

UNIVERSITÀ  
DEGLI STUDI  
DI TRIESTE



## Ingegneria navale

*Conoscere, progettare e costruire i mezzi navali*

*L'evoluzione delle navi mercantili*

Prof. ing. Alberto Marinò

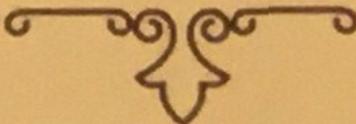
Docente di Costruzioni navali, Navi militari e Sommergibili

# Definizione di nave secondo la Enciclopedia Britannica del 1771



A SHIP IS UNDOUBTEDLY  
THE NOBLEST MACHINE  
THAT EVER WAS INVENTED

ENCICLOPÆDIA BRITANNICA - Edimburgo M.DCC.LXXI.



... tutto ebbe inizio con un tronco scavato!



© BNPS



# *General cargo ship*

# General cargo ship

*attrezzata con picchi di carico*

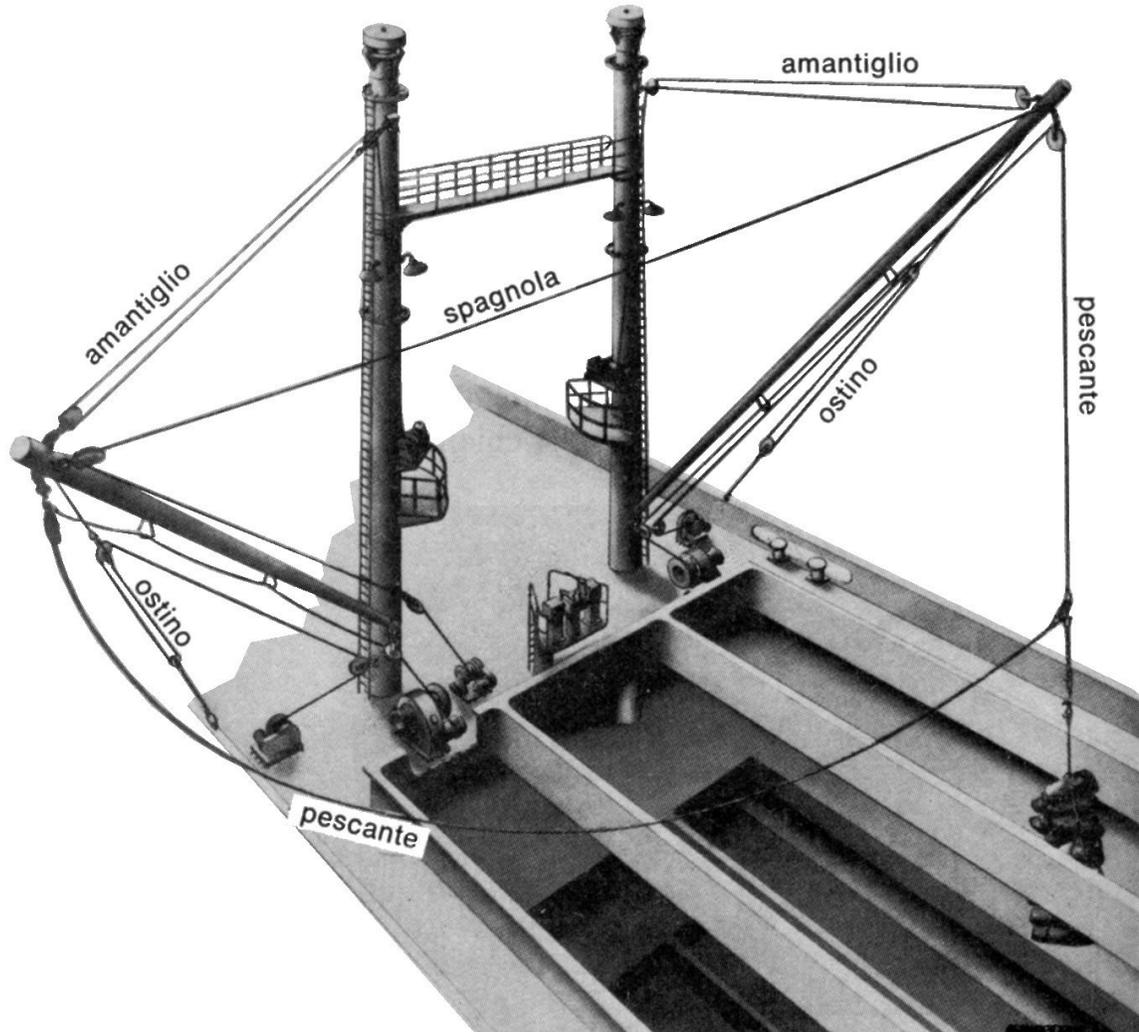


# General cargo ship



# General cargo ship

## *Picchi di carico*



# General cargo ship

## *Gru girevole*

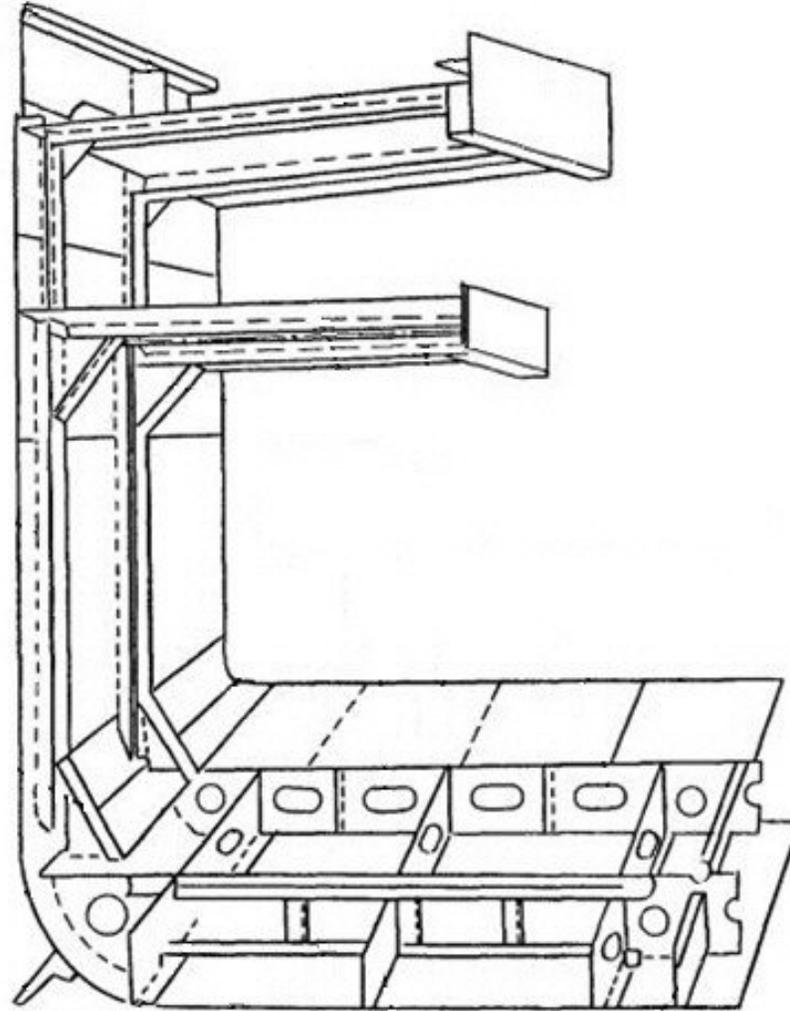


# General cargo ship *attrezzata con gru girevoli*



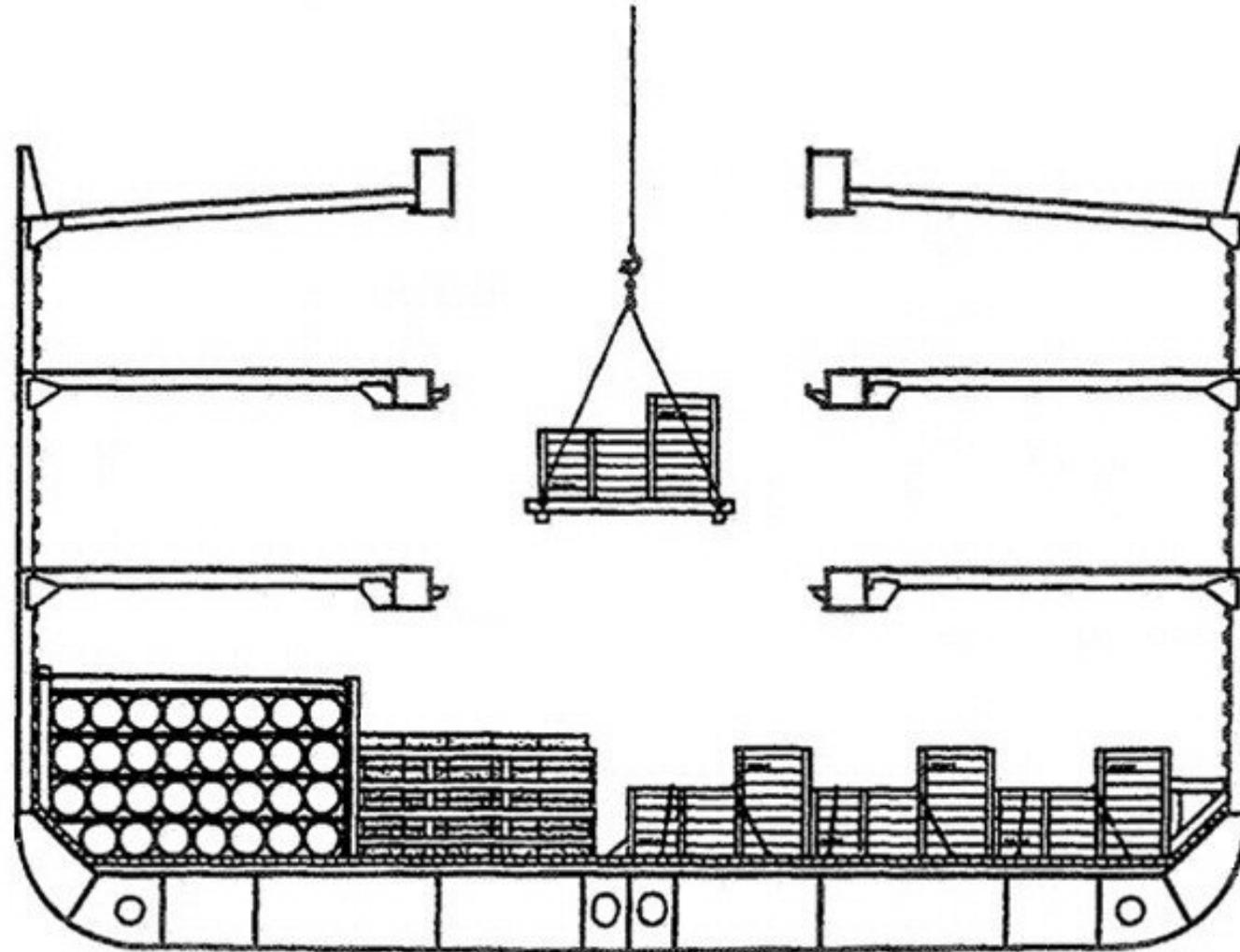
# General cargo ship

## Stiva



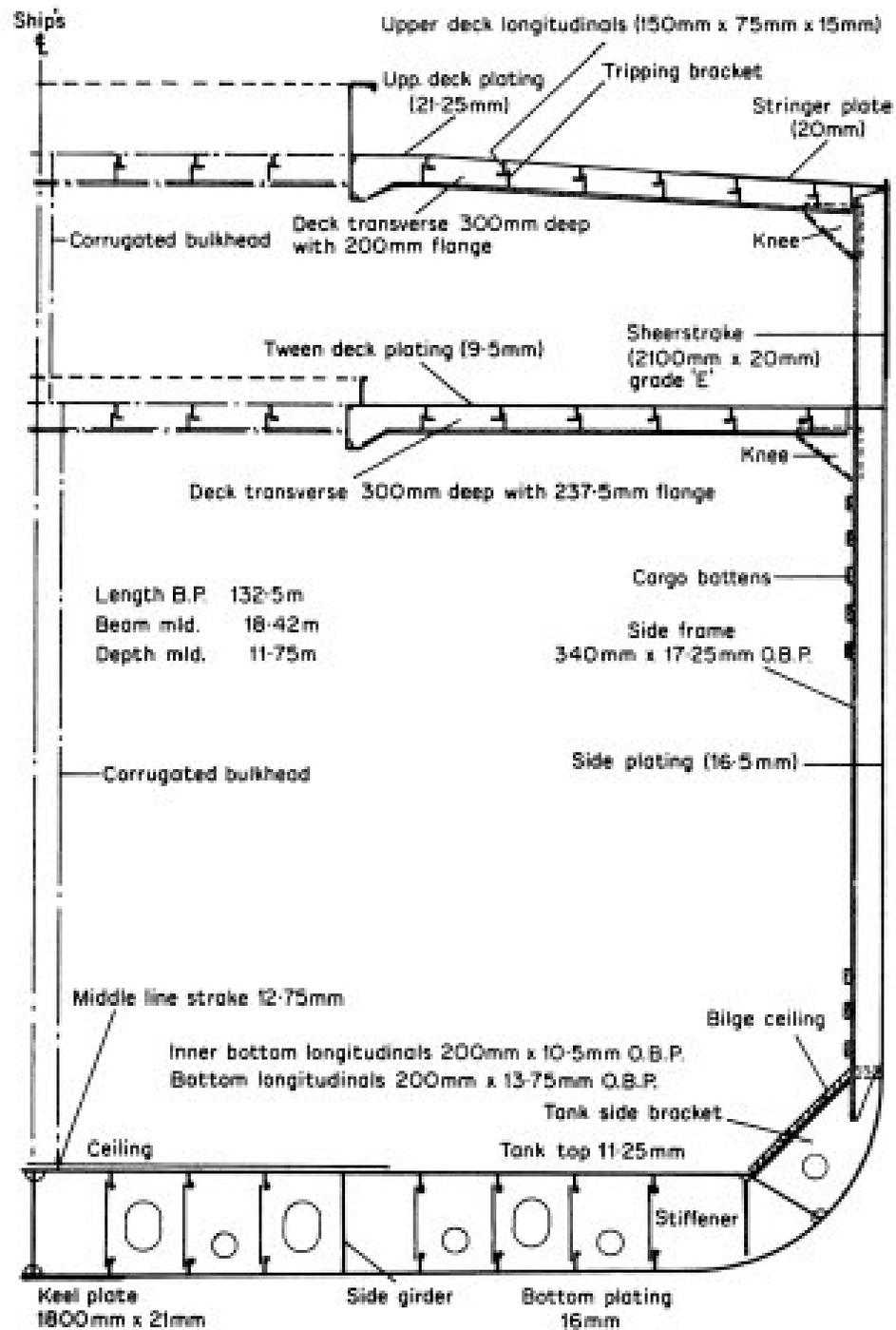
# General cargo ship

## Caricazione stiva



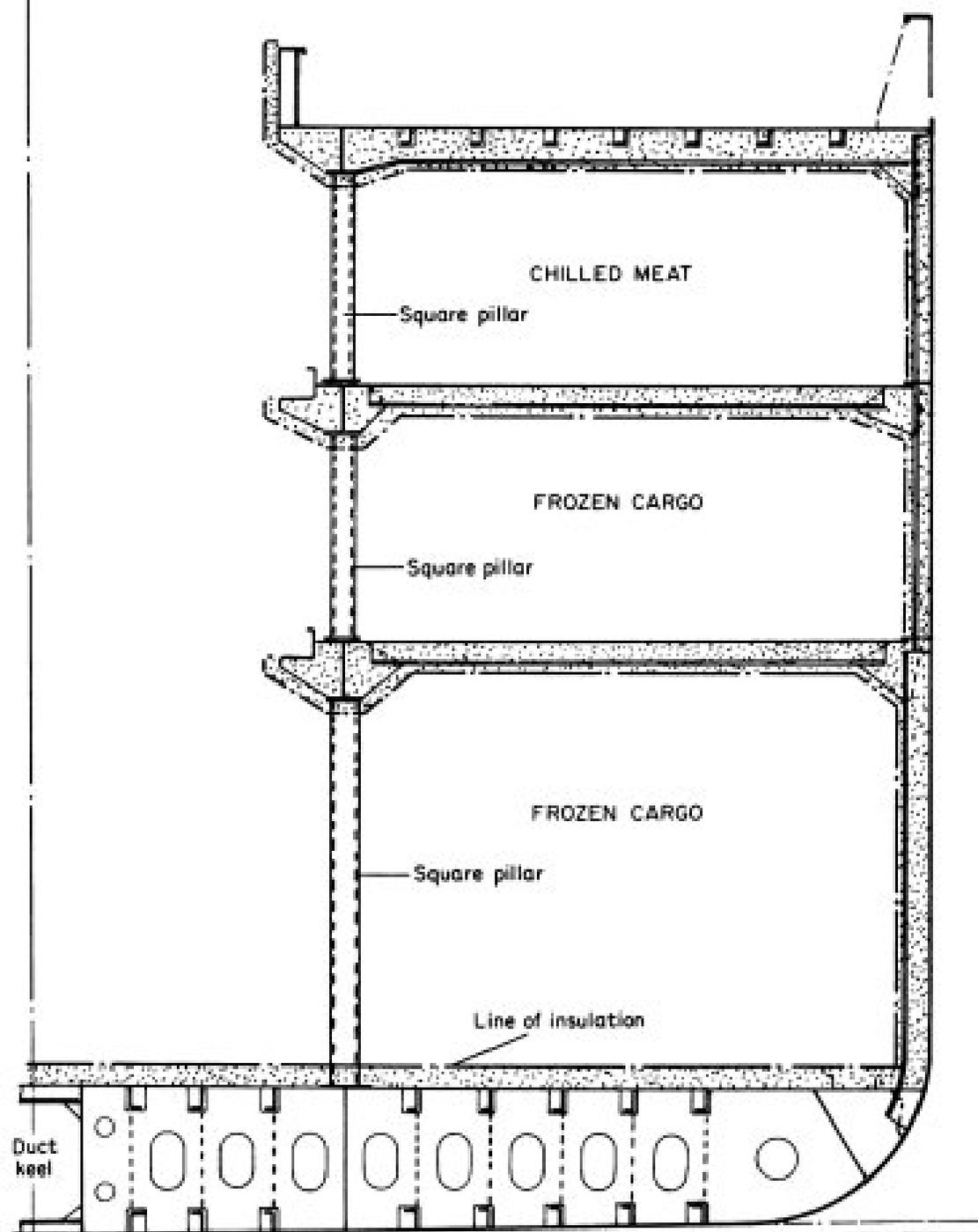
# General cargo ship

## Sezione maestra



# General cargo ship

*Nave per carichi refrigerati*



# General cargo ship

## *Squadre di stivatori a lavoro*



# *Unitized-cargo ships*

*Container ship*

*Ro-Ro ship*

*Barge carrier*

# *Container ships*

# L'evoluzione dei mezzi navali

## *Unitized cargo*



# Container ship



# Container ship

*18000 TEU*



# Ultra-large Container ship

19100 TEU



# Ultra-large Container ship

*20150 TEU*



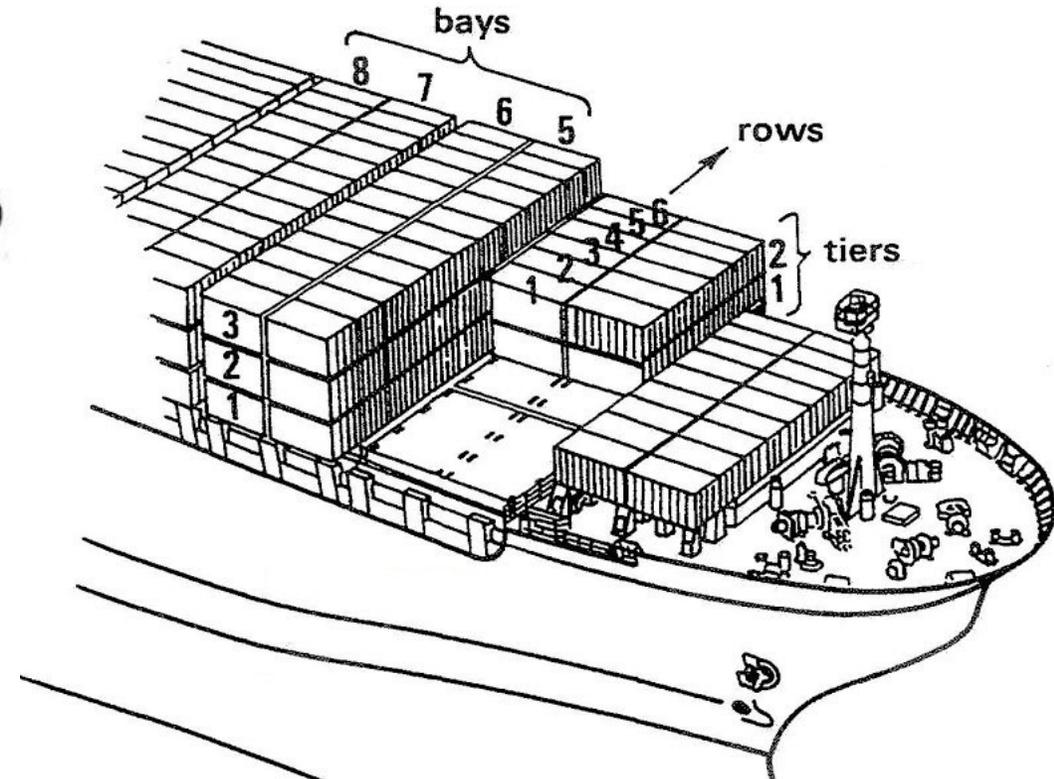
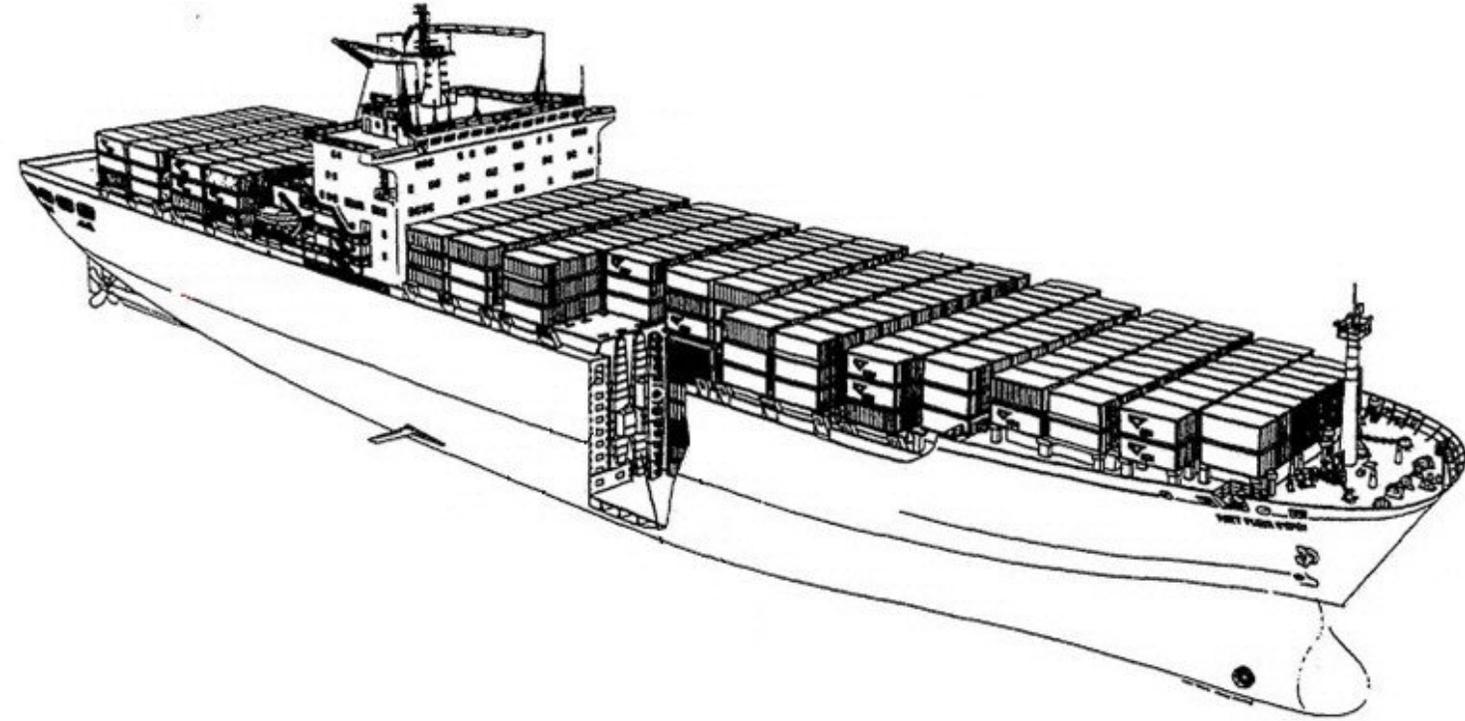
# Dimensioni del container standard ISO da 20 piedi

*TEU = Twenty-foot Equivalent Unit (L × W × H = 20 ft × 8 ft × 8,5 ft)*



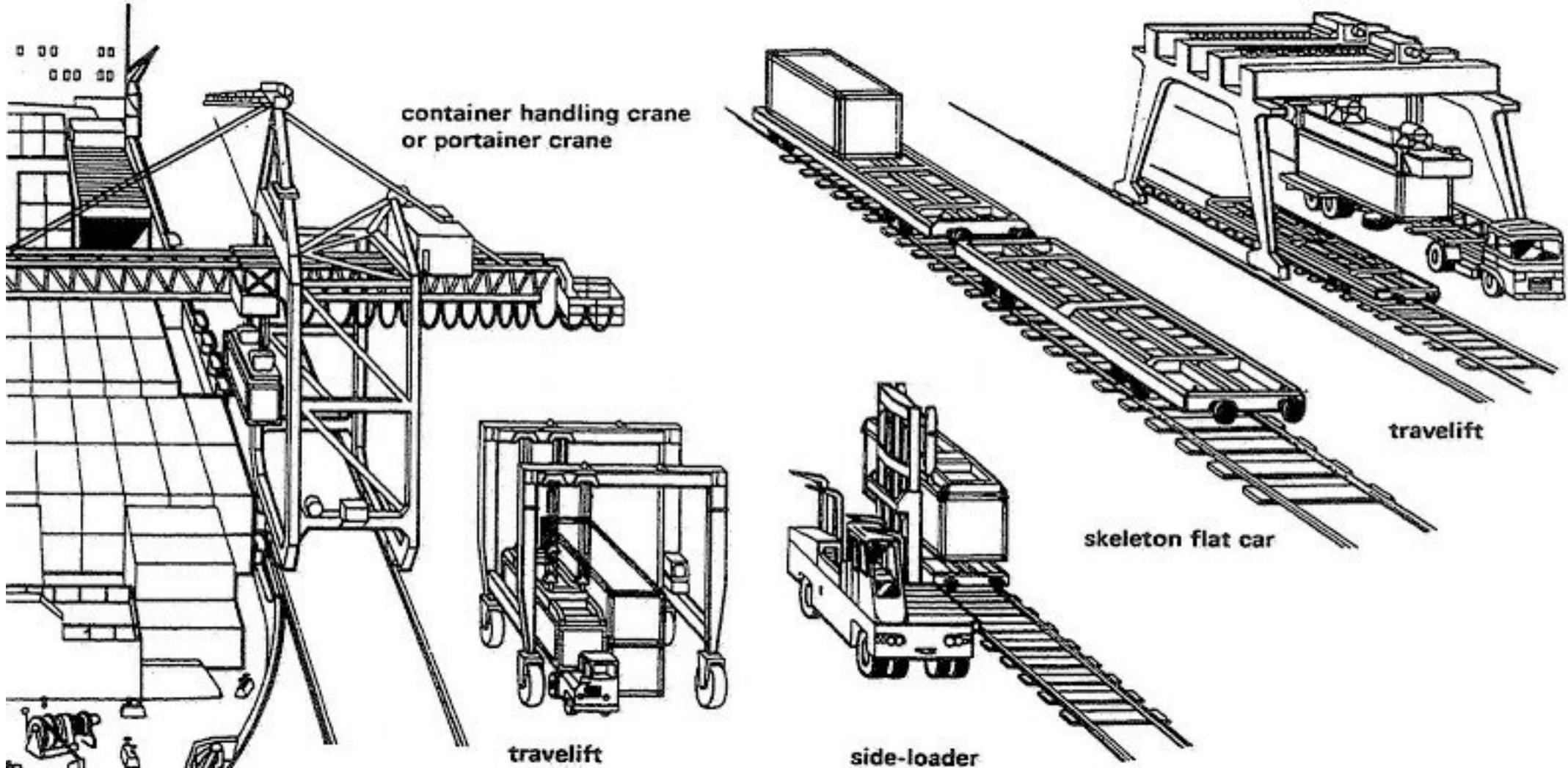
# Container ship

## *Sistema di riferimento contenitori*



# Container ship

## Movimentazione contenitori



# Container ship

## *Portainer crane*



# Container ship

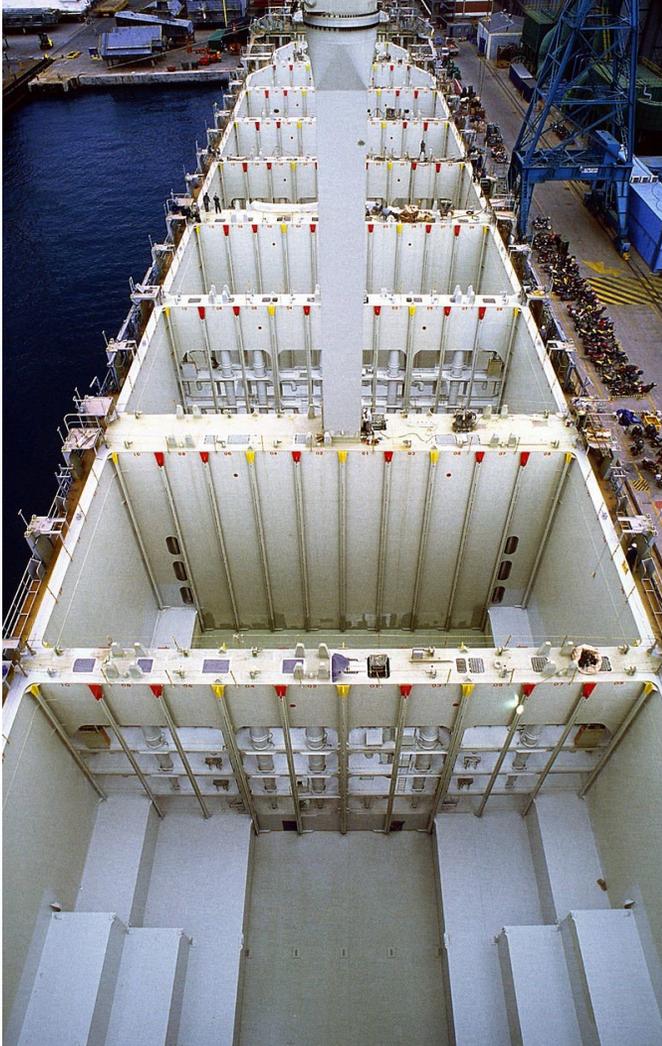
## *Portainer crane*





# Container ship

## Stive



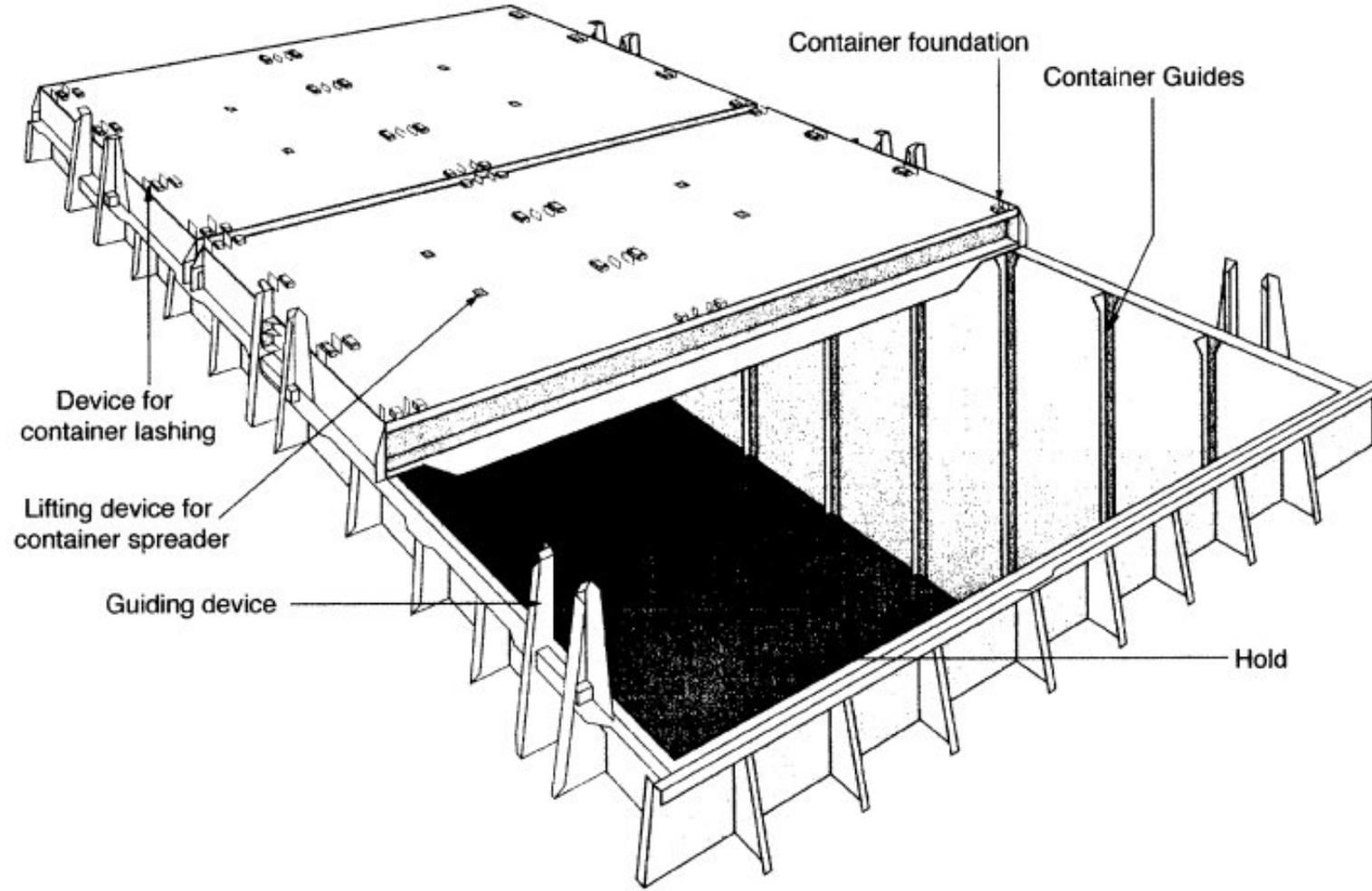
# Container ship

## Guide



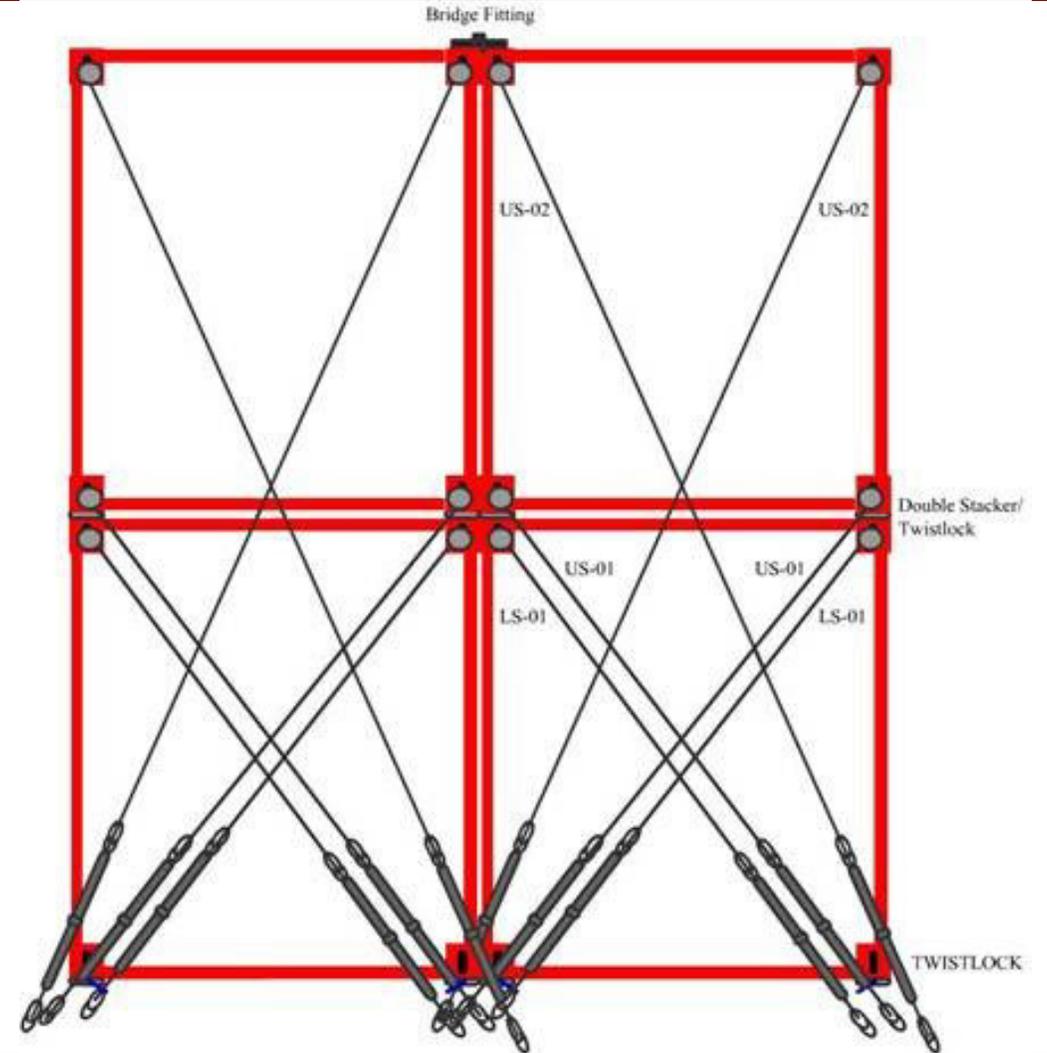
# Container ship

## *Copertura di boccaporta*



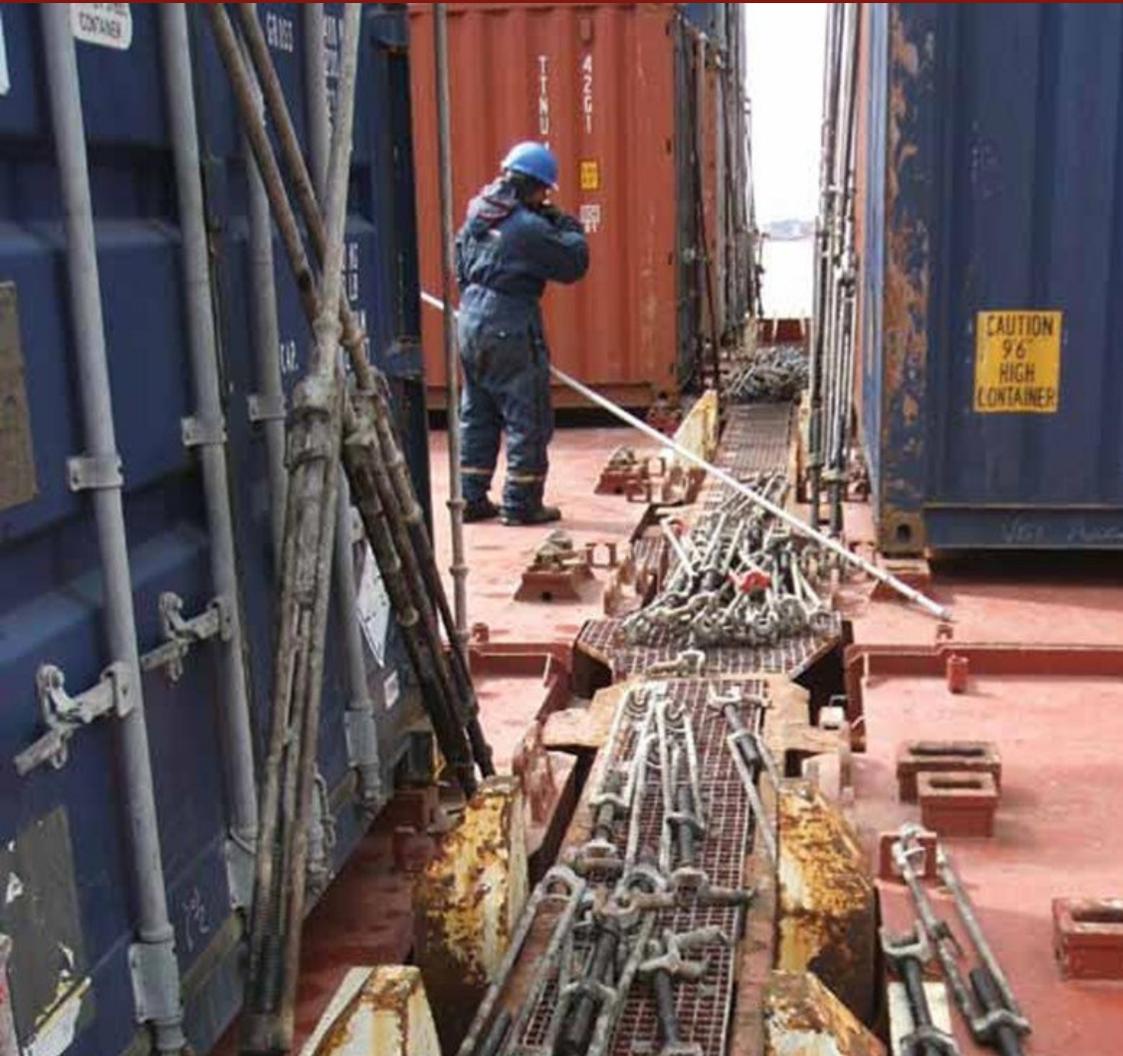
# Container ship

## *Rizzatura container sovracoperta*



# Container ship

*Rizzatura container (lashing rods, twistlock)*



# Container ship

*Twistlock sul ponte e sui pianali di camion o carri ferroviari)*



# Container ship



# Container ship



# Tipi di container

## *General purpose container*



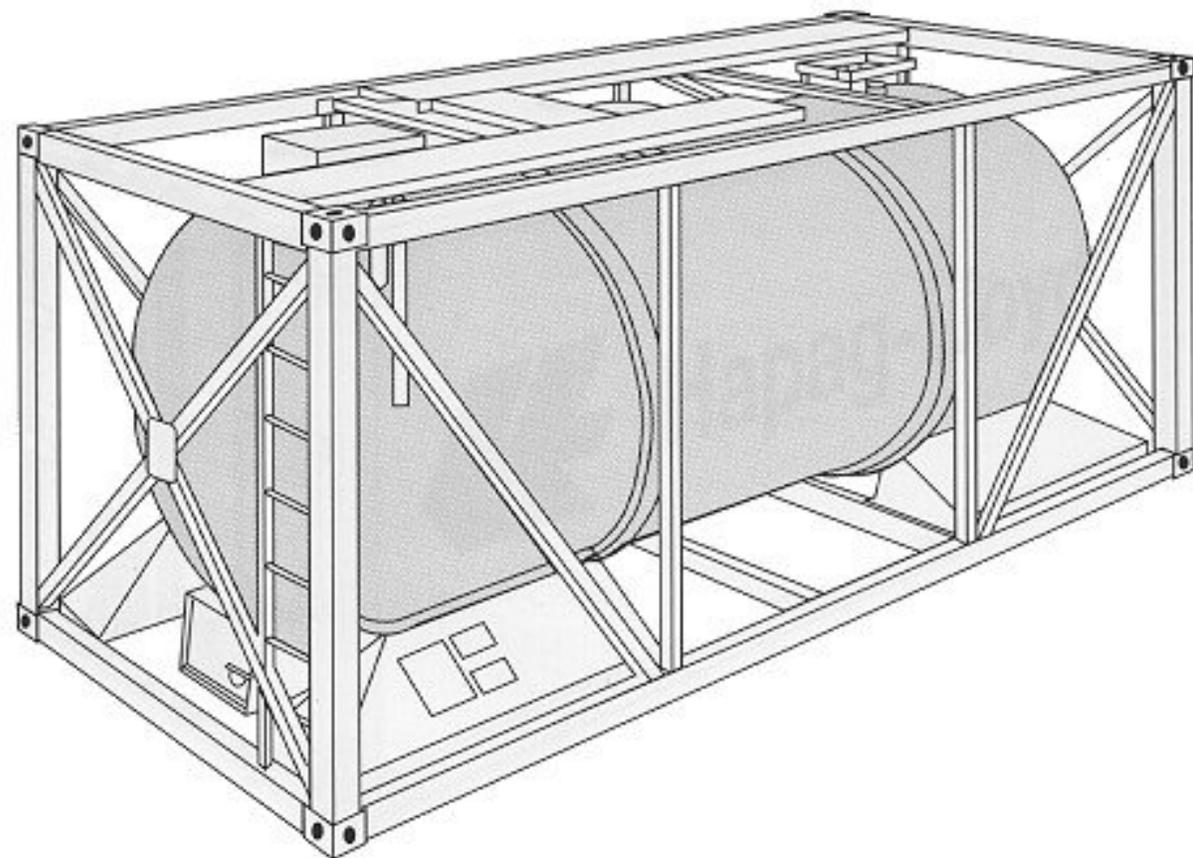
# Tipi di container

## *Open side container*



# Tipi di container

## *Tank container*



# Tipi di container

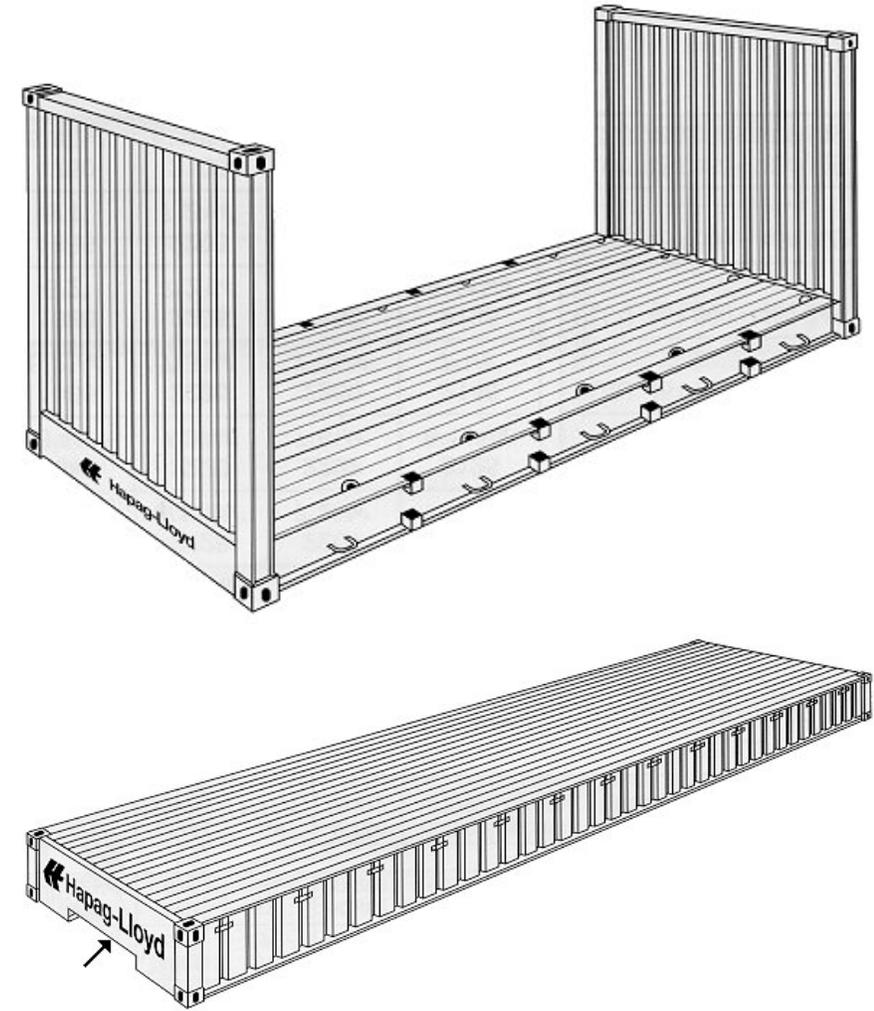
## *Open top container*



# Tipi di container

## Flat rack / Platform

### 20' Flat Rack



# Tipi di container

## *Dry bulk container*



# Tipi di container

## *Dry bulk liner*



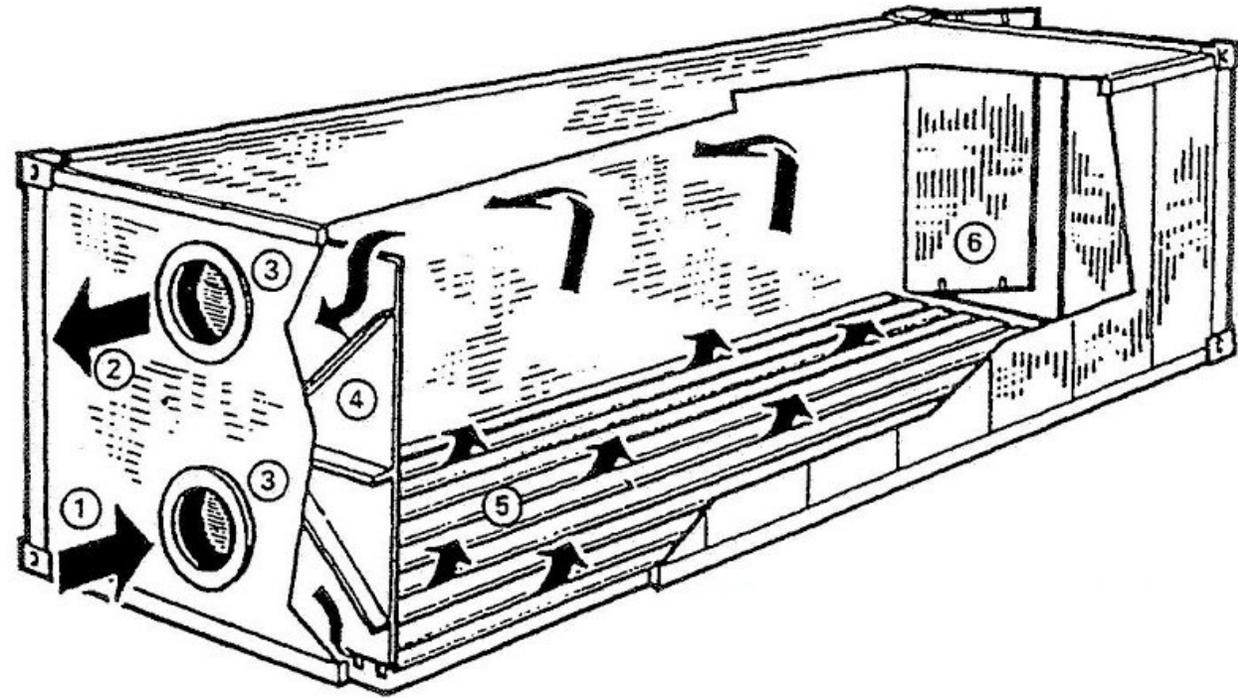
# Tipi di container

## *Reefer container*

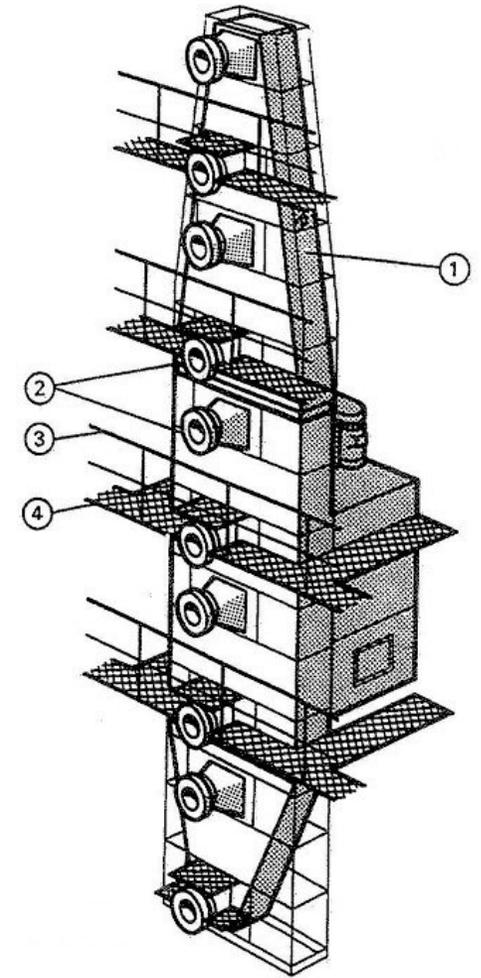
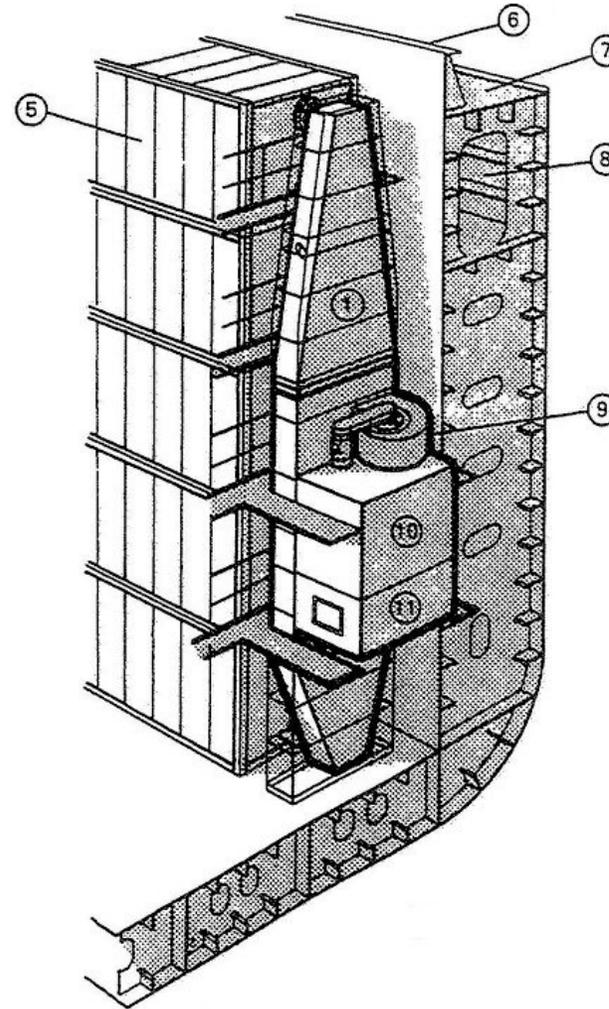
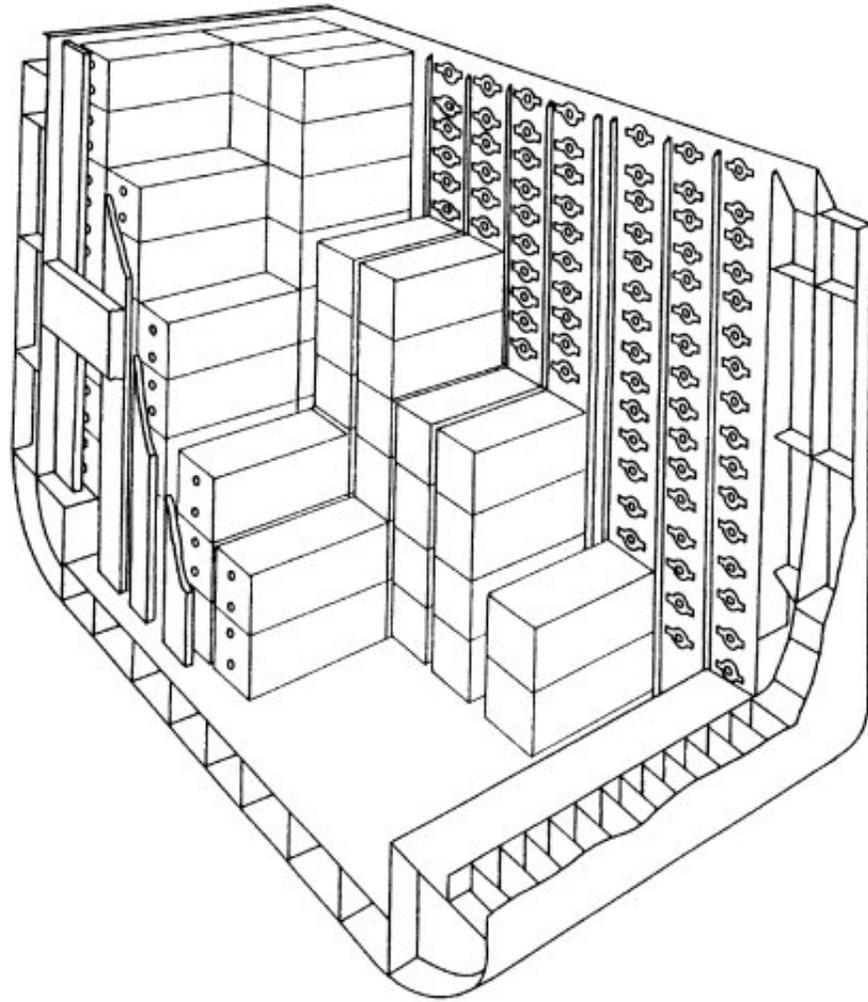


# Tipi di container

*Insulated container (circolazione forzata dell'aria)*



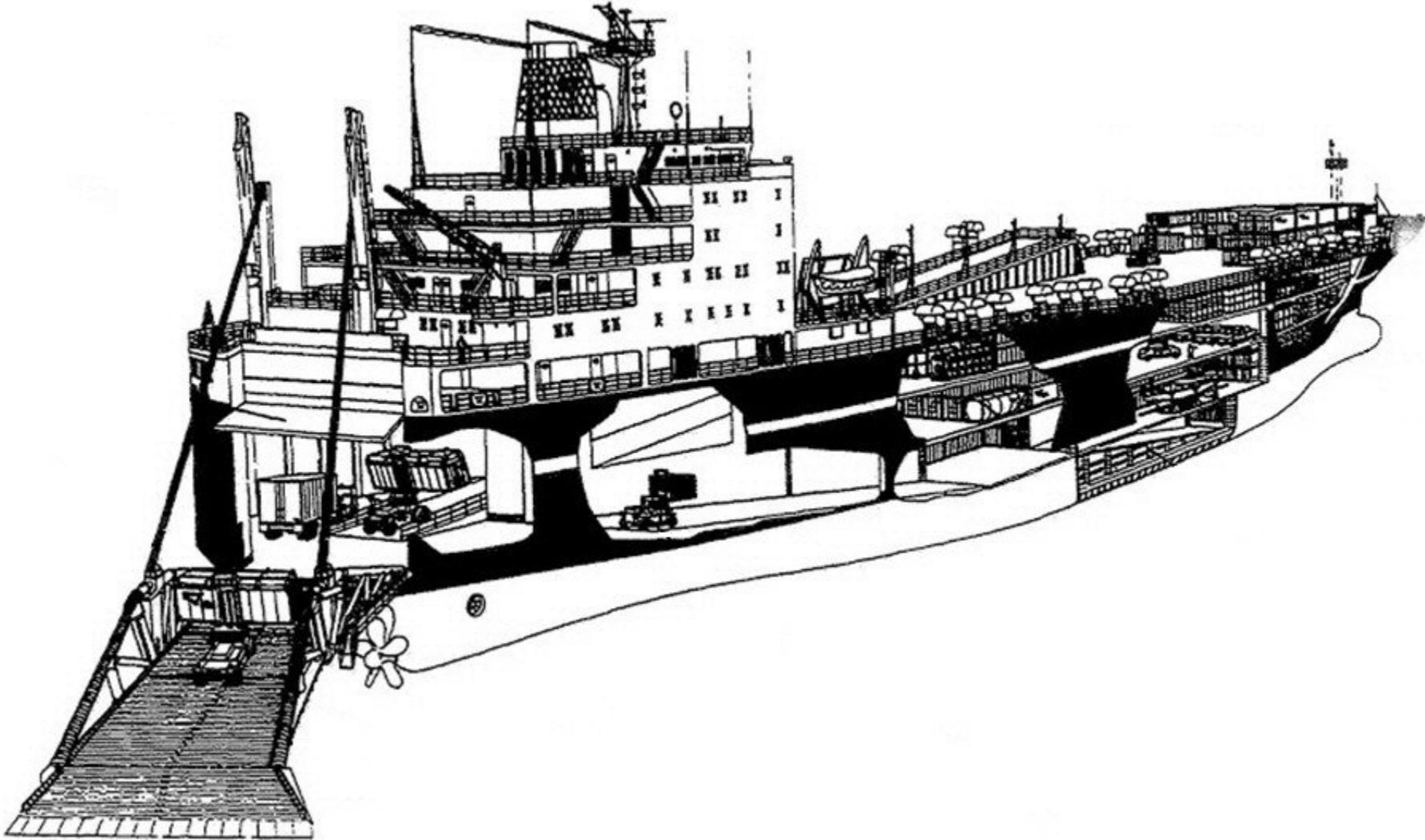
# Stiva/Moduli di ventilazione per contenitori refrigerati



# *Ro-Ro ships*

# Ro-Ro ship

*(Roll on – Roll off ship)*



# Ro-Ro ship



# Ro-Ro ship



# Ro-Ro ship

## *Bow door (celata)*



# Ro-Ro ship

## Bow visor



# Ro-Ro ship

*Operazioni di carico/scarico dal portellone di poppa*



# Roll on – Roll off ship

## *Rampa interna mobile*



# Roll on – Roll off ship

## *Copertura sul ponte*



# Roll on – Roll off ship

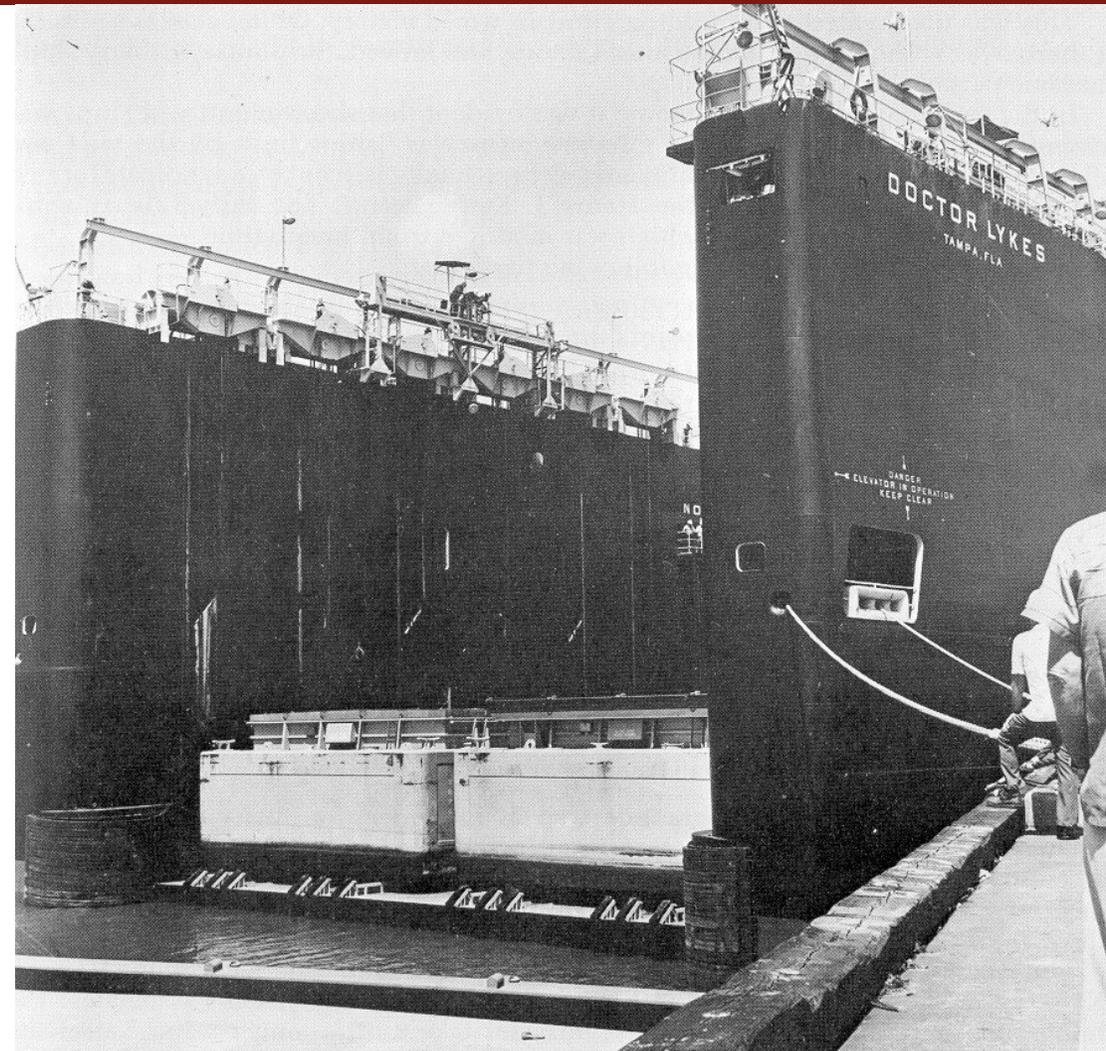
## *Car deck mobili*



# *Barge carrier*

# Barge carrier

## *SeaBee carrier*



Barge carrier

*LASH carrier*



# *Oil tanker*

# Oil tanker

## *Very Large Crude Carrier (VLCC)*



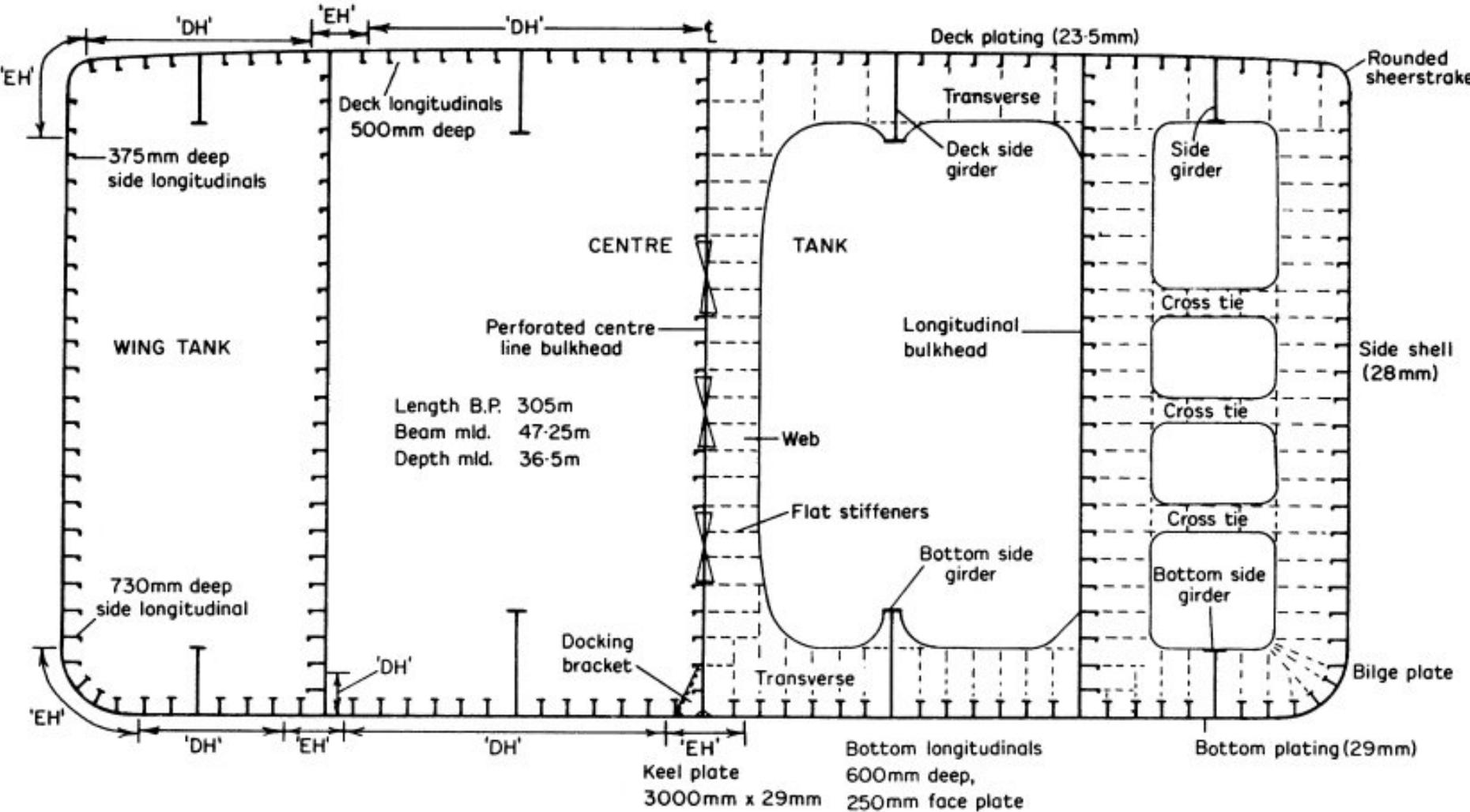
# Oil tanker

## *Very Large Crude Carrier (VLCC)*



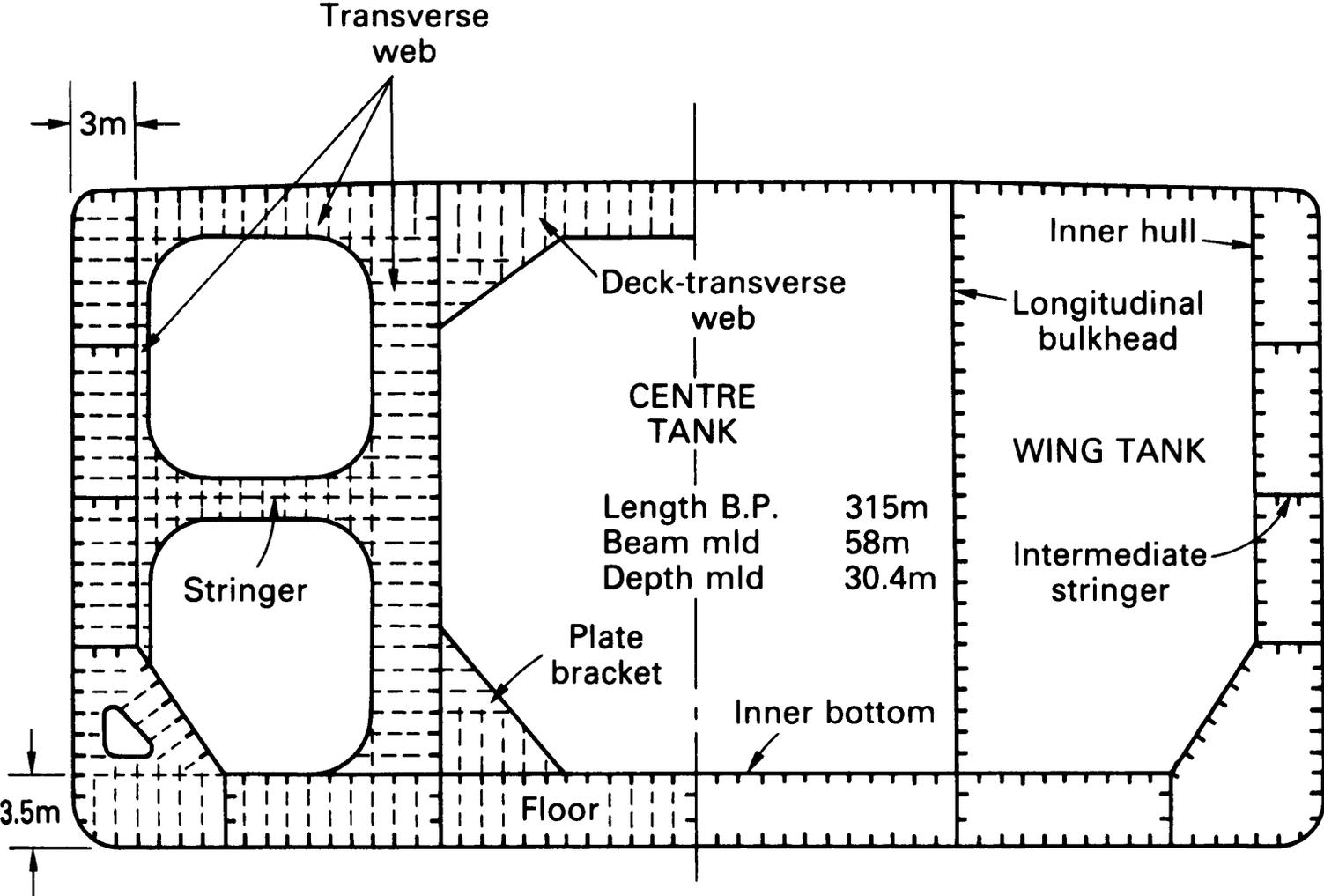
# Oil tanker

## Sezione maestra (scafo singolo)



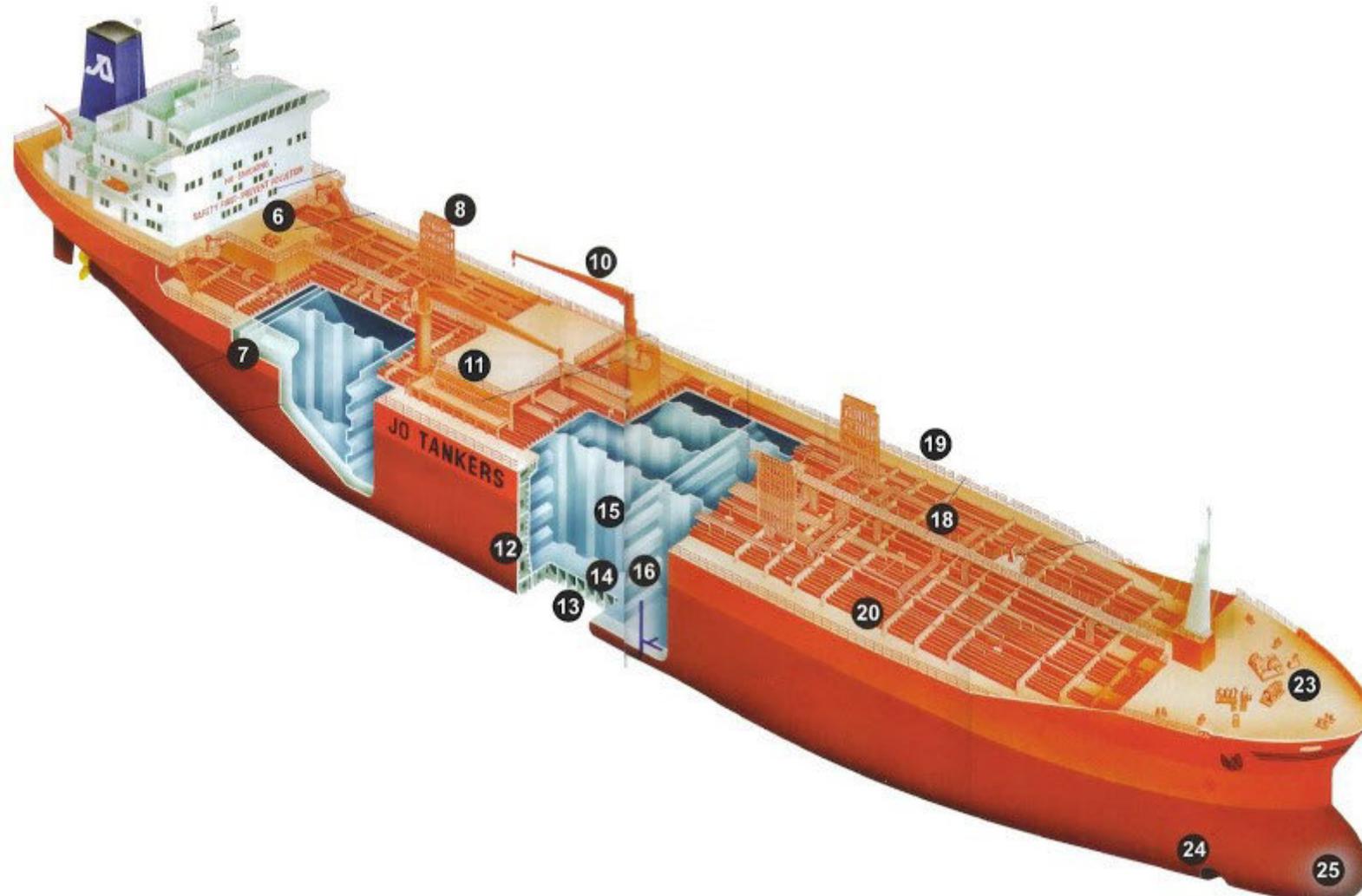
# Oil tanker

## Sezione maestra (doppio scafo)



# *Chemical tanker*

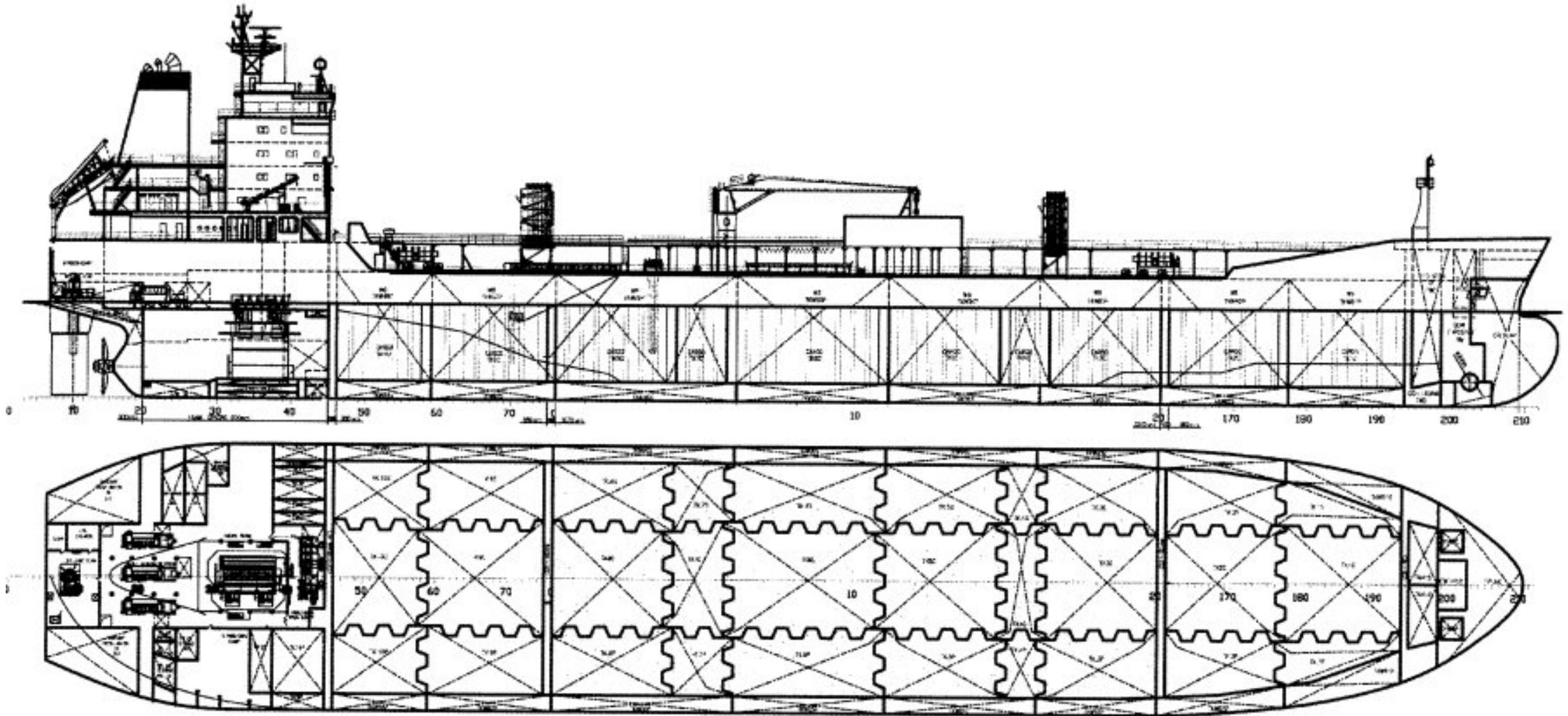
# Chemical tanker



# Chemical tanker

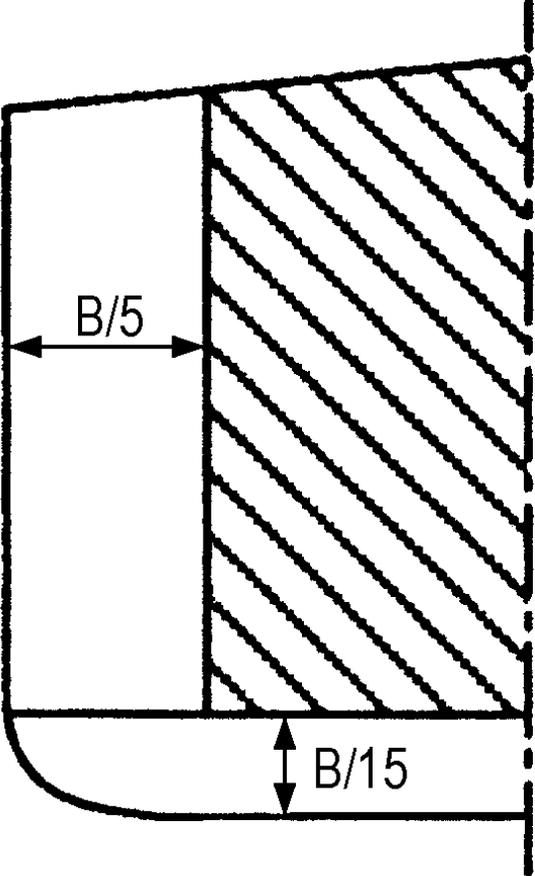


# Chemical tanker

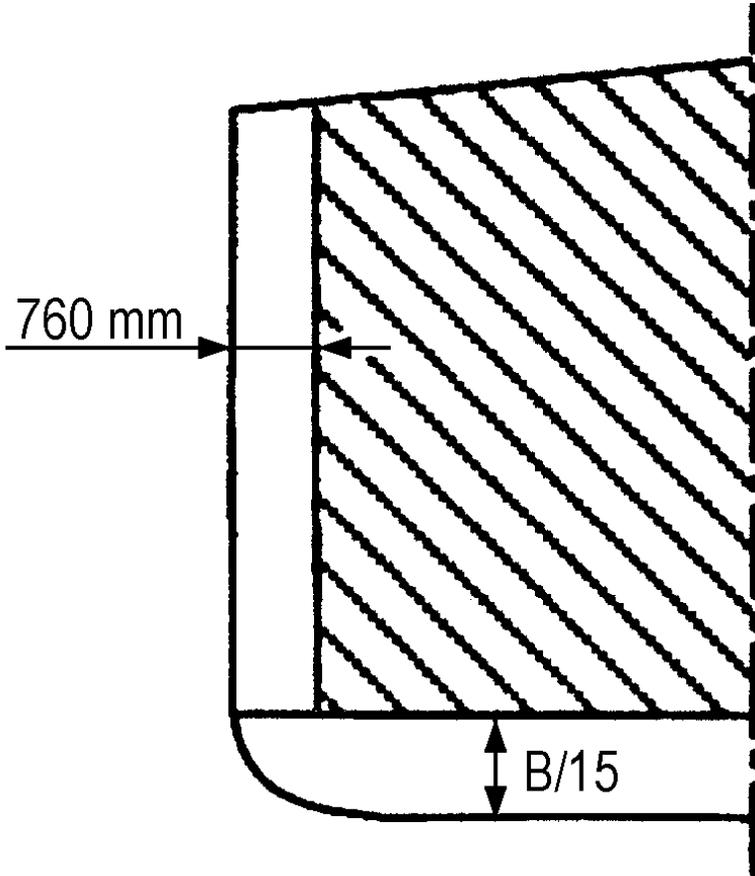


# Chemical tanker

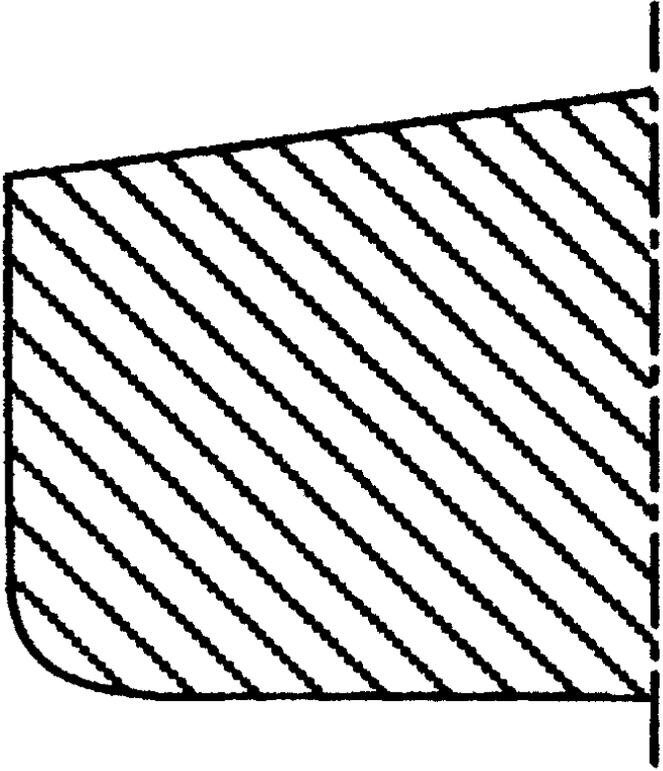
*IMO type*



**Type I**



**Type II**

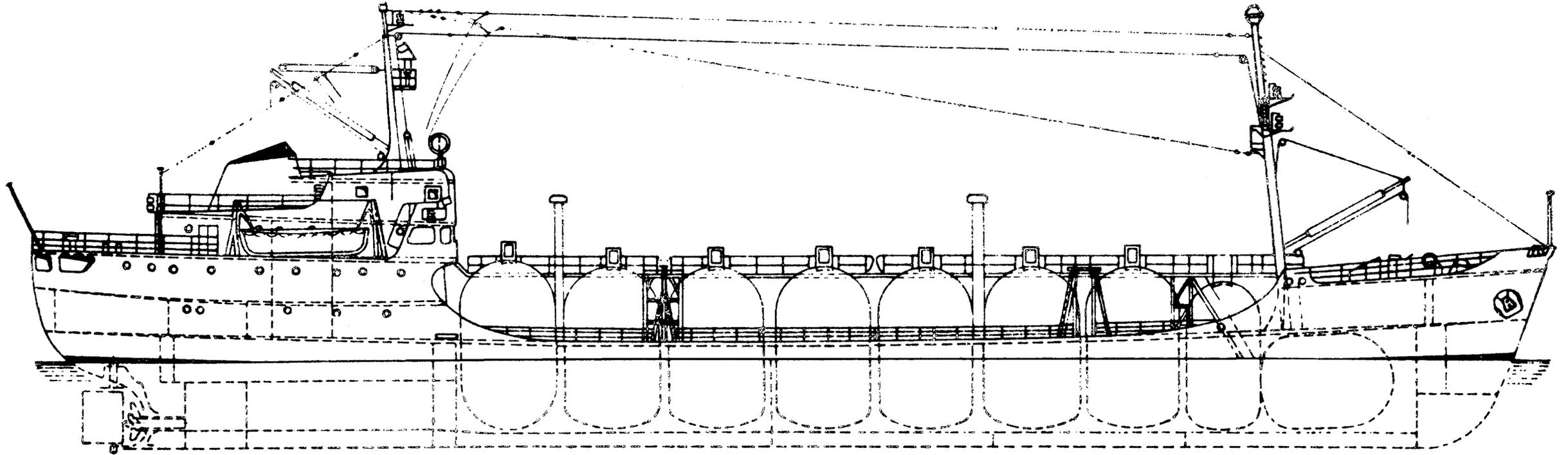


**Type III**

# *Gas carrier*

# Gas carrier

## *Fully pressurised tanks*

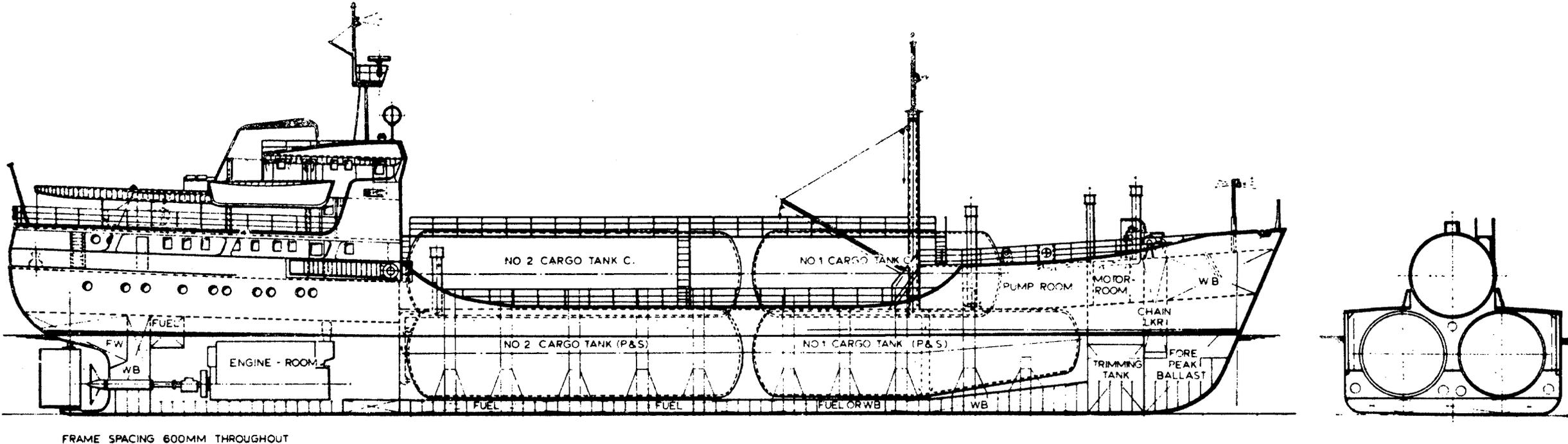


Fully pressurised tanks

2

# Gas carrier

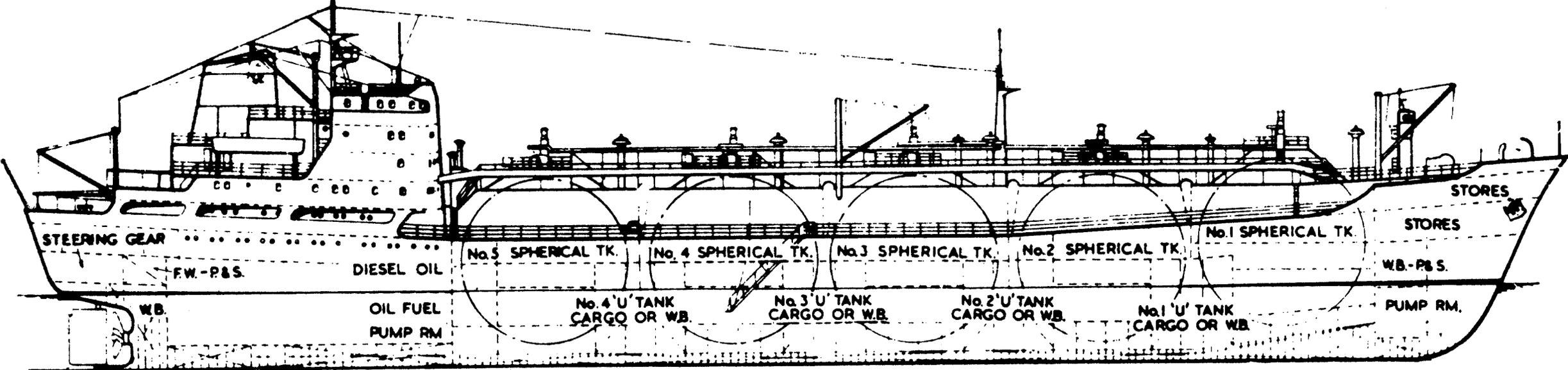
## *Semi-pressurised Semi-refrigerated tanks*



Semi-pressurised Semi-refrigerated tanks

# Gas carrier

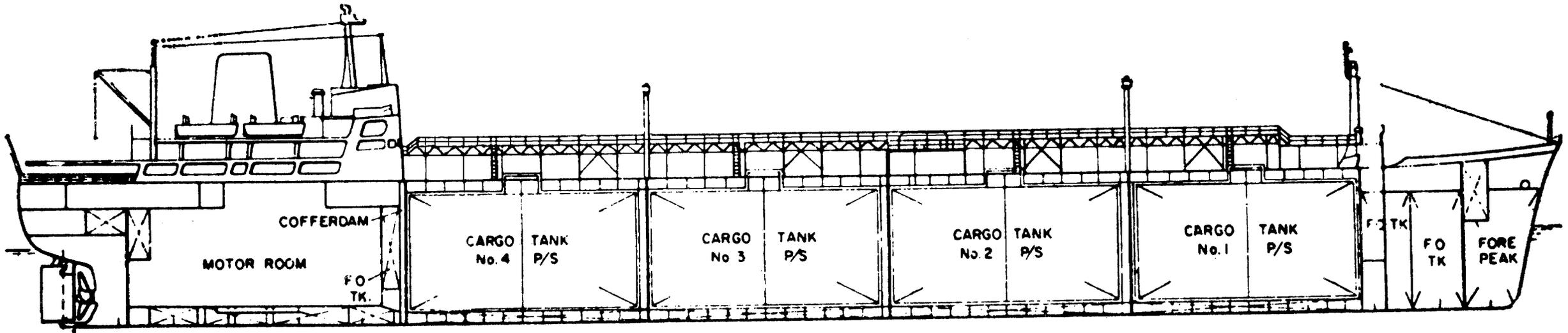
## *Semi-pressurised Semi-refrigerated tanks*



Semi-pressurised Semi-refrigerated tanks

# Gas carrier

## *Fully refrigerated tanks*



Fully refrigerated tanks

# Gas carrier

## *Serbatoio autoportante: sistema Moss-Rosenberg*



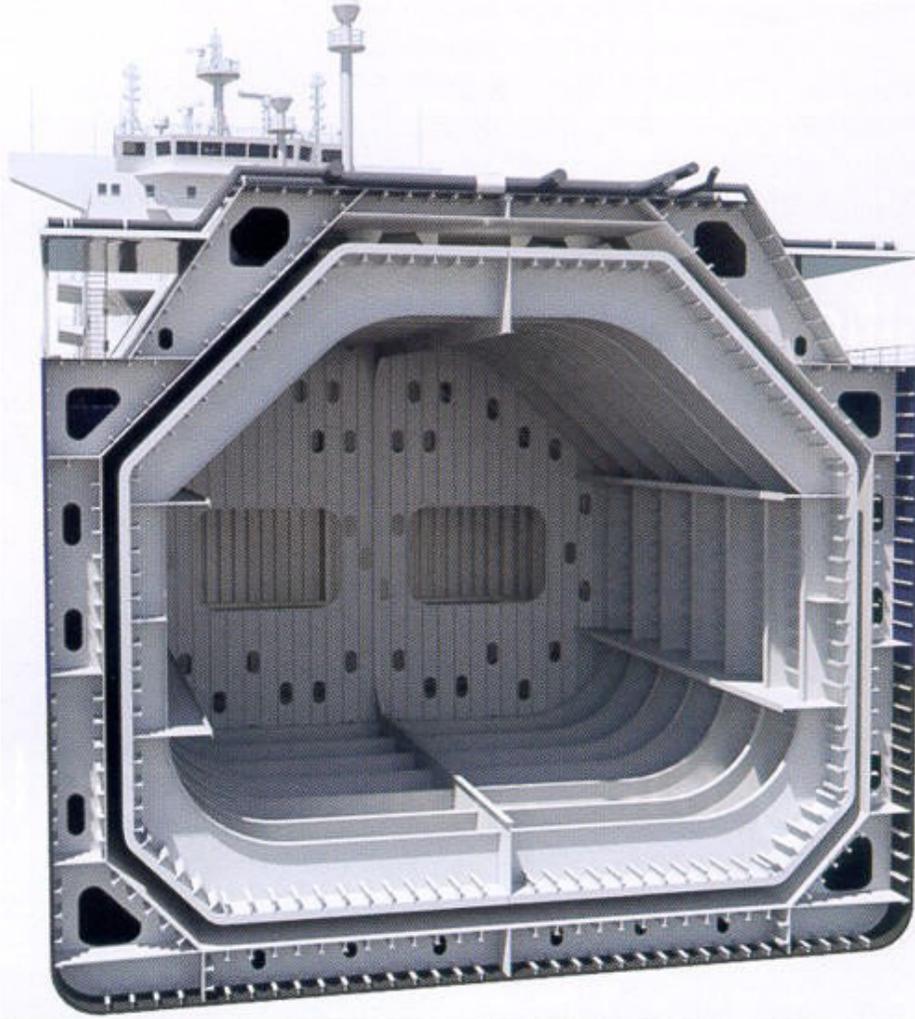
# Gas carrier

*LNG – serbatoi autoportanti Moss-Rosenberg*



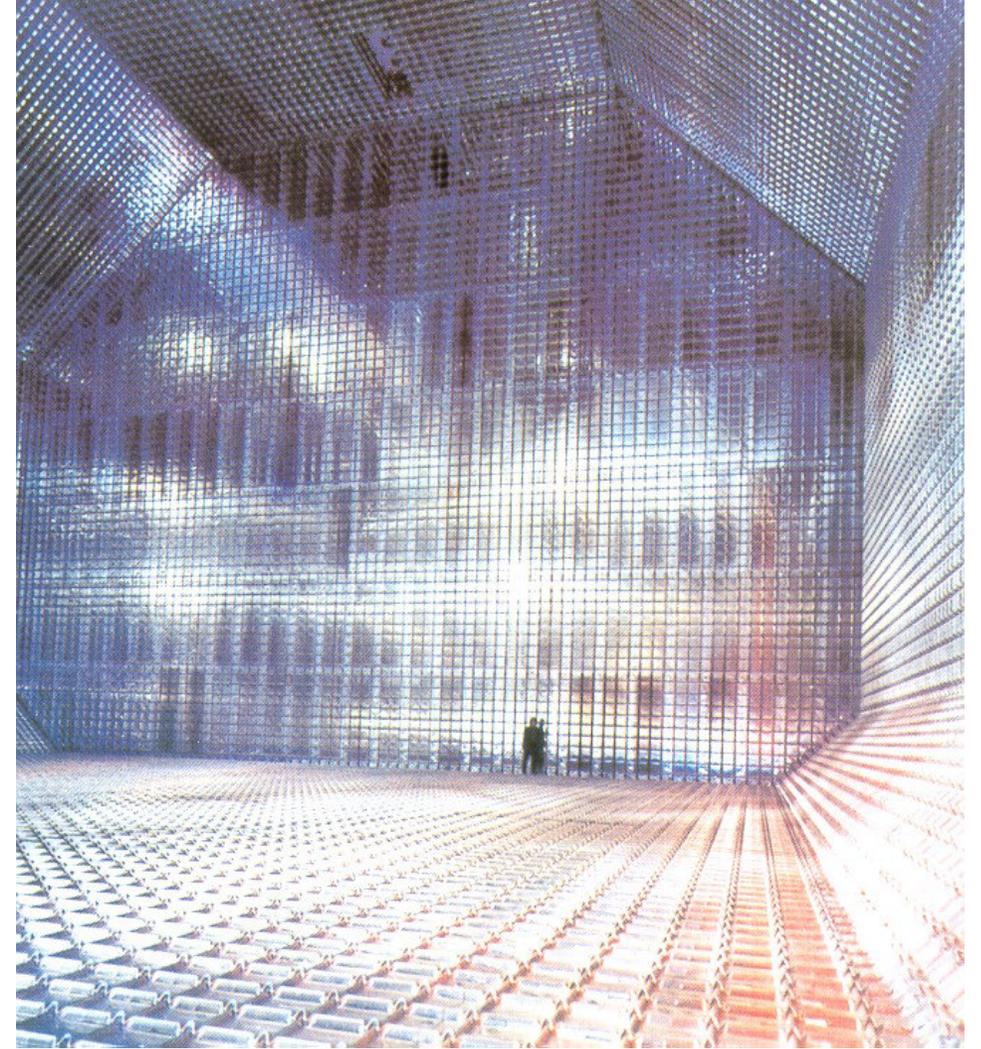
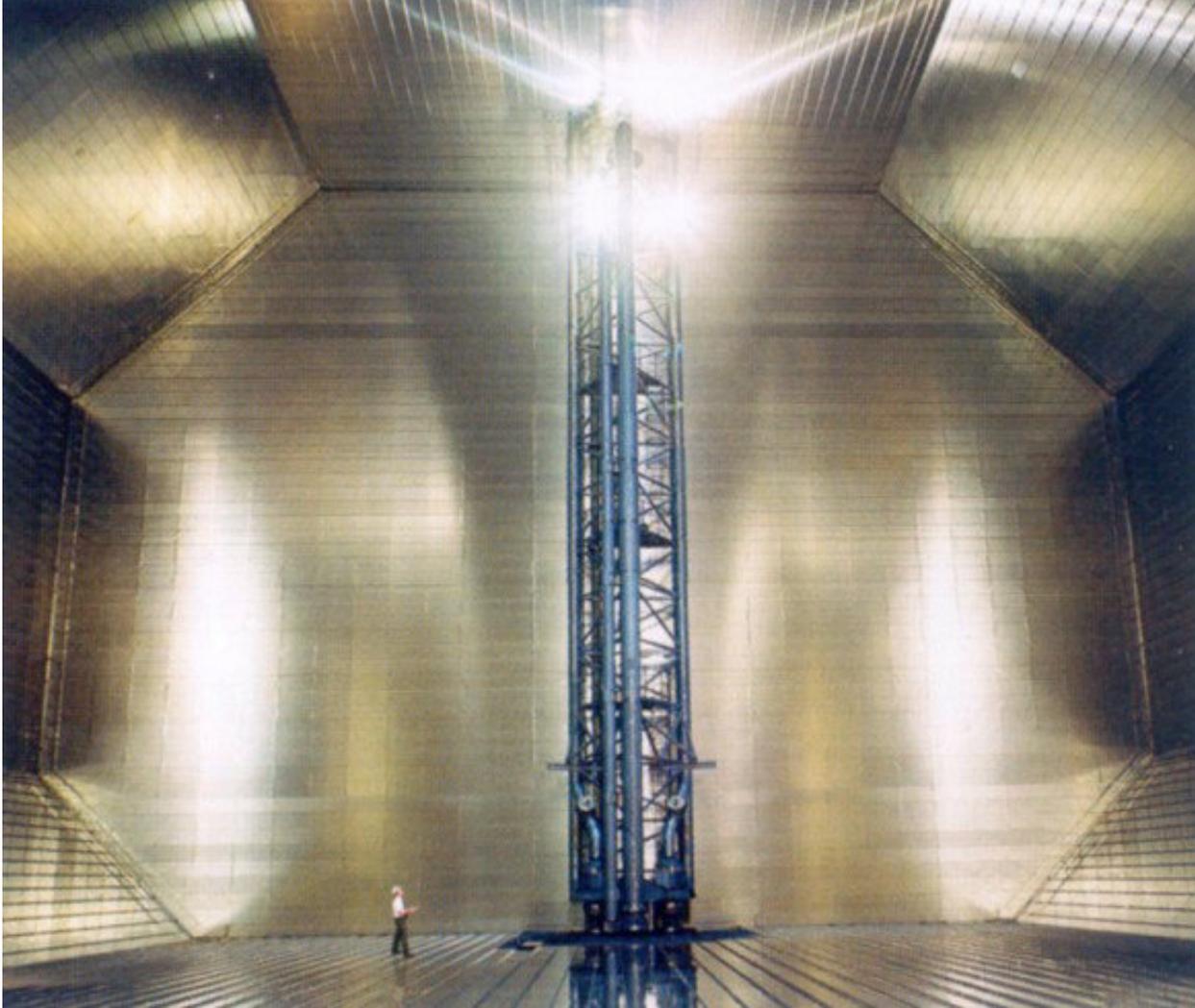
# Gas carrier

## *Serbatoio autoportante: sistema IHI-SPB*



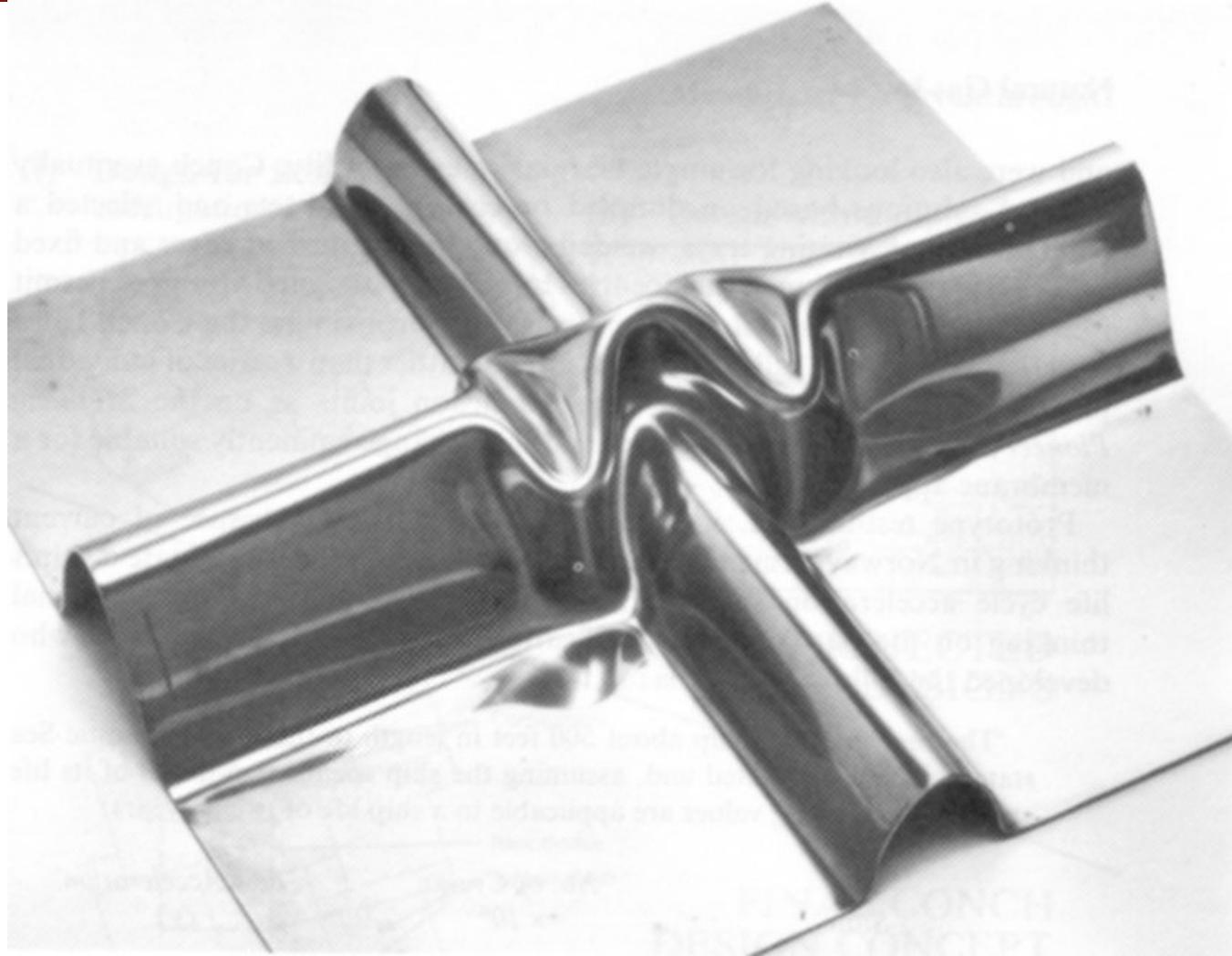
# Gas carrier

*Serbatoio membranale: sistema Gaz Transport (sinistra) / sistema Technigaz (destra)*



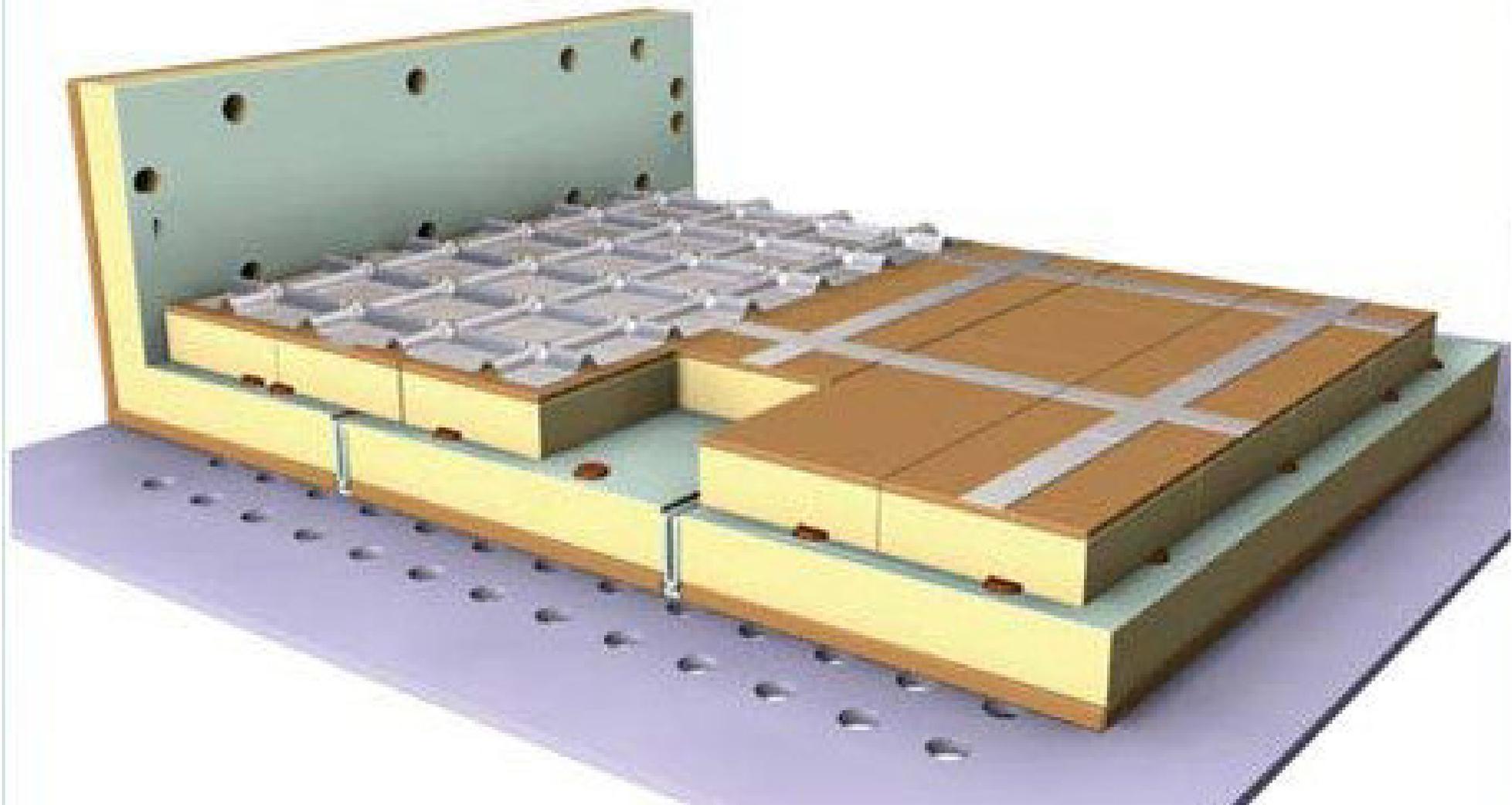
# Gas carrier

## *Particolare barriera primaria sistema Technigaz*



# Gas carrier

## *Particolare coibentazione serbatoi membranali*



# Gas carrier

*LNG – serbatoi membranali*



# *Bulk carrier*

# Bulk carrier



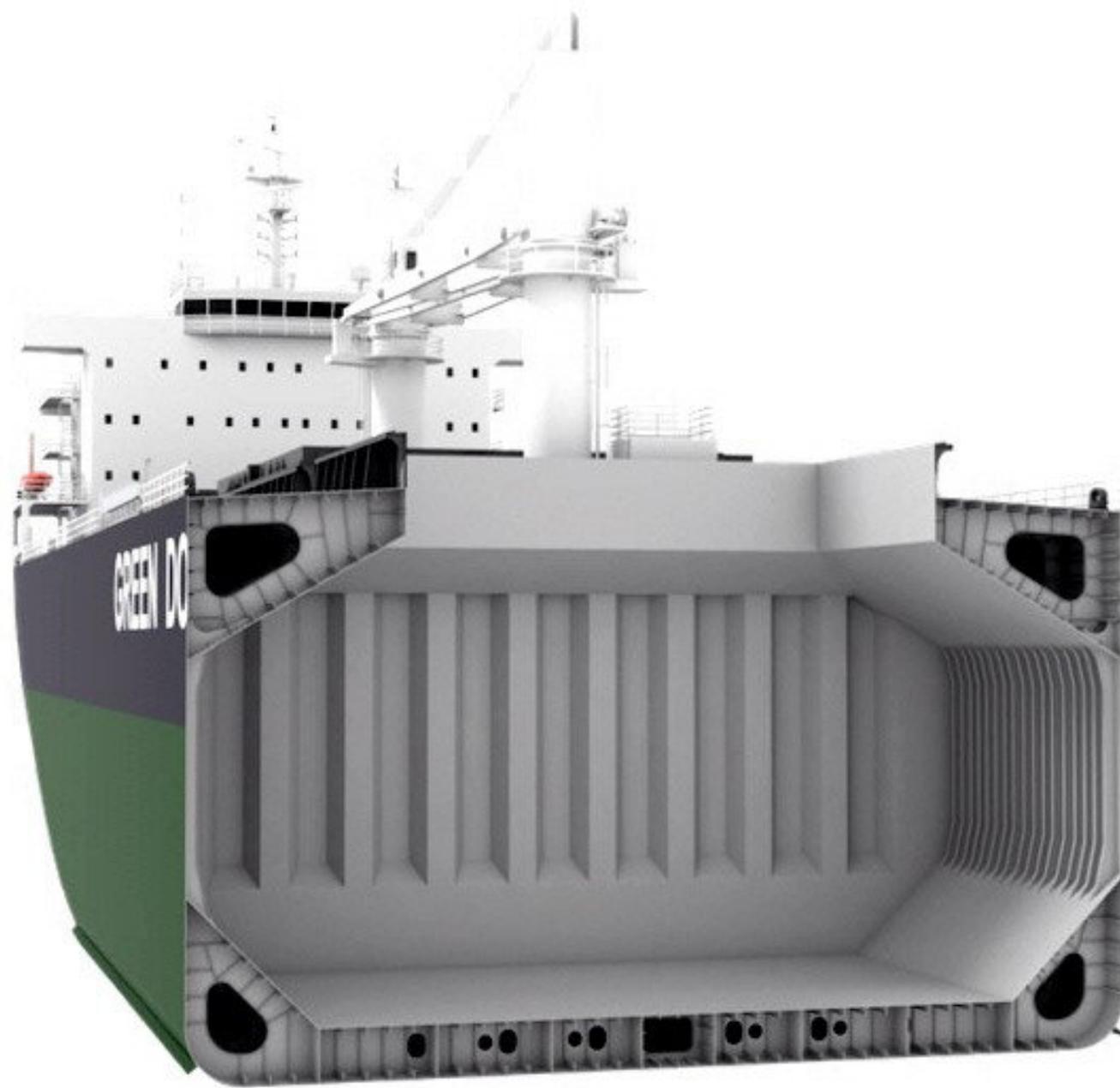
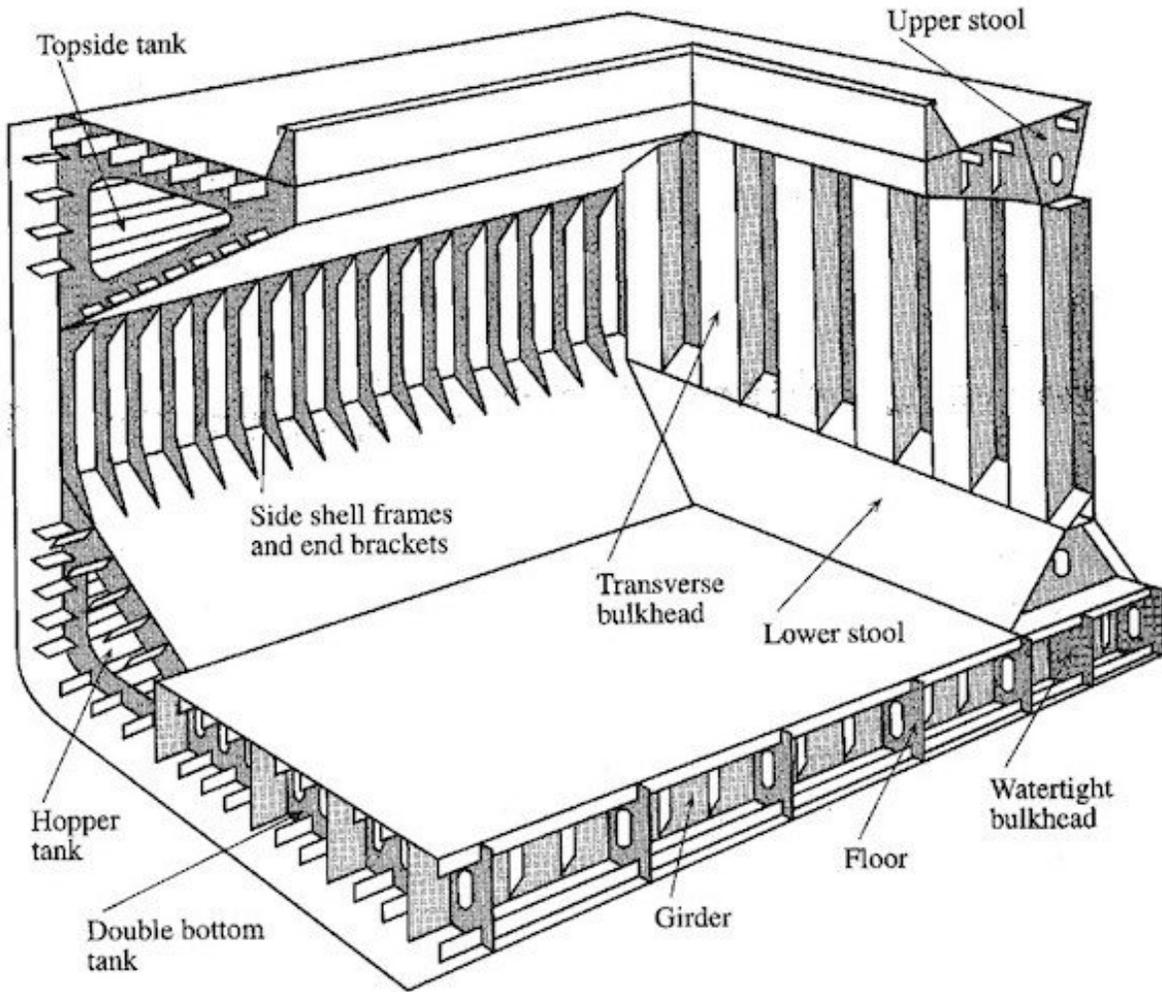
# Bulk carrier

## *Ponte di coperta*



# Bulk carrier

## Tipica configurazione di stiva



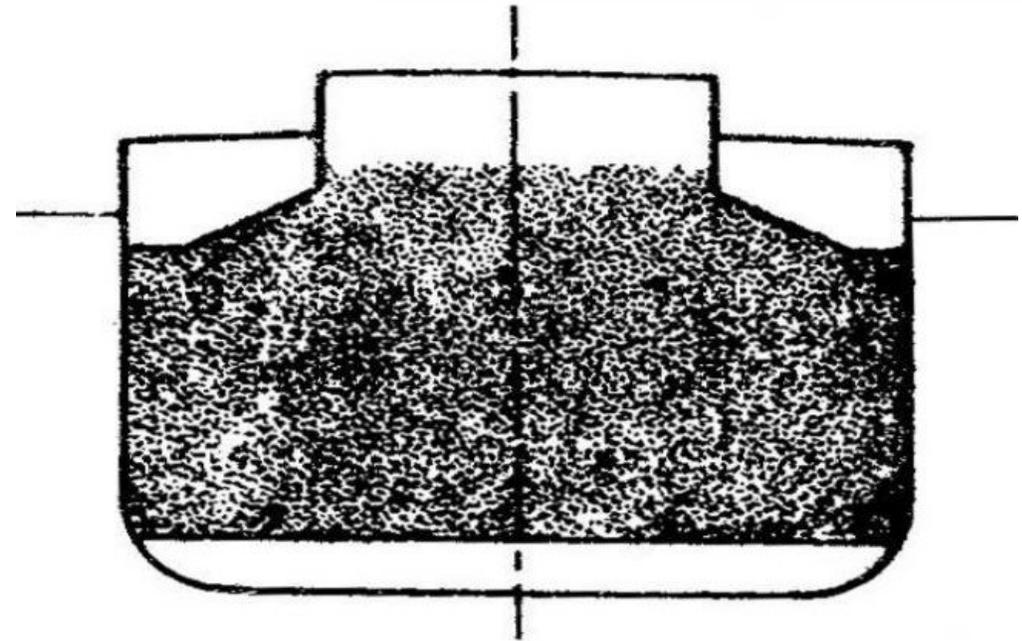
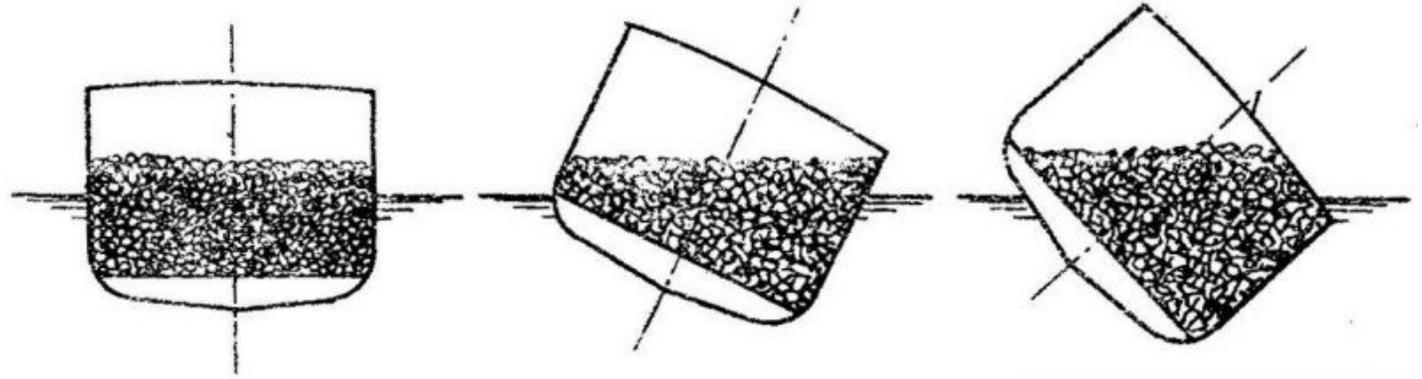
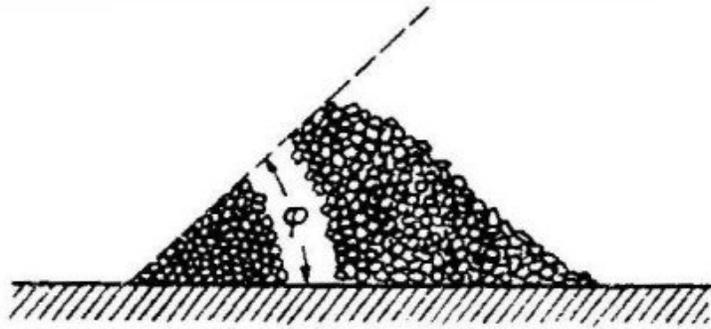
# Bulk carrier

## *Stiva*



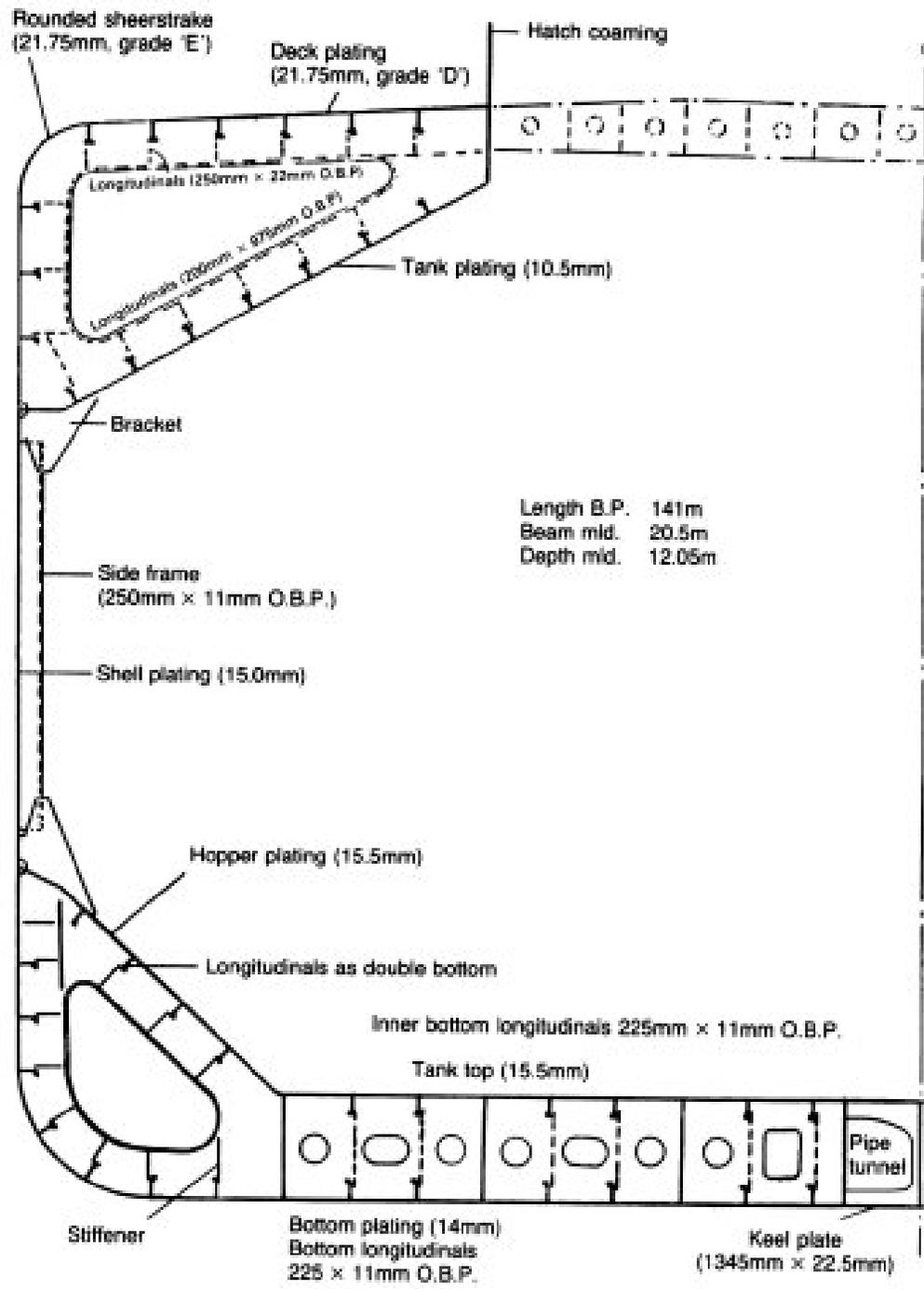
# Bulk carrier

*L'angolo di natural declivio (attrito interno) di materiale alla rinfusa*

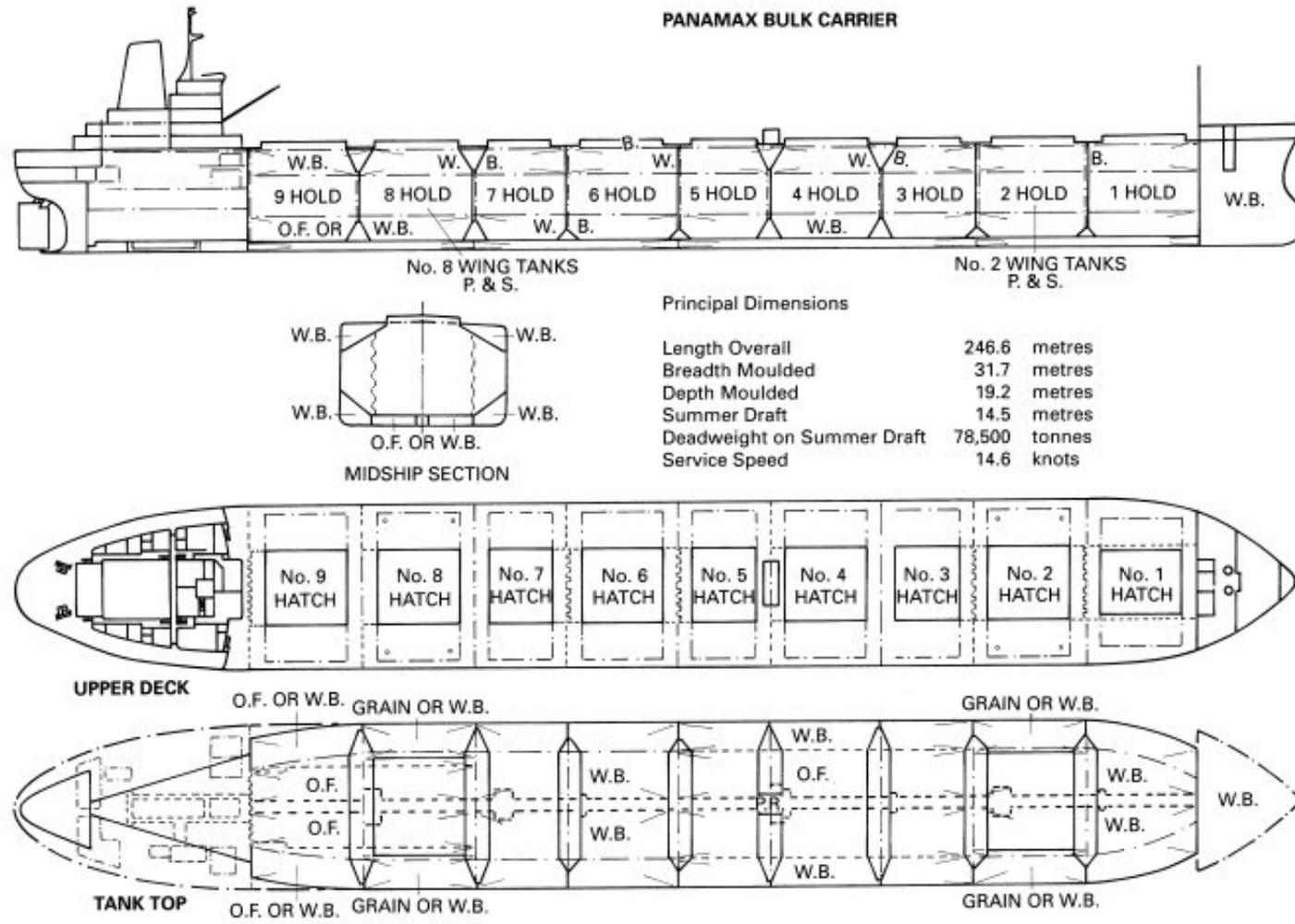


# Bulk carrier

## Sezione maestra



# Bulk carrier



# Bulk carrier

## *Grù con benna bivalve*



# Bulk carrier



# Bulk carrier



# *...altri tipi di navi mercantili*

# Heavy-Lift ship



# Semi-submersible Heavy-Lift ship



# Semi-submersible Heavy-Lift ship



# Semi-submersible Heavy-Lift ship



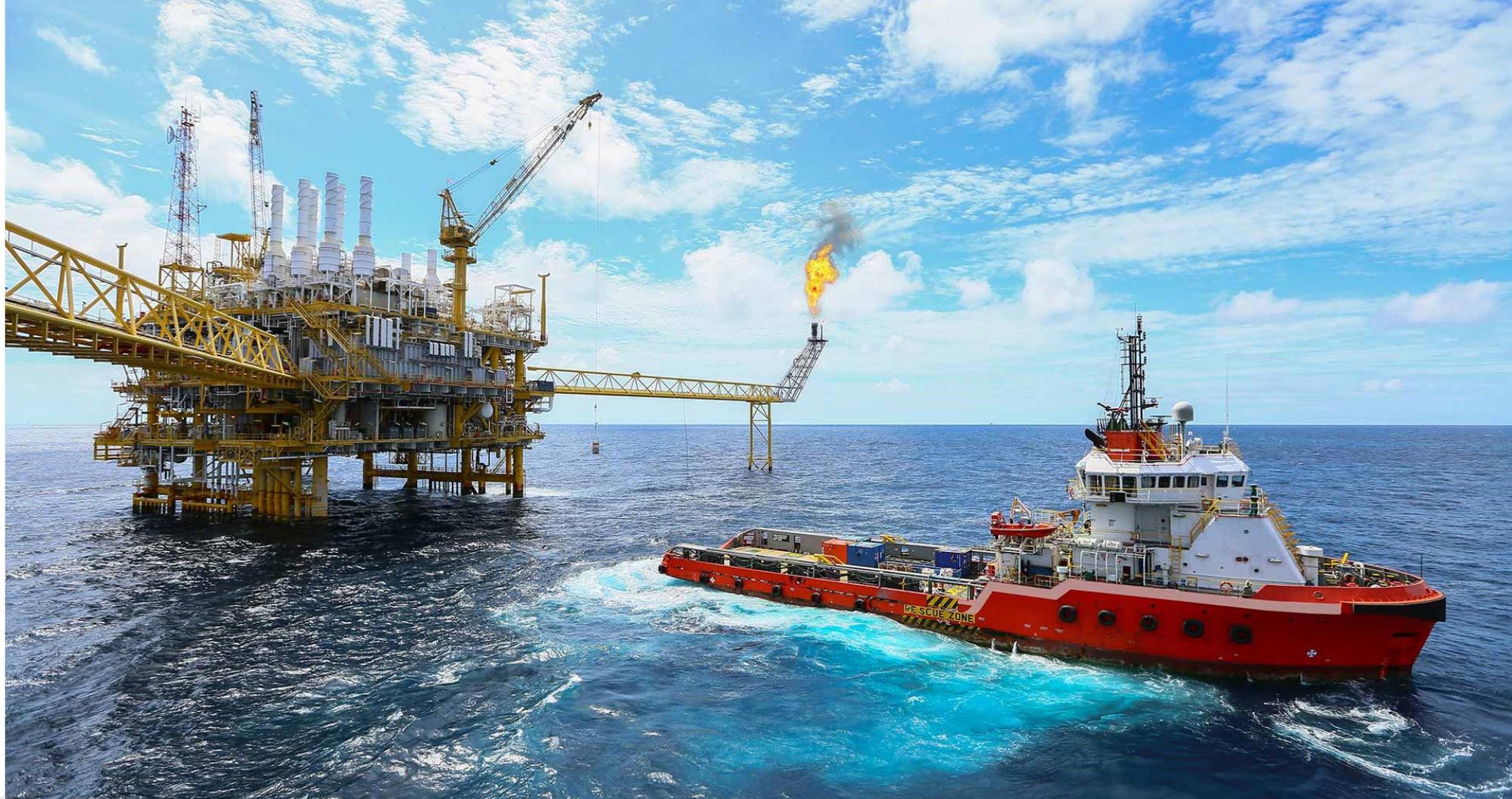
# Pipe laying vessel



# Pipe laying vessel



# Supply vessel



# Tug



# Tug



# Pure car carrier



# Pure car carrier



# Livestock carrier

## *Nave per trasporto bestiame*



# Cruise ferry



# Trawler



# Hydrofoil



# Catamaran



# Passenger ship



# Passenger ship



# Passenger ship





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**INGEGNERIA NAVALE**