

Chapter 14

International Terminal Operations

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- Ocean Terminals
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- Rail Terminals
- Road Freight Centers
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Functions of Freight Terminals (I)

Freight terminals are the points at which freight is handled between segments of an international voyage.

- They are an **interface** between modes of transportation. They have equipment that allows them to unload cargo from one mode of transportation and load it on another. They have access to the networks of both modes of transportation. An ocean terminal can load/unload cargo from ships, as well as from railcars and trucks.
- They are **transfer points** within the same mode of transportation. They have equipment that allows them to load and unload cargo from one vehicle in a transportation network to another. An air freight terminal can move cargo from one aircraft to another.

Functions of Freight Terminals (II)

- They are a **point of convergence**, where cargo from different origins can be consolidated into a large shipment. For example, a port will take cargo from hundreds of trucks and consolidate it into a single ship's cargo. The reciprocal is also true; a single ship's cargo will be transferred to hundreds of rail cars.
- They offer **short-term storage** to shippers, either while they are waiting for a means of transportation, or while the cargo is waiting to be cleared through customs.

If cargo is left at a terminal for too long, the terminal will charge demurrage fees.

Ocean Terminals

Ocean terminals tend to specialize in the type of cargo they handle:

- Bulk terminals handle dry bulk, wet bulk, or LNG cargoes
- General-merchandise terminals handle breakbulk cargo
- RORO terminals handle wheeled cargo
- Container terminals handle containerized cargo
- Refrigerated terminals

Since the capital costs of the equipment needed to handle cargo can be very high, a terminal generally handles only one type of cargo.

Dry-Bulk Terminals

Dry-bulk terminals handle cargo such as grain, coal, fertilizer, or gravel. These cargoes “behave” like liquids in that they fill the entire cargo hold of a ship and are not packaged.

Dry-bulk terminals tend to be either export terminals (the country only exports that commodity and does not import it) or import terminals (the country only imports that commodity and does not export it).

An export terminal will unload trains, barges or trucks, and load ocean-going drybulk ships, and an import terminal will unload ships, and load their cargo into trains or trucks.



The ADM Terminal is handling exports of grain from the United States.

Source: Blue Water Shipping Company



The drybulk terminal in the Port of Sihanoukville, in Cambodia, exports wood chips that are loaded in every space available on the ship.

Source: Amarin Jitnathum



The drybulk terminal in the Port of Guangzhou, China, unloads grain into hoppers that drop the cargo into trucks.

Source: Ivan Kuzkin

Liquid-Bulk Terminals

Liquid-bulk terminals handle cargo such as petroleum oil, oil-derivative products, but also vegetable oils and juices.

Liquid-bulk terminals tend to be either export terminals or import terminals.

A liquid-bulk terminal will interface with the pipeline network (petroleum oil and derivatives) or with the road and rail network (vegetable oils and juices).



The oil terminal in the Port of Singapore.

Source: Oiltanking



The juice terminal in the Port of Rotterdam in the Netherlands.
Source: Dana Clarke

LNG Terminals

LNG terminals handle exclusively liquefied natural gas or liquefied petroleum gas.

LNG export terminals liquefy natural gas that arrives by pipeline by removing impurities and cooling it to cryogenic temperatures (-162° C or -260 ° F).

LNG import terminals unload liquefied natural gas and returns it to gas using a gasification plant. It also adds an odorant before distributing it through the inland network (pipeline, rail or road).



The LNG import terminal in the Port of Revithoussa in Greece.
Source: DESFA

General-Merchandise Terminals

General-merchandise terminals are also called general-cargo terminals or breakbulk terminals.

They handle the export and import of cargo that is too heavy or too bulky to be placed in a container and is transported directly in the holds of breakbulk ships. The cargo is unitized in a crate, a box or other transportation unit.

Because the cargo is not of uniform size, weight, or shape, the stevedores must determine the best way to load it.



A breakbulk terminal's stevedores must load the cargo and make sure it does not move during transport.

Source: Alexander Klunnikov

Roll-On Roll-Off Terminals

Roll-on roll-off terminals handle cargo that can be wheeled onto the ship. Most frequently the cargo is self-propelled.

Many RORO terminals are also exclusively export terminals or import terminals, as the balance of trade in automobiles tends to be very lopsided.

Wheeled cargo other than automobiles represent challenges for RORO terminals as their weight and size may



A RORO terminal uses a lot of labor to drive the cars on and off the ship, and a lot of space to park the cars before loading and after unloading them.

Source: Aerial-motion

Container Terminals

Container terminals handle cargo that has been containerized. They function as export and import terminals, and the greater the balance between exports and imports, the more efficiently they can operate.

Ocean container terminals interface with the road network, the rail network, as well as with fresh-water barges.

Container terminals are equipped to handle containers of all kinds, including dangerous goods and refrigerated goods.



Container stackers move containers from trucks to the container yard.
Source: Sanit Fuangnakhon



Rubber-tired gantry cranes move containers in the container yard.

Source: Kalmar Global



Yard trucks are the most frequently used method to move containers from the yard to the quay crane area.

Source: Container Management



Automated Guided Vehicles (AGVs) transport containers between the yard and the quay cranes in the Port of Amsterdam.

Source: VandeWorlf Images



Quay gantry cranes work simultaneously to load and unload a containership. The white containers are reefers; they are powered by the ship's power supply.

Source: StockStudio Aerials



The container yard area in the Port of Antwerp .
Source: PSA Antwerp



The port of Yangshan in China is the largest container port in the world.

Source: Zhao Jiankang



Containers are lashed onboard the ship by lash bars and twist locks.

Source: Ole Tange

Refrigerated Terminals

Terminals that handle cargo that is perishable are called refrigerated terminals. They handle cargo that is transported directly in refrigerated holds in ships or placed in reefer containers.

Many refrigerated terminals specialize in one type of commodity; for example, the Port of Wilmington in the United States is dominant in the import of bananas, and it imports few other commodities.

Refrigerated terminals' short-term storage includes warehouses that are cooled to the temperature necessary to maintain these commodities under ideal conditions.



The port of Wilmington, Delaware, specializes in the import of bananas.
Source: Port of Wilmington

Dry Ports

Dry ports are inland terminals that handle containerized cargo. They are generally in the vicinity of an ocean port but can be further away.

Dry ports accept cargo from shippers, store it temporarily and then deliver it to the port. They can also pick up goods from a port, store it, then hand it to the buyer.

Originally, dry ports were designed to remove congestion in ocean ports, but many other inland terminals have adopted this term to describe themselves, so the term is less precise than it was.



The dry port of Lagos, Nigeria, reduces congestion in the main port.
Source: Africa Global

Air Freight Terminals

Air freight terminals fulfill the four roles of terminal very clearly:

- They act as an interface between air transport and road transport
- They are a point of transfer from one aircraft to another
- They are a point of convergence, consolidating small packets into larger shipments
- They offer short-term storage

All air freight terminals handle all types of freight (they do not specialize), but some have added specialties in handling certain cargoes.



The air freight terminal in Schiphol, the Netherlands, specializes in imports and exports of flowers.
Source: Air France - KLM - Martinair

Rail Terminals

There are two types of rail terminals:

- **Rail yards** are terminals that act mostly as points of transfers, taking cargo (railcars or containers) arriving on one train and transferring it to another train.
- **Rail terminals** are interfaces between the rail network and another transportation network, whether road or pipeline.



The Maschen Hamburg rail yard in Germany assembles trains with railcars from different origins.
Source: pa/dpa



The Hardisty Oil Terminal in Alberta, Canada, where oil is loaded onto trains that take the oil to the Cushing Terminal in Oklahoma, in the United States, where it is transferred to the pipeline network.
Source: USD Partners LP



The rail terminal in Khorgos, Kazakhstan, is the interface between the Chinese rail network and the Russian rail network, which have different rail track gauges.

Source: Vladimir Tretyakov

Road Freight Terminals

Road freight terminals are called **road freight centers**. They act as points of transfer from one truck to another.

For full-truckload (FTL) cargo, the trailer is simply transferred from one tractor to another.

For less-than-truckload (LTL) cargo, the cargo is unloaded from one truck and consolidated with others with the same destination.



The Garonor Freight Center, north of Paris, France, transfers cargo from semi-trucks and places it in smaller straight trucks that are more suitable for delivery in the streets of Paris.

Source: Prologis

Major Terrorist Acts 1993 – 2012		
World Trade Center Bombing	February 26, 1993	New York City, United States
Sarin Gas Subway Attack	March 20, 1995	Tokyo, Japan
Oklahoma City Bombing	April 19, 1995	Oklahoma City, United States
Métro Bombings	Summer-Fall 1995	Paris, France
Omagh Bombings	August 15, 1998	Omagh, Northern Ireland
World Trade Center Attacks	September 11, 2001	New York City, United States
Anthrax Mailings	September-October 2001	United States
Bali Bombings	October 12, 2002	Bali, Indonesia
Istanbul Bombings	November 15 and 20, 2003	Istanbul, Turkey
Moscow Metro Bombing	February 6, 2004	Moscow, Russia
Madrid Train Bombings	March 11, 2004	Madrid, Spain
London Subway Bombings	July 7, 2005	London, United Kingdom
Mumbai Hotel Attacks	November 26, 2008	Mumbai, India
Kampala attacks	July 11, 2011	Kampala, Uganda
Utoya Island massacre	July 22, 2011	Utoya Island and Oslo, Norway
Monterrey Casino attack	August 25, 2011	Monterrey, Mexico
Boston Marathon bombings	April 15, 2013	Boston, United States
College campus attacks	April 2, 2015	Garissa, Kenya
Bataclan Theater	November 13, 2015	Paris, France
Chemical attack on rebel territory	April 7, 2016	Aleppo, Syria
Truck rampage	July 14, 2016	Nice, France
Car rampages	March 23, and June 3, 2017	London, United Kingdom
Mosque shooting	March 15, 2019	Christchurch, New Zealand
Vienna attack	November 2, 2020	Vienna, Austria