LPG CARRIER

10,000 CBM | 12.5 KNOTS | WEST TO EAST COAST OF INDIA

GROUP 10

HARSHVARDDHAN - 21NA30027

PARTH GUPTA - 21NA10023

KARTHIK NAIK - 21NA30012

PARV JAIN - 21NA30022

Types of LPG Tanks

Segments	Capacity (m3)	Speed
Very Large Gas Carriers (VLGC)	At least 60,000	16
Large Gas Carriers (LGC)	40,000 - 60,000	15
Medium Gas Carriers (MGC)	20,000 - 40,000	16
Small Gas Carriers (SGC)	5,000 - 20,000	14

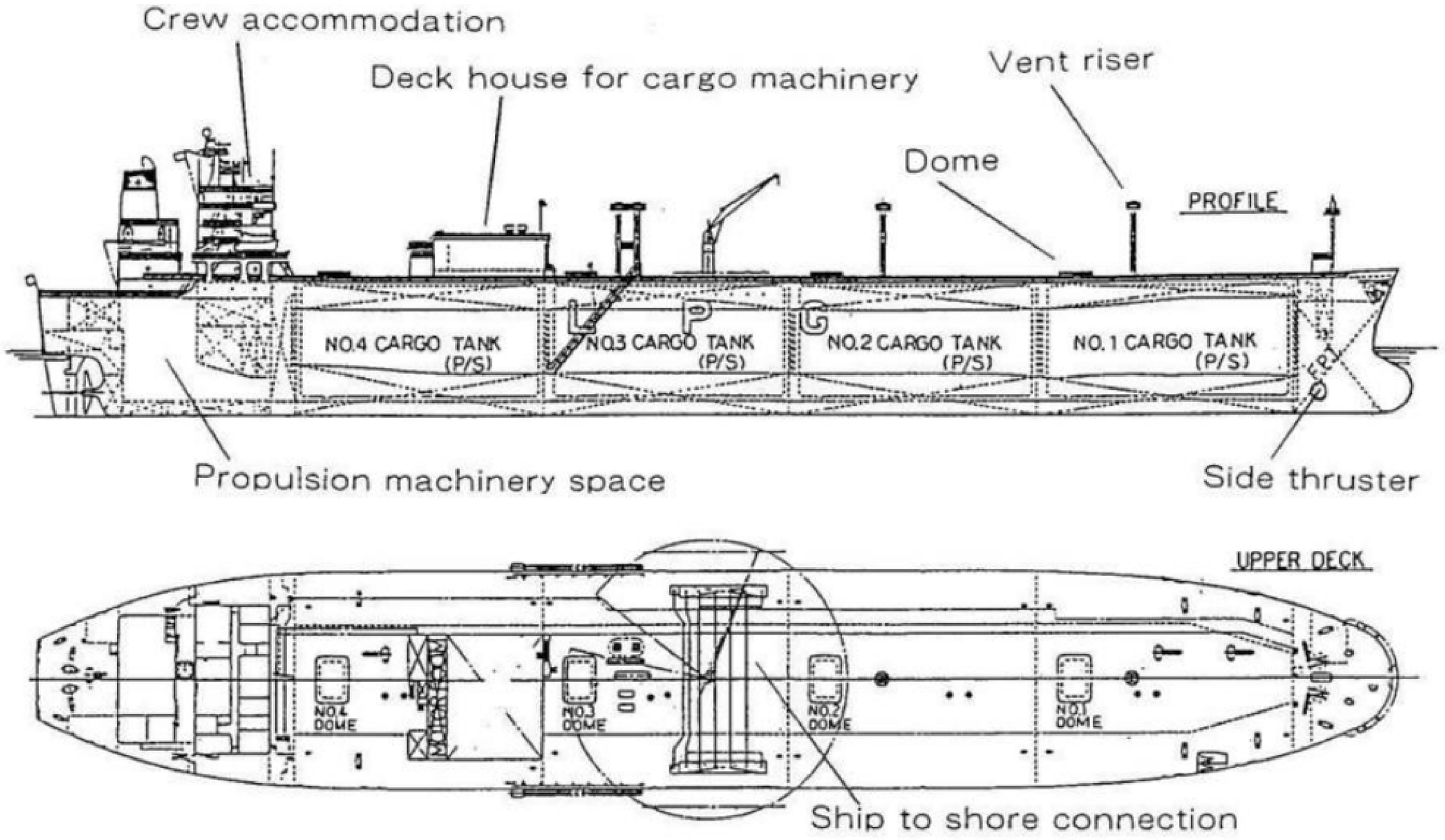
Typical Dimensions of the Ship:

Capacity: 10,000 m3

Length: 105m

Breadth: 16m

Draft: 6m


Crew accommodation
Deck house for cargo machinery
Vent riser
Dome
PROFILE
NO.4 CARGO TANK (P/S)
NO.3 CARGO TANK (P/S)
NO.2 CARGO TANK (P/S)
NO.1 CARGO TANK (P/S)
Propulsion machinery space
Side thruster
UPPER DECK
NO.4 DOME
NO.3 DOME
NO.2 DOME
NO.1 DOME
Ship to shore connection

General Arrangement

Propulsion Machinery and Crew Accommodation

- The propulsion machinery and crew accommodations are generally arranged aft in liquified gas carriers.
- This is to separate deckhouse from gas dangerous zone (GDZ) for obviously safety reasons.

Gas Dangerous Zone

- The gas dangerous zone is the zone where it is considered that gas potentially exists.
- The equipment in GDZ must be designed so that it does not have sufficient electric power to produce spark.

General Arrangement

Cargo Tanks

- Cargo tanks are arranged forward of machinery space and deckhouse.
- The number of cargo tanks and their capacity is determined to satisfy the purposes of the ship.
- If the number of tanks increase, the gas carrier becomes expensive.

Deckhouse for Cargo Machinery

- In general, a deckhouse for cargo machinery is arranged on upper deck.
- The driving motors of these machines are installed in an adjacent space separated by a gas tight bulkhead.
- For gas carriers, which are small or have narrow deck space, cargo machines are arranged in the fore part or at the side of deck.

General Arrangement

Ship to Shore Connection

- The cargo manifold is arranged at about amidships on the weather deck for ship to shore connection for loading and unloading cargoes.

Vent riser

- Discharge from the safety relief valves of cargo tanks is led to vent
- riser through vent line on deck.
- According to IGC code, the location of vent riser has to be at least 25 meters from living quarter.
- In case of large ships the vent riser is installed one for each tank because the size of vent pipe is comparatively large.

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General Arrangement

Cargo Pumps

- Cargo unloading pumps of liquefied gas carriers are generally of the deep well type or the submerged type and installed in each cargo tank near the bottom to discharge liquefied gas only in that tank.
- This is because that the tank is independent from hull in most cases, and it is not permitted to connect tanks with pipes at the bottom part in the holds from safety viewpoint.

Hull

- All LPG carriers must have a double bottom below their tanks.
- LPG carriers only need to have a single skin hull structure if their tanks are self-supporting.

General Arrangement

Side thruster

- Some liquefied gas carriers, especially the expensive LNG carriers, install side thruster(s) to improve the maneuverability in port or at an offshore mooring.
- The location of side thruster is similar to other ships like container ships.

Cargo piping and Dome

- The cargo pipes are located on the open deck, and ideally, they are connected directly to the tank from there.
- For safety reasons, there should not be any pipes that pass through the cargo tank and into the surrounding hold space.

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Propulsion and Performance

Steam Turbines

In the past , many large ships including LPG carriers were powered by steam turbines. These engines convert the energy from steam into mechanical energy to drive the ship’s propellers.

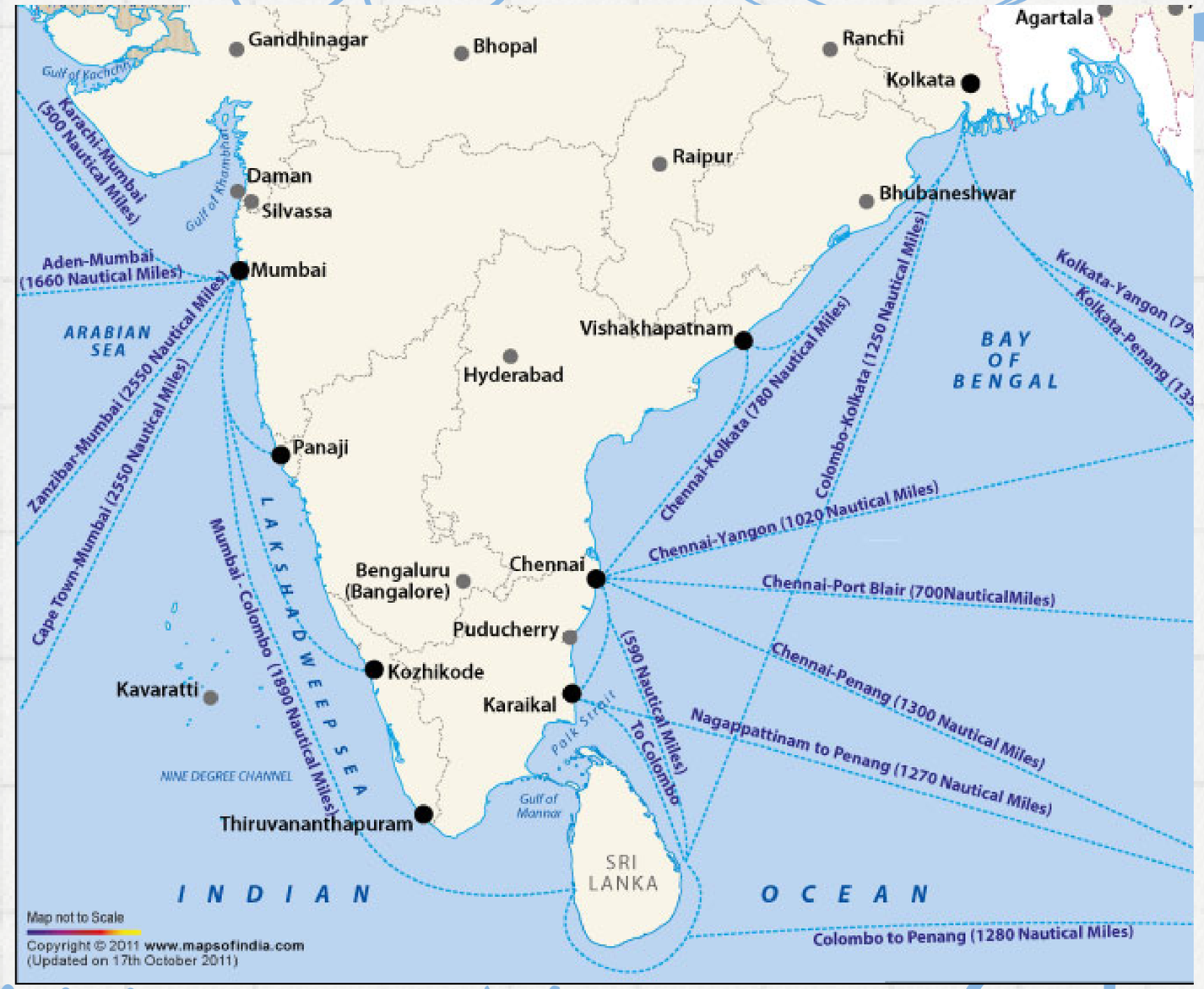
Dual Fuel Engines

Many modern LPG carriers are equipped with dual fuel engines. Which can run both on LNG and marine diesel oil (MDO).

Slow - Speed Diesel Engines

Slow - speed diesel engines are commonly used in large vessels including some LPG carriers, These engines operate at low RPM and have excellent fuel efficiency and reliability.

West to East Coast Route Map

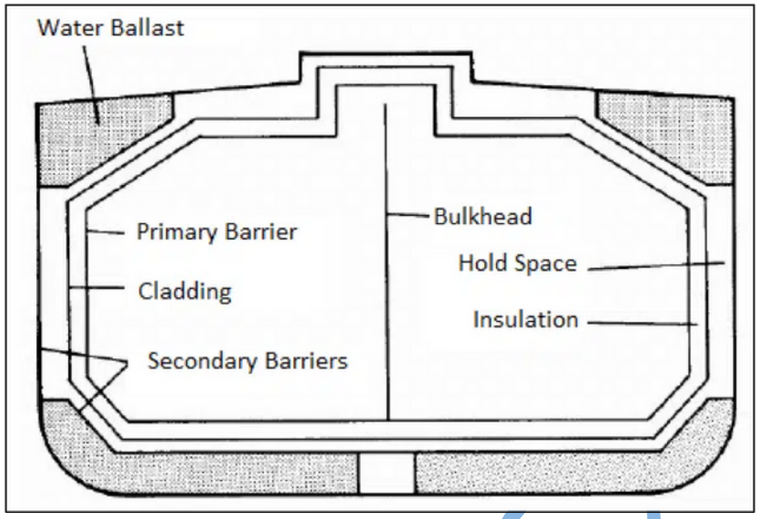


Hull arrangement

The forecastle at the bow prevents seawater from splashing onto the deck. Ballast water isn't stored in cargo tanks, so separate spaces like double hull compartments, bilge, and upper wing tanks are used for ballast.

Independent Type A Tanks:

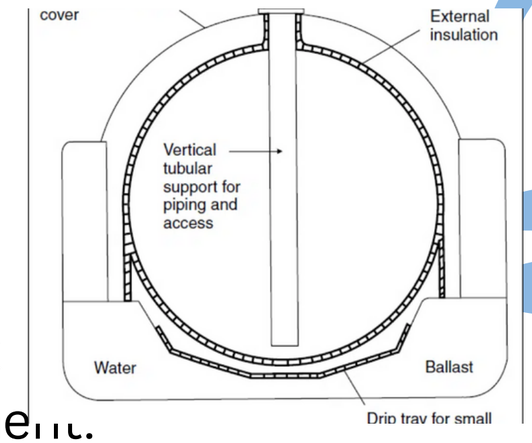
- Box-like shape with flat surfaces.
- Maximum design vapor pressure: 0.07 Mpa.
- Cargoes carried fully refrigerated at or near atmospheric pressure, usually below 0.025 Mpa
  Example: Refrigerated LPG/Ammonia carriers.



Hull arrangement

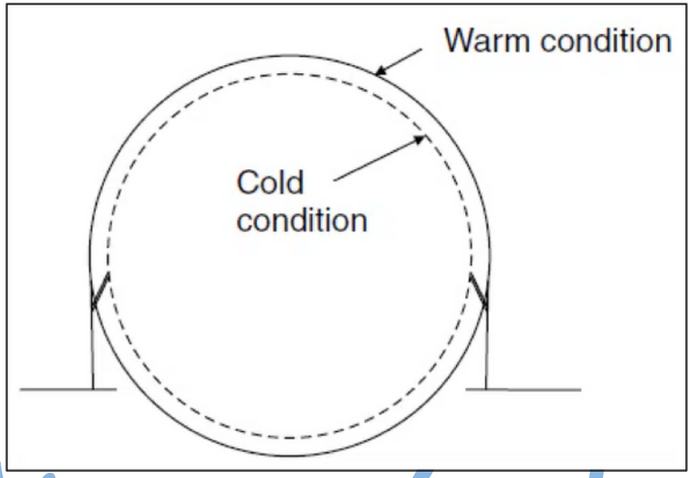
Type B Tanks:

- Can be flat-surfaced and box-shaped (prismatic) or cylindrical (pressure vessel).
- Prismatic tanks: Design vapor pressure below 0.07 Mpa.
- Subjected to comprehensive strength analysis, including fatigue and crack propagation assessments (design by analysis).
- Type B tanks undergo precise strength analysis, covering fatigue and crack propagation, and necessitate only a partial secondary barrier for containment.
- Require a partial secondary barrier.



Type C Tanks:

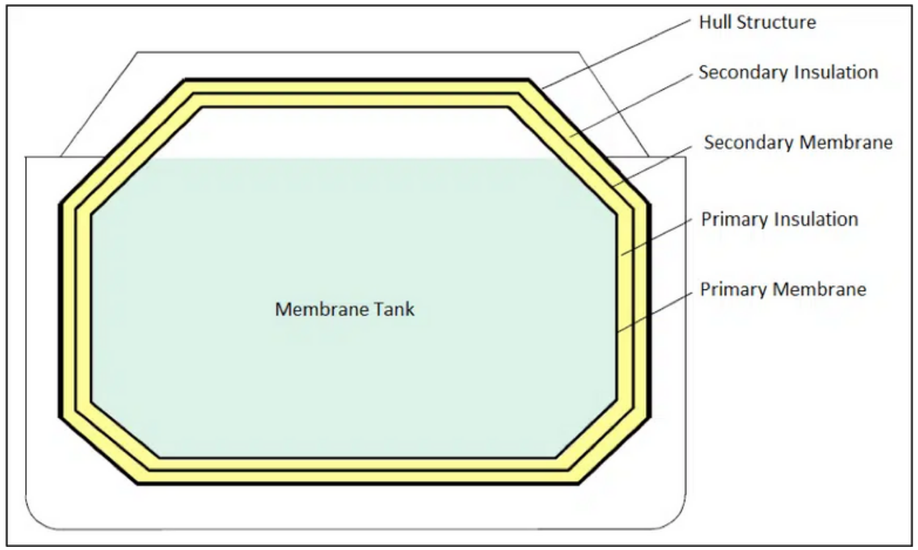
- Spherical or pressure vessel type.
- Vapor pressure above 0.2MPa.
- Utilized in pressurized or pressurized/refrigerated gas carriers.
- Built following standard pressure vessel codes.
- Accurate stress analysis; no secondary barrier needed.



Hull arrangement

Membrane Tanks:

Thin, non-self-supporting layers supported by insulation to the hull.
Design vapor pressure typically below 0.025 Mpa.
Exclusively applied in LNG carriers.



Semi-membrane Tanks:

- Variation of membrane tanks with a thicker primary barrier.
- Self-supporting when empty, not under load.
- Lower maintenance and installation cost compared to full membrane tanks.
- Used on LPG ships, particularly in refrigerated LPG carriers in Japan.

Integral Tanks:

- Part of the ship's hull structure, subjected to the same stress.
- Not typically used for carrying liquefied gas below -10°C.
- Some tanks on Japanese LPG carriers serve the specific purpose of carrying fully refrigerated butane.

Internal Insulation Tanks:

- Variation of membrane tanks with a thicker primary barrier.
- Self-supporting when empty but not under load.
- Lower maintenance and installation cost compared to full membrane tanks.
- Used on LPG ships, including some refrigerated LPG carriers in Japan.

Environmental precaution

- **Safe Handling and Storage:** Adherence to precise protocols during loading, unloading, and LPG storage to avert spills and leaks.
- **Routine Maintenance:** Regular upkeep of carriers to reduce equipment failure risks and potential harm to the environment.
- **Spill Contingency Plan:** Maintenance of a detailed spill response strategy for prompt action in case of accidental spills.
- **Crew Education:** Training for all crew members on secure handling methods, emergency reactions, and environmental preservation.

- **Discharge Regulation:** Adherence to global discharge regulations for ballast water and waste materials to prevent marine pollution.

- **Environmental Evaluation:** Before LPG carriers commence operations, an assessment should be conducted to identify and address potential environmental hazards.

- **Surveillance and Notification:** Implementation of systems to monitor and report incidents that could affect the environment, ensuring timely notification.

Thank you!