) CARGO

Cargo (to be) unloaded from a ship, who is not to call at the cargo's final destination, and (to be) reloaded to another ship for further carriage

TRANSIT TIME

The time required for a ship to sail from a loading port to a discharge port. Shipping companies do their best to minimize this transit time (in average) as exporters/importers tend to select a ship on the basis of the transit time of their cargoes.