

# **NEW LNG VESSEL DESIGN & CONTAINMENT**

by

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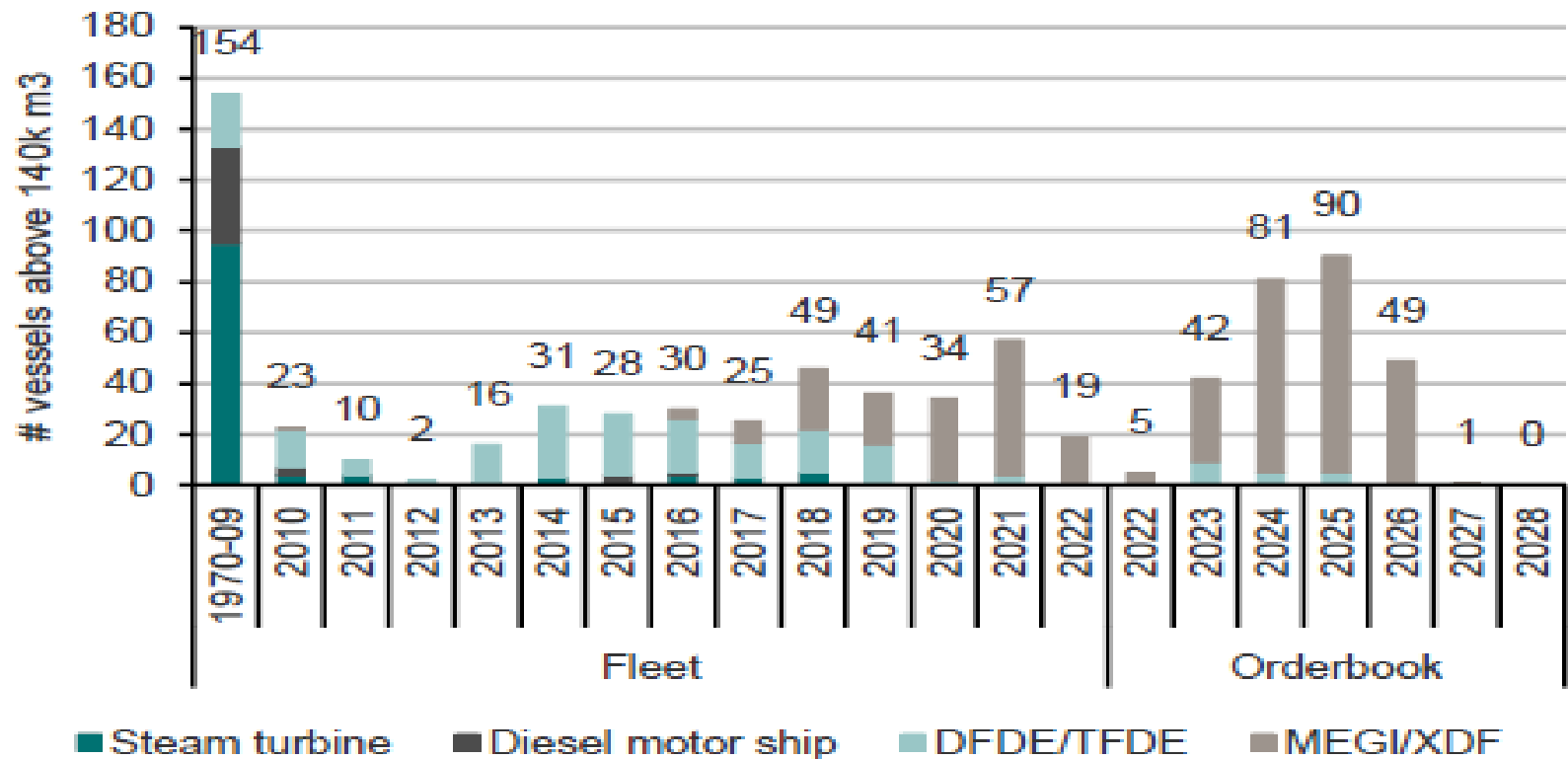
Extra Master & Author

# LNG VESSELS DATA

- TOTAL ACTIVE LNG VESSELS - ABOUT 672
- TOTAL NEW ORDER - ABOUT 323 (ABOUT 48% OF PRESENT FLEET) – TOTAL 995
- 2023 NEW LNG DELIVERY – 42
- 2024 NEW LNG DELIVERY – 81
- 2025 NEW LNG DELIVERY - 90
- 2026 NEW LNG DELIVERY - 49

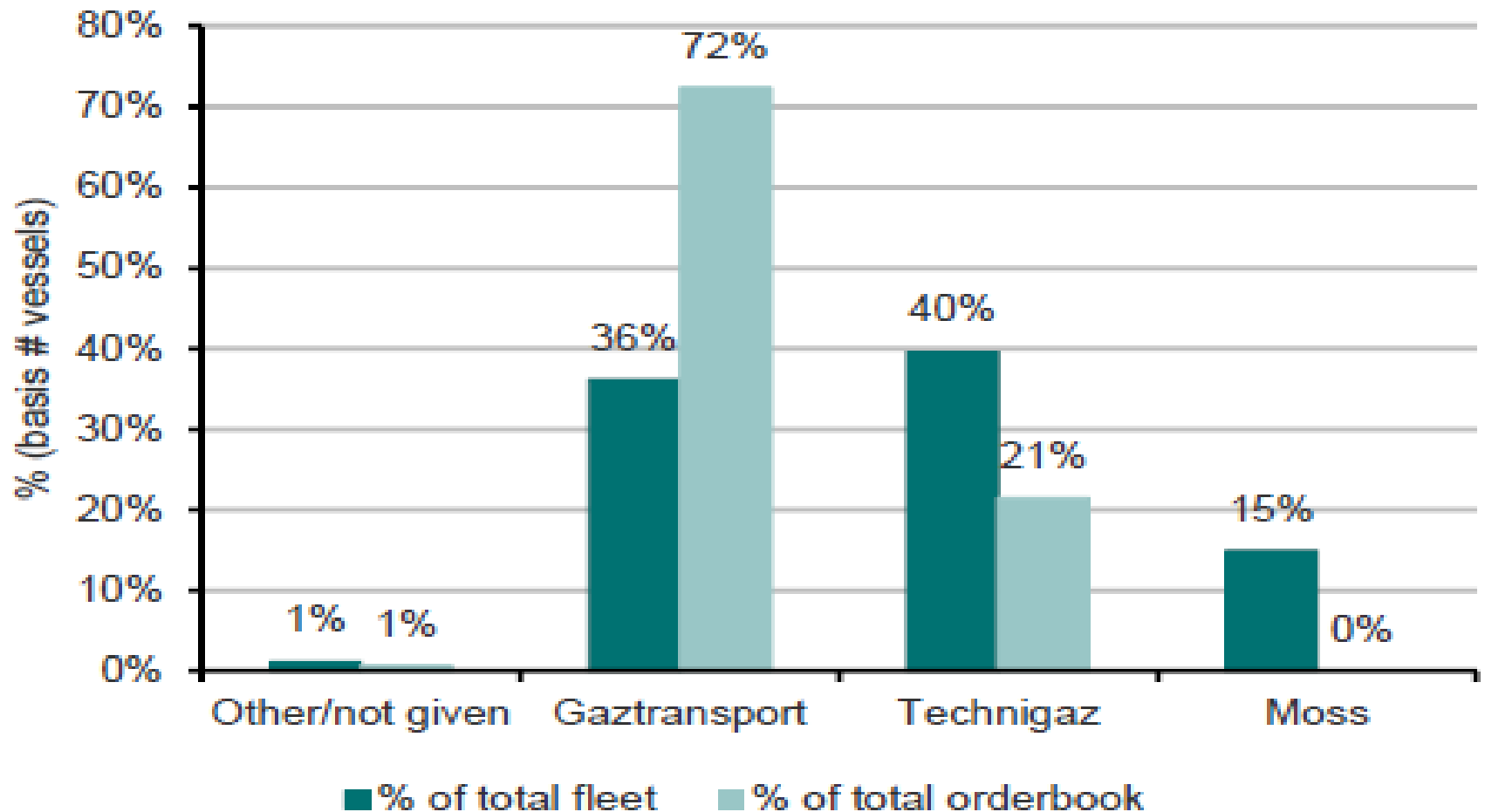
# LNG VESSEL NEW ORDER BOOK

Number of vessels above 140k cbm by (expected) delivery year and vessel technology



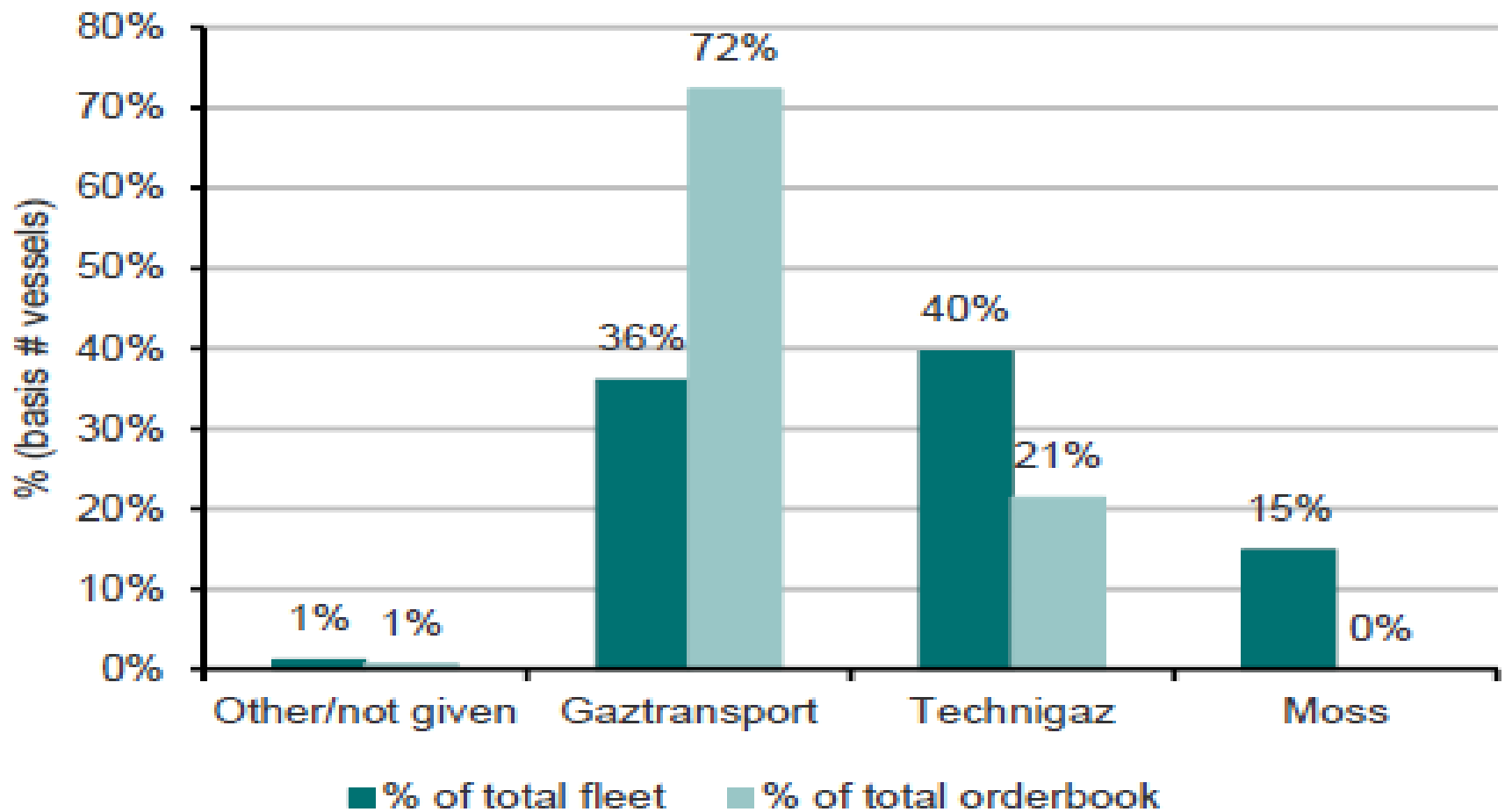
# LNG FLEET

## Global LNG fleet – cargo containment system and orderbook



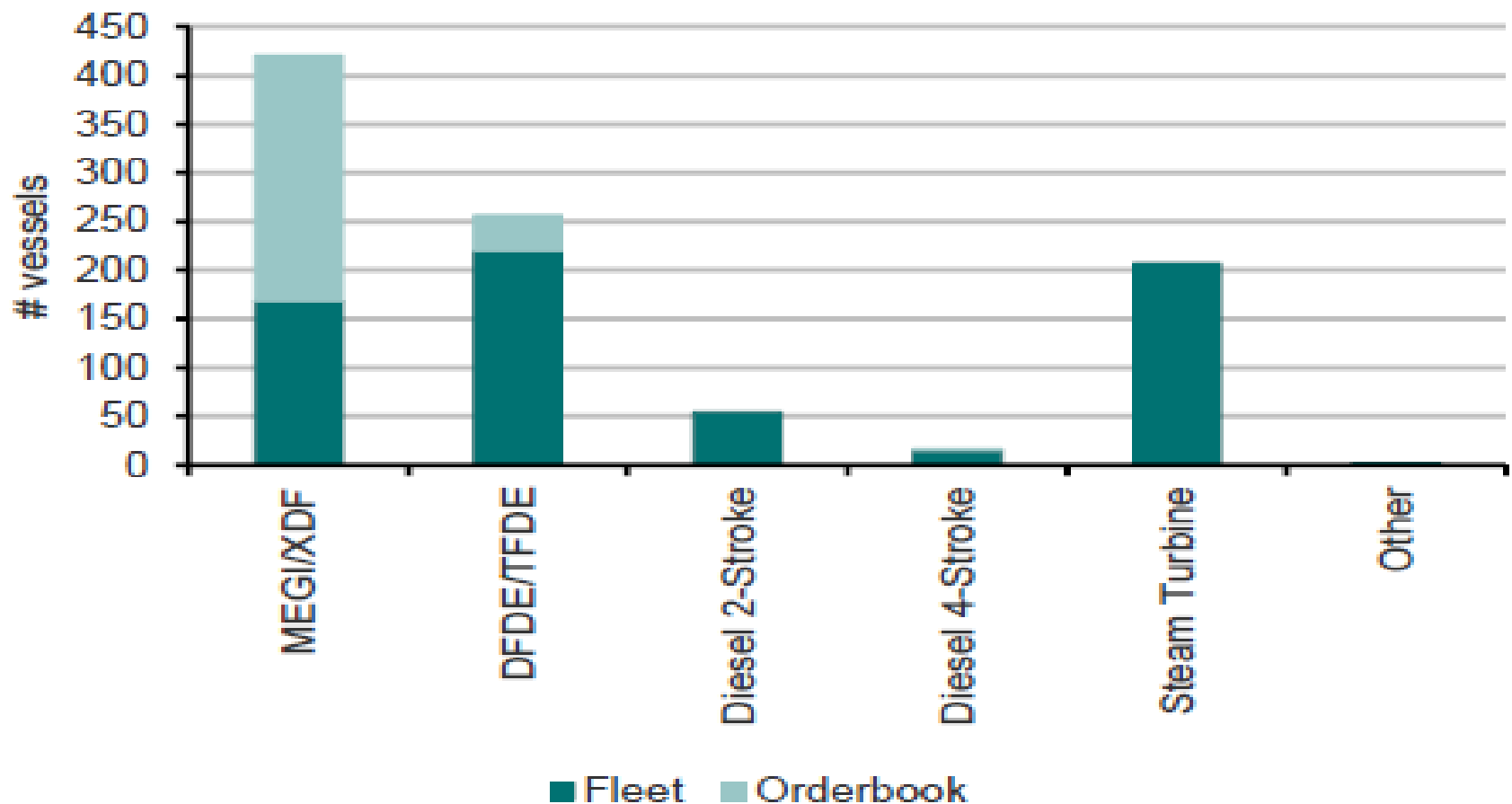
# LNG FLEET

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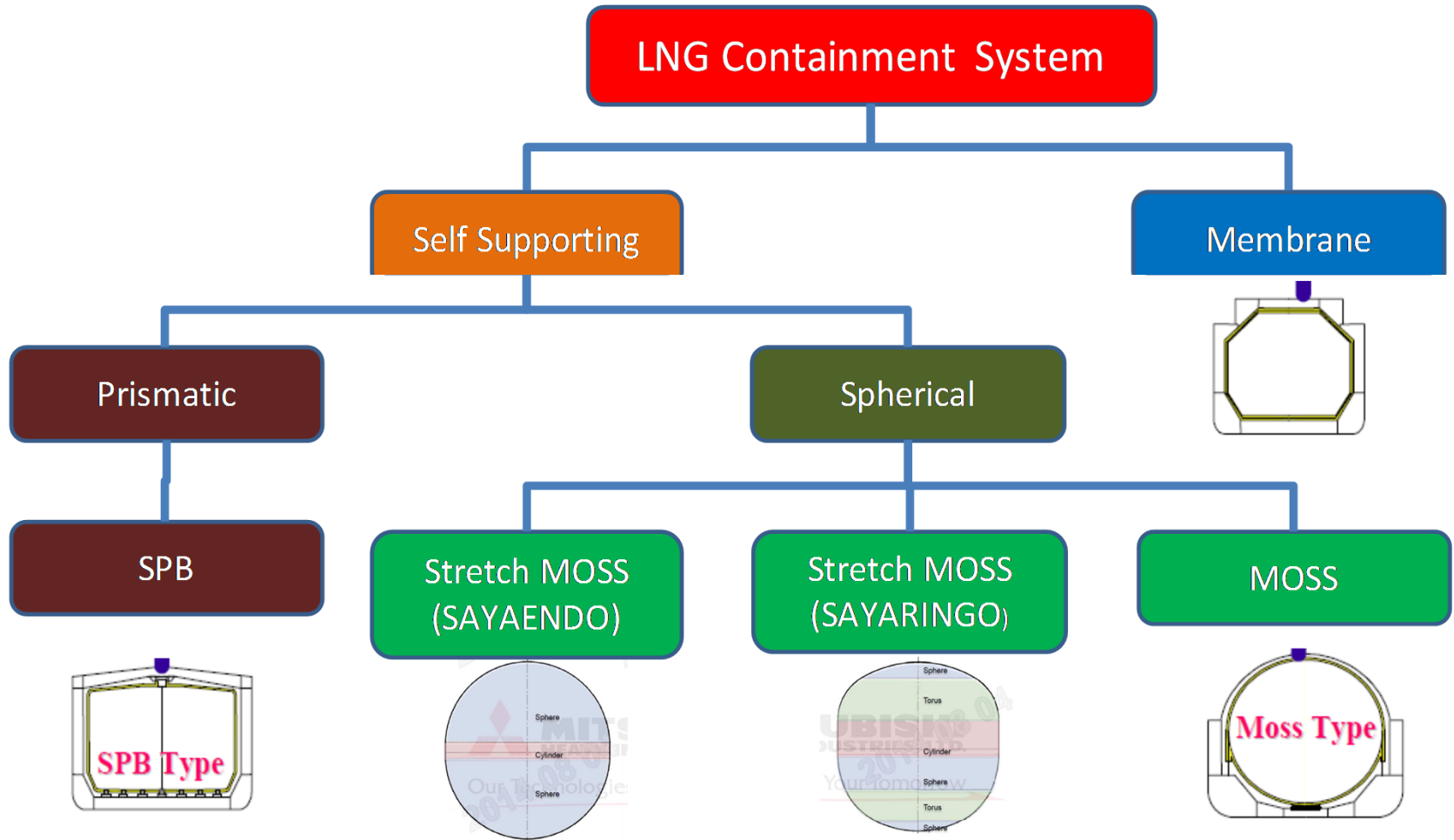


# LNG FLEET PROPULSION WISE

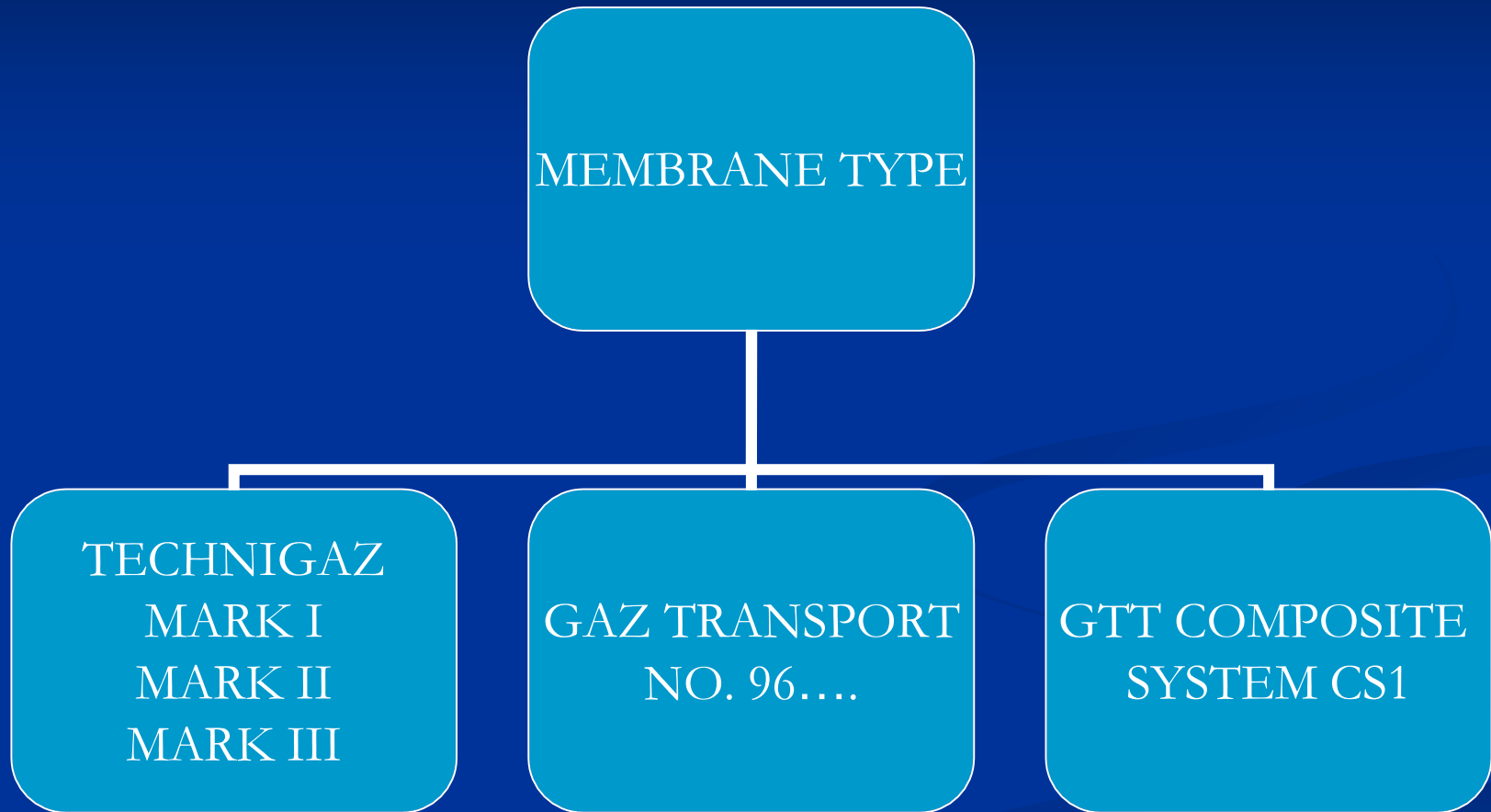
Global LNG fleet and orderbook –engine type (number of vessels)



# LNG VESSEL DESIGN & CONTAINMENT



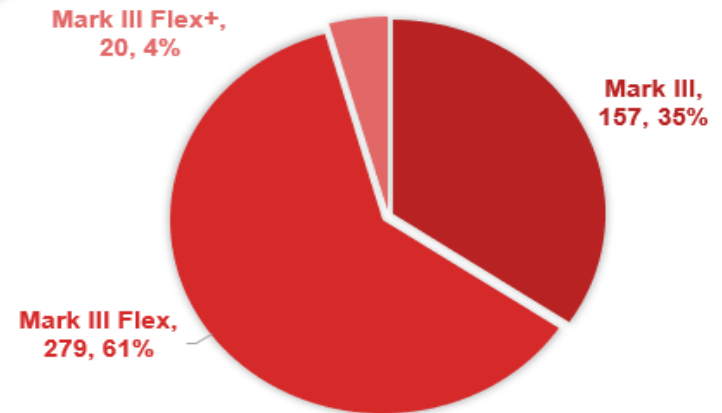
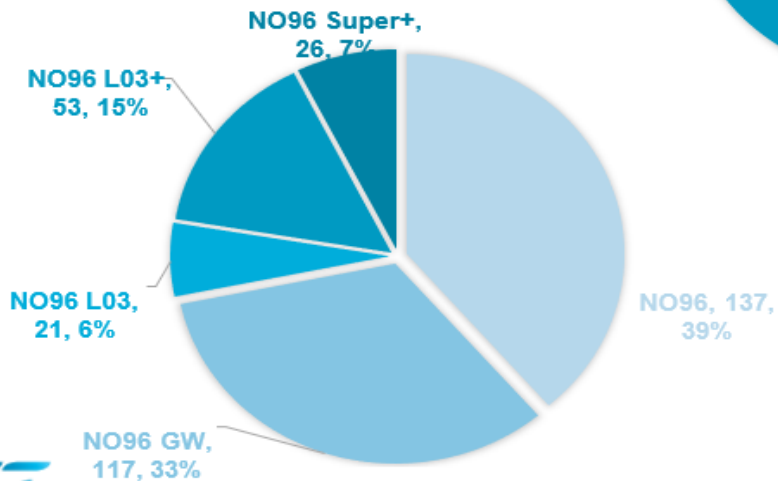
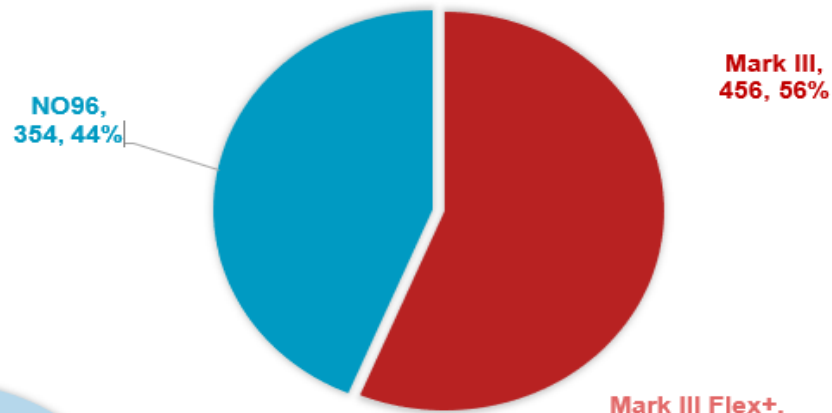
# MEMBRANE TYPE LNG





# MEMBANE SHIPS

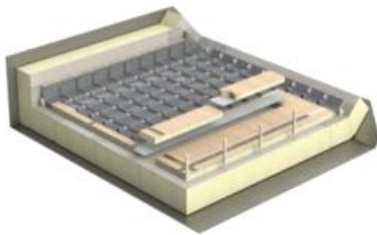
## DELIVERED AND IN-ORDER LNGC \* / FSRU AS OF Q4 2022



# MEMBRANE SHIPS

## GTT MEMBRANE TECHNOLOGIES

Mark III system

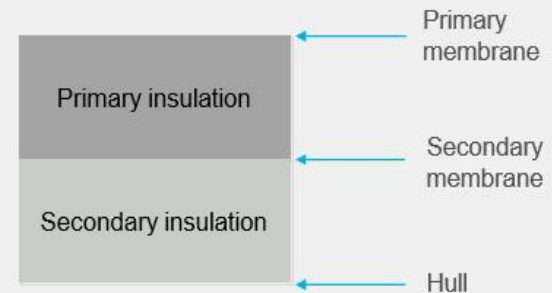


NO96 system



### GENERAL PRINCIPLE:

- Two membranes
- Two layers of insulations
- Containment system anchored to the inner hull



# MEMBANE SHIPS

3

## NO96 design concept

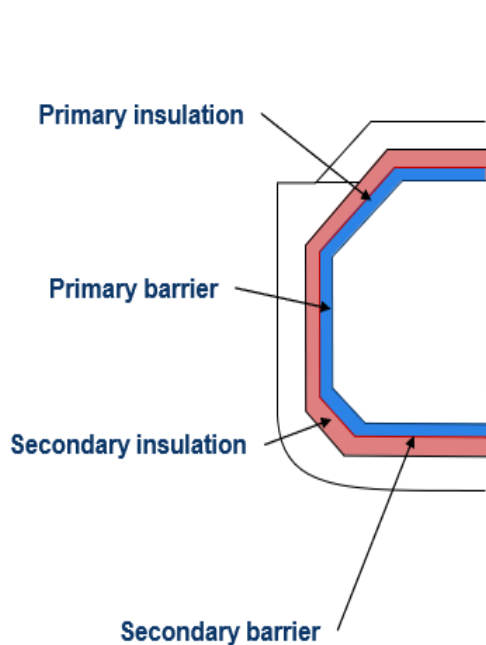


Corporate PPT Template – September 2023 – C3: Restricted Access



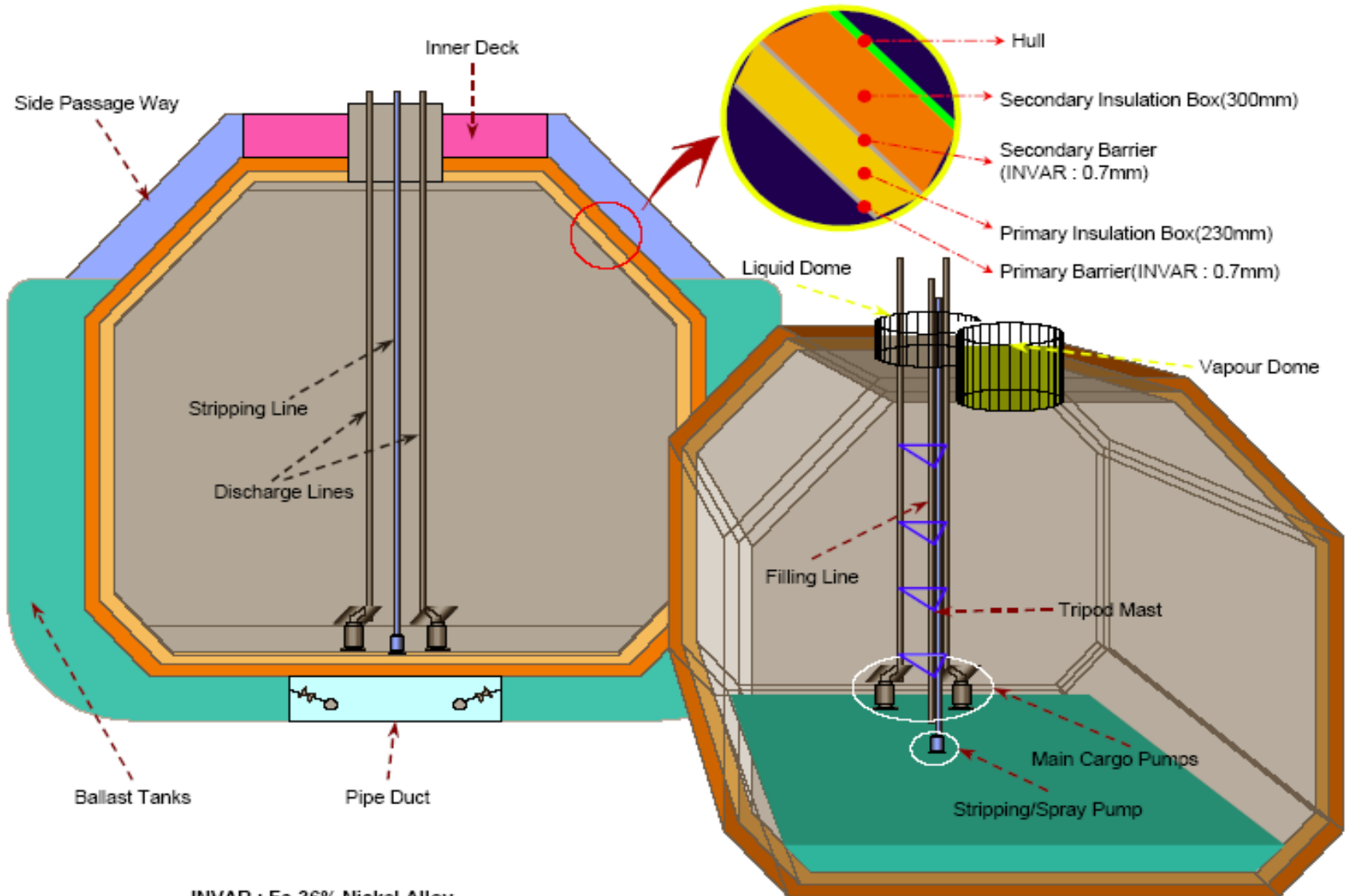
# MEMBANE SHIPS- NO 96

## 1. NO96 DESIGN CONCEPT



- The NO96 system is a membrane containment system for LNG transportation as defined by the IGC Code, including :
  - Two tight thin metallic membranes.
  - Two layers of insulation.
- A fully redundant membrane and insulating system.
- The NO96 design concept lies on two pillars:
  - A membrane made out of Invar®
  - Insulating boxes or panels

# Gaz Transport NO 96 Membrane Tank





# MEMBANE SHIPS- NO 96

## 1. NO96 DESIGN CONCEPT

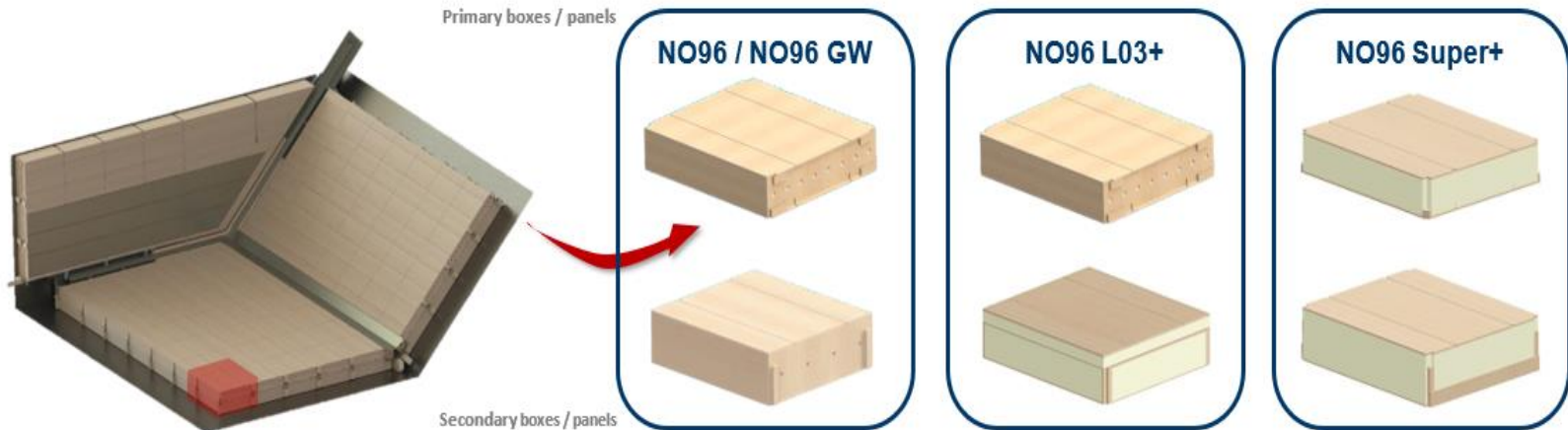
- **The Invar® membrane :**
  - Thickness : 0.7mm (for the most part)
  - Material : Invar® (36% Nickel-Steel Alloy)



# MEMBANE SHIPS- NO 96

## 1. NO96 DESIGN CONCEPT

- **The insulating boxes or panels :**
  - Boxes made of birch plywood, filled with insulating material  
or
  - Panels made with a mix of Reinforced Polyurethane Foam and plywood

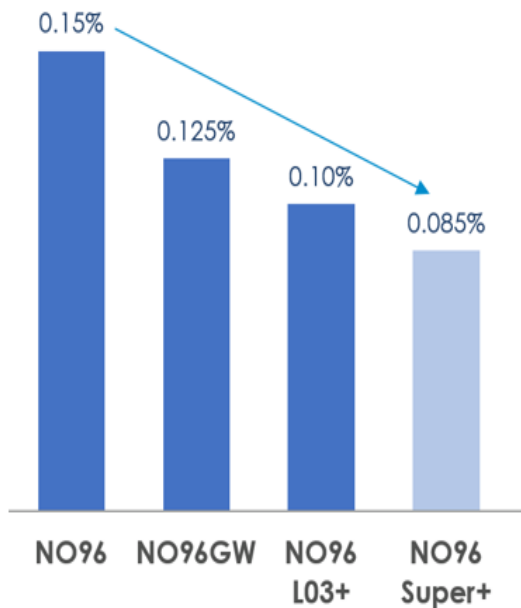


# MEMBANE SHIPS- NO 96

## 1. NO96 DESIGN CONCEPT

- Different technologies enabling a better energy efficiency :

Boil-off rate for a 174k m3 LNGC (%/d)





# MEMBANE SHIPS- NO 96

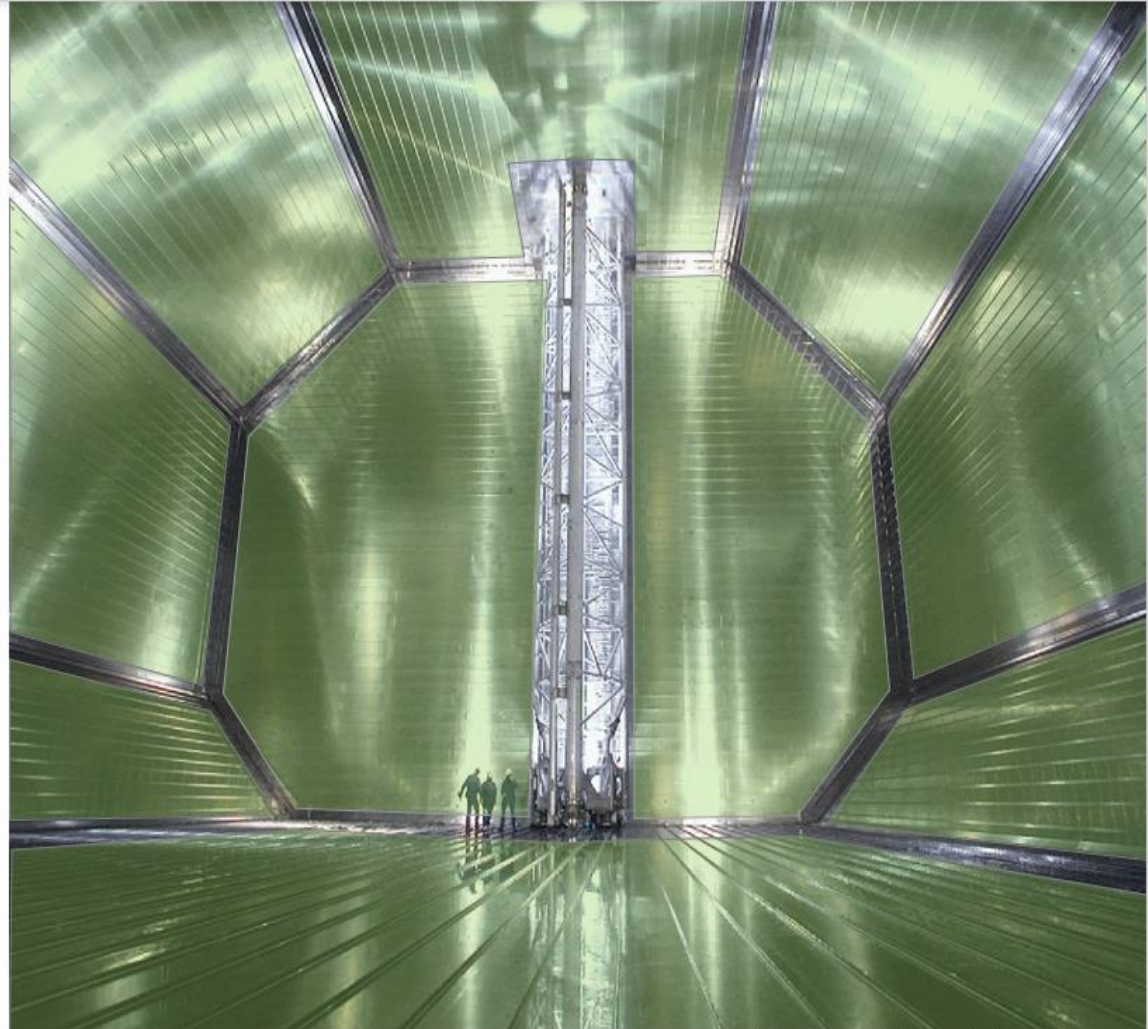
4-1

## System description

- 1. FLAT WALL AREA
- 2. TRANSVERSE CORNER
- 3. LONGITUDINAL CORNER
- 4. OBLIQUE CORNER
- 5. TRIHEDRON



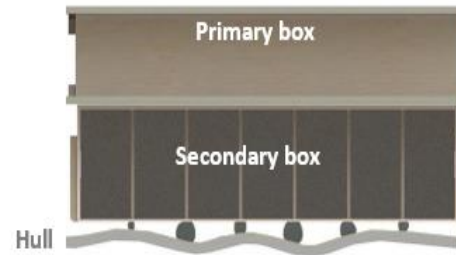
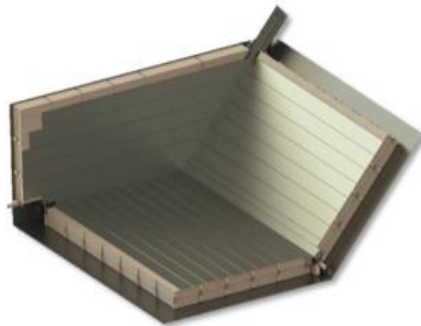
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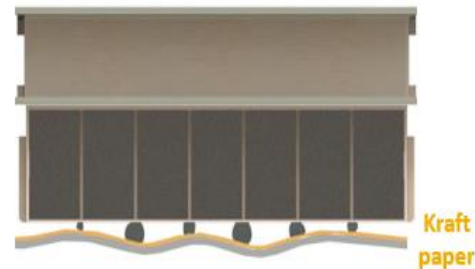
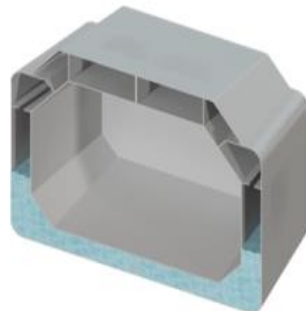
# MEMBANE SHIPS- NO 96

## 4.1. SYSTEM DESCRIPTION – FLAT WALL AREA - (MASTIC + KRAFT PAPER)

- Perfect flatness → Mastic ropes



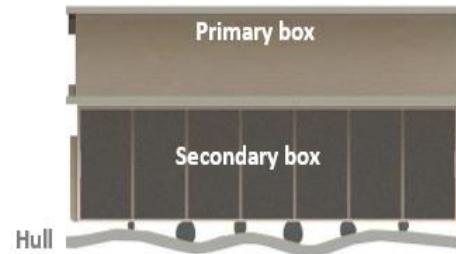
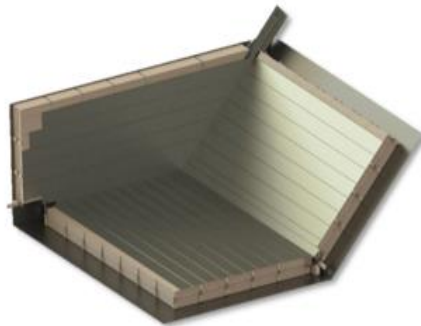
- Hull deformation → Kraft paper (+ "flexible" anchoring device)



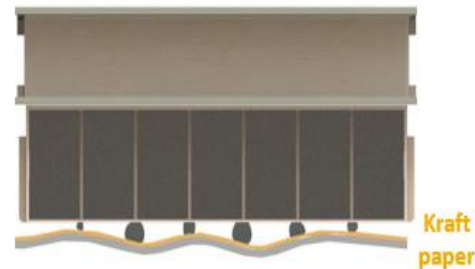
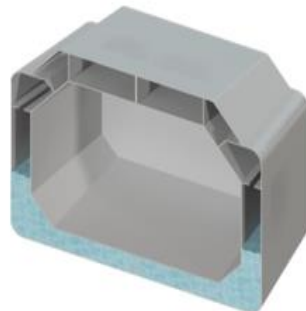
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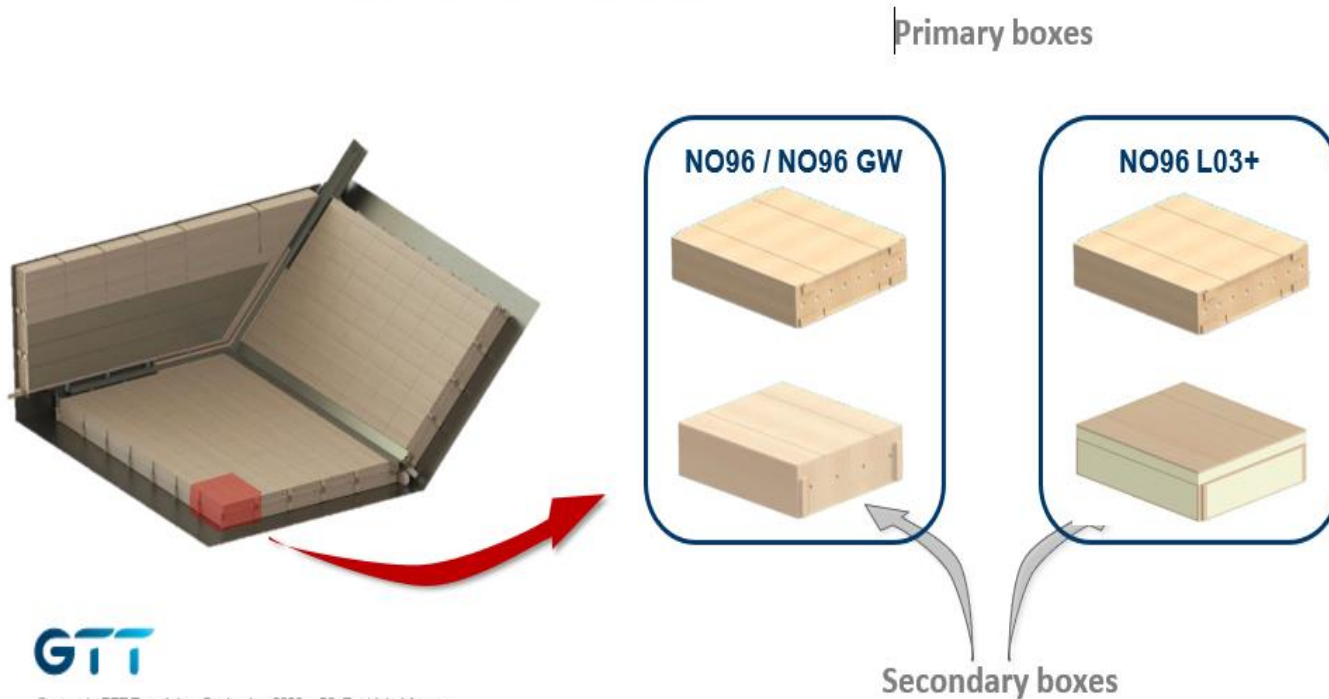




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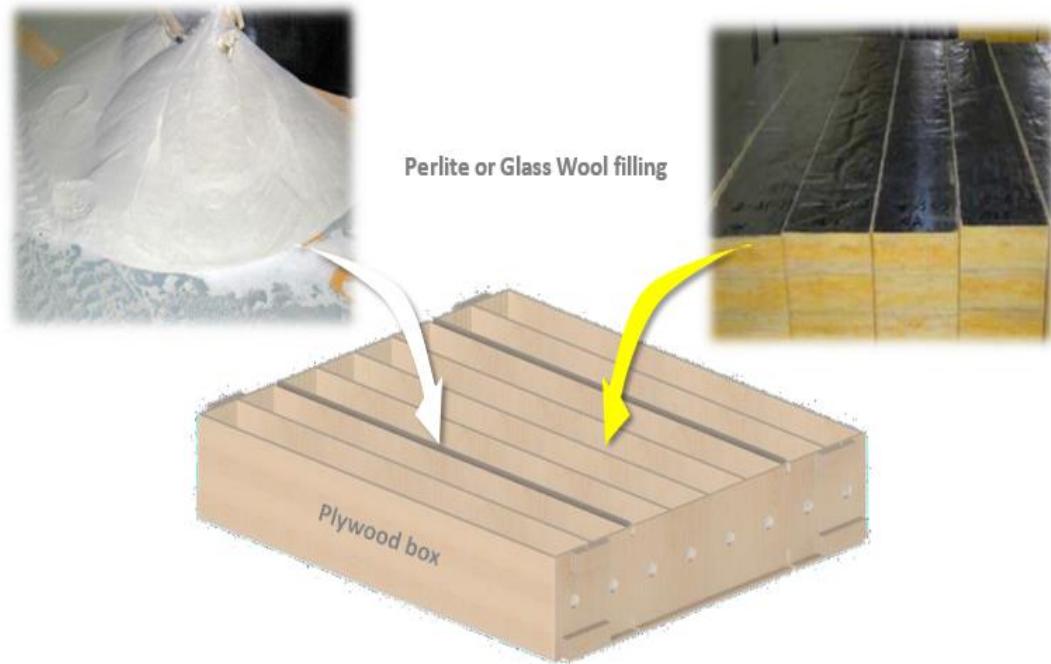
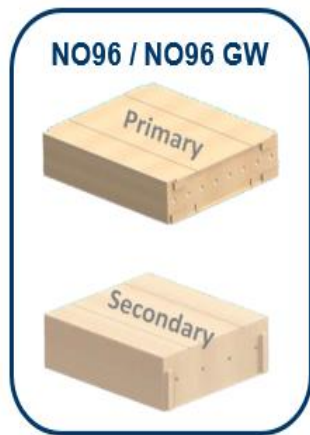
## 4.1. SYSTEM DESCRIPTION – FLAT WALL AREA - (INSULATING BOXES)

- The main components of the flat wall area are the primary and secondary insulating boxes.



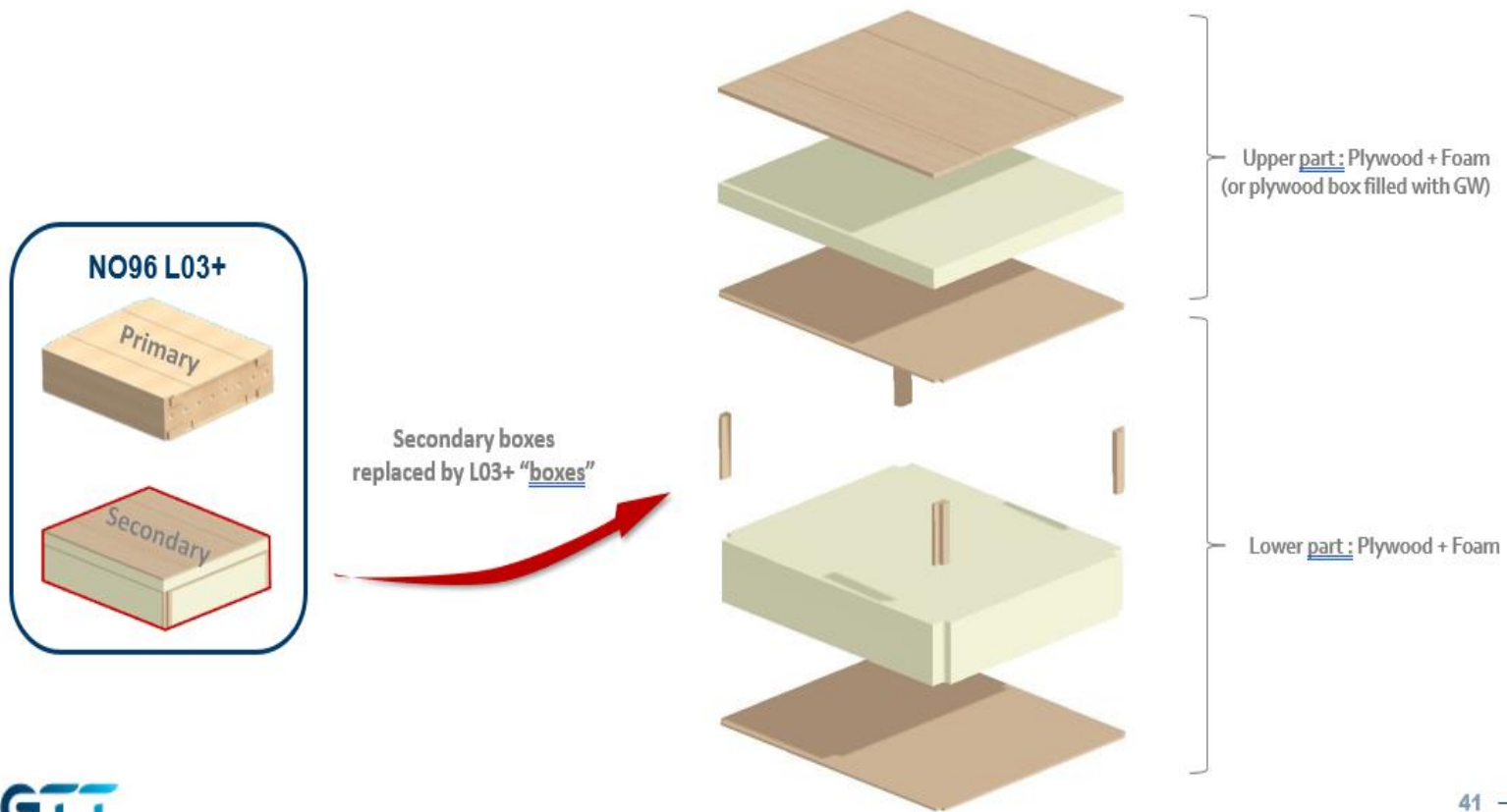
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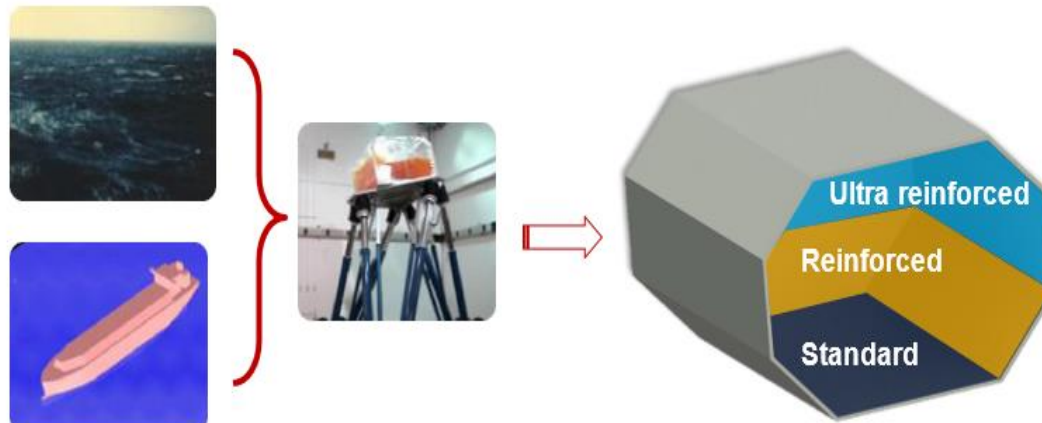
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# MEMBRANE SHIPS- NO 96

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- Depending on the project, reinforced boxes (secondary and primary) can be necessary.



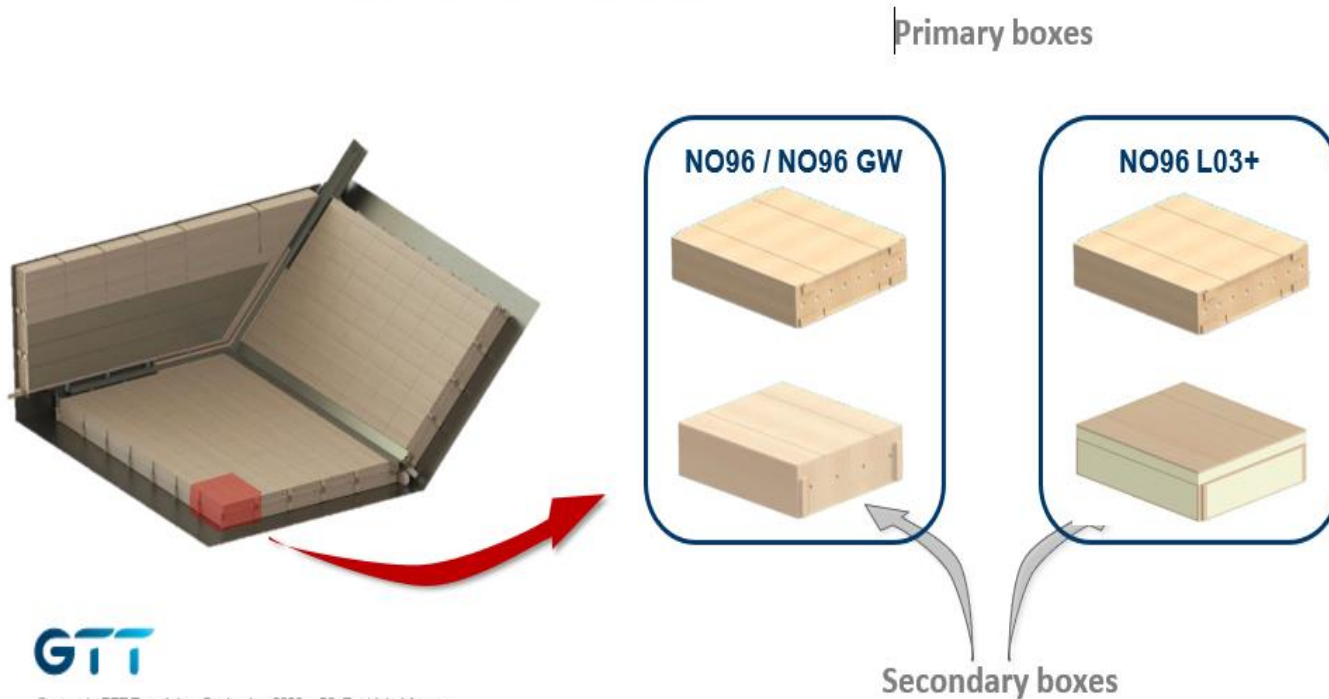
Example of reinforcement repartition



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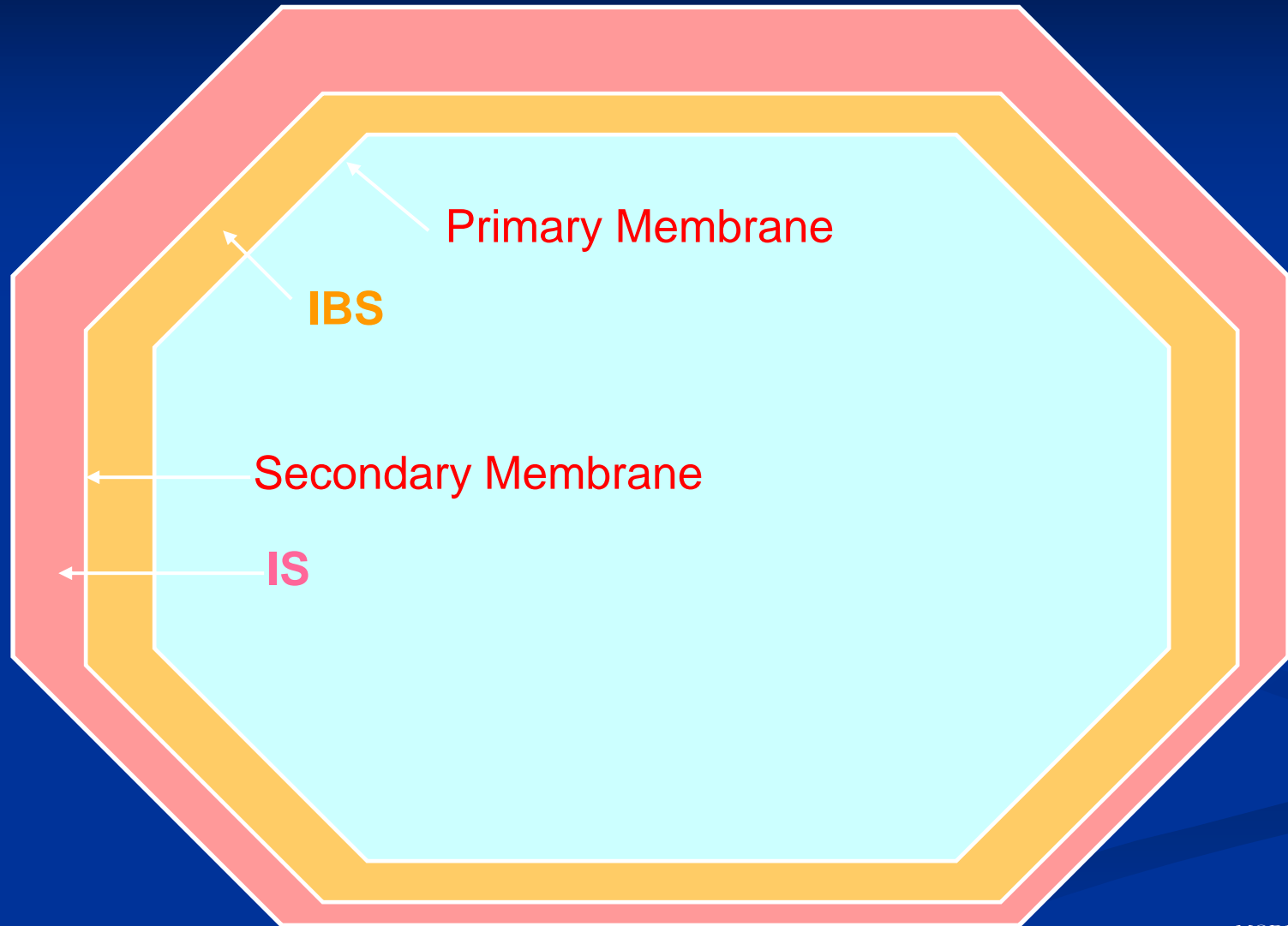




# MEMBANE SHIPS- MARK III



# TECHNIGAZ Membrane Mark II Tank Structure



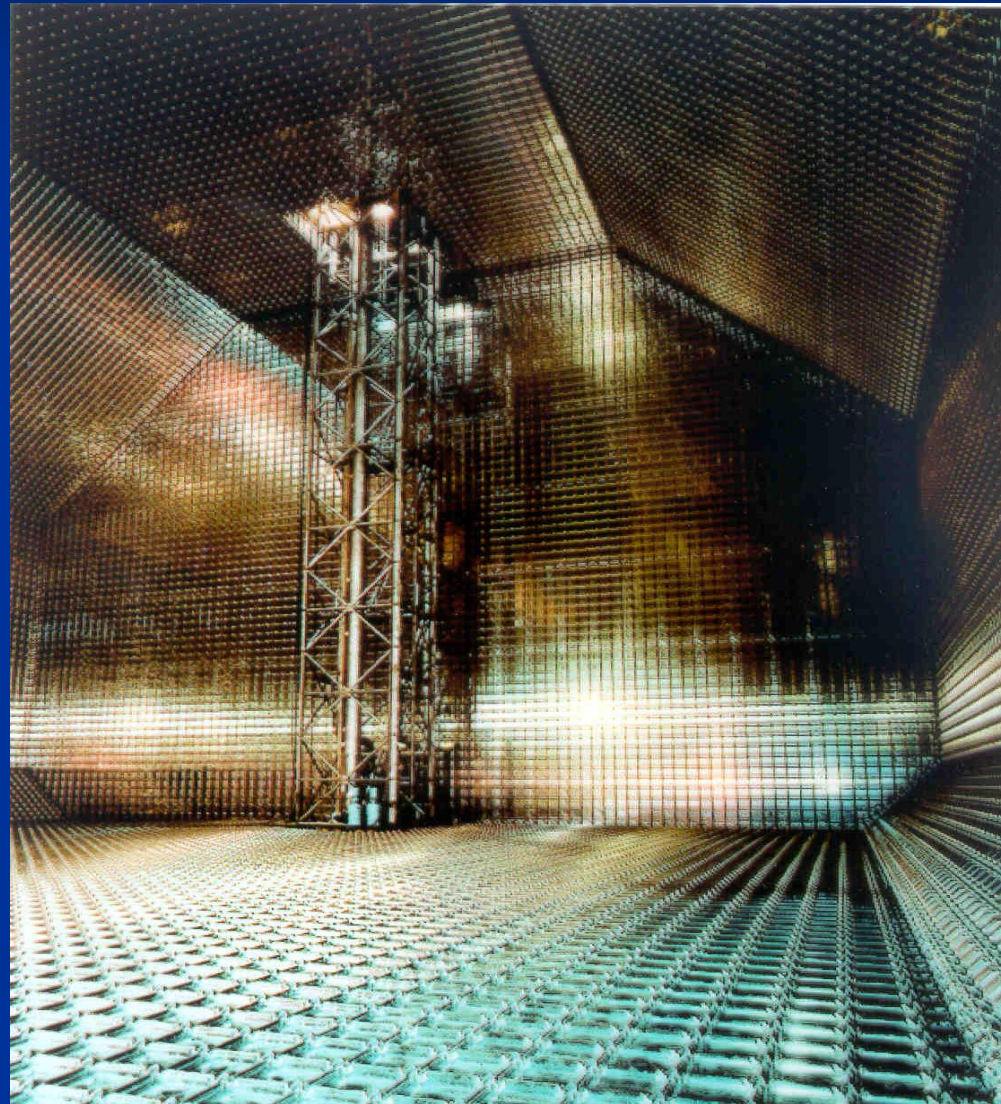


# Technigaz Mk-III System

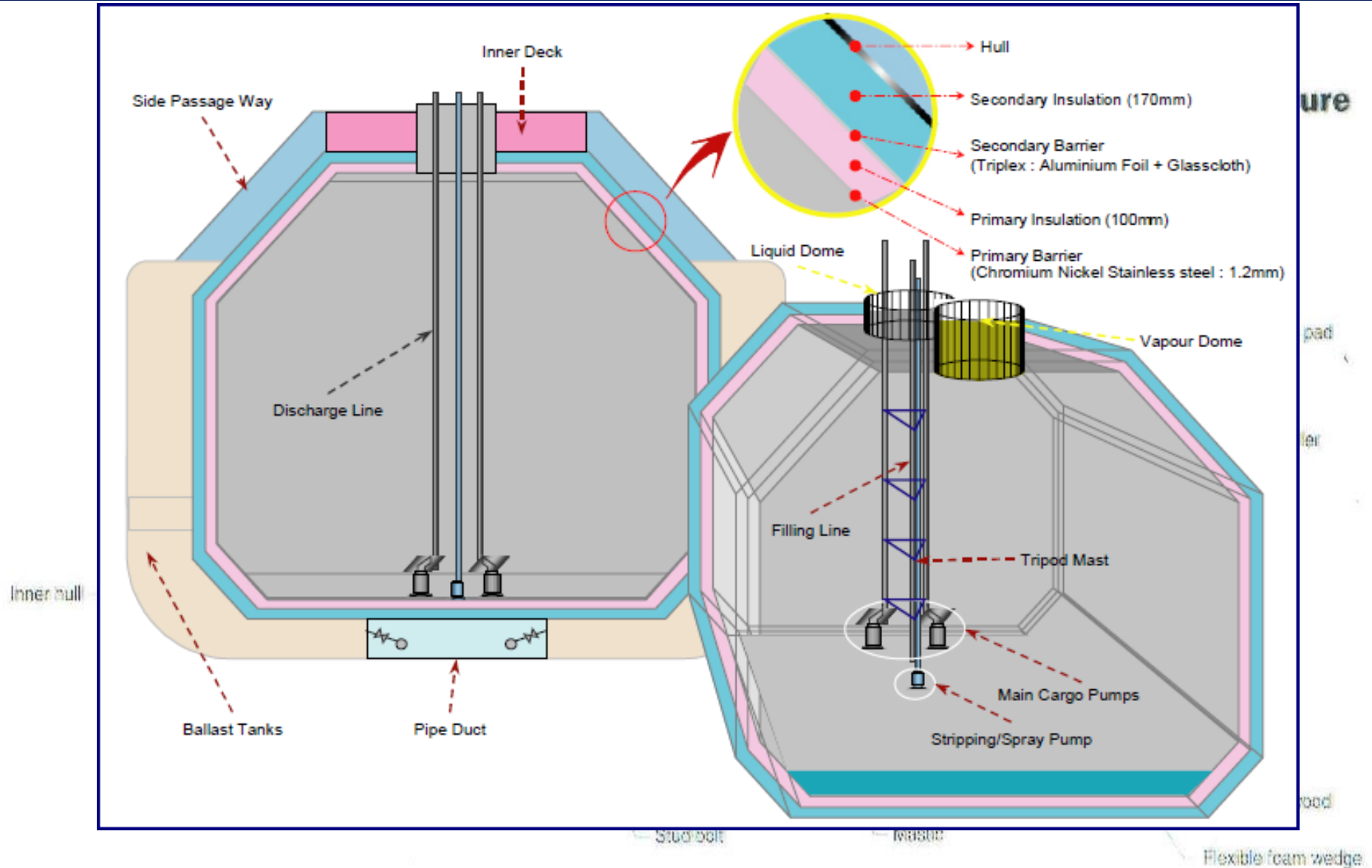
THIN MEMBRANE OF  
STAINLESS STEEL ABOUT  
1.2MM THICK

THE WAFFLE PLATE  
ALLOWS FOR EXPANSION  
AND CONTRACTION

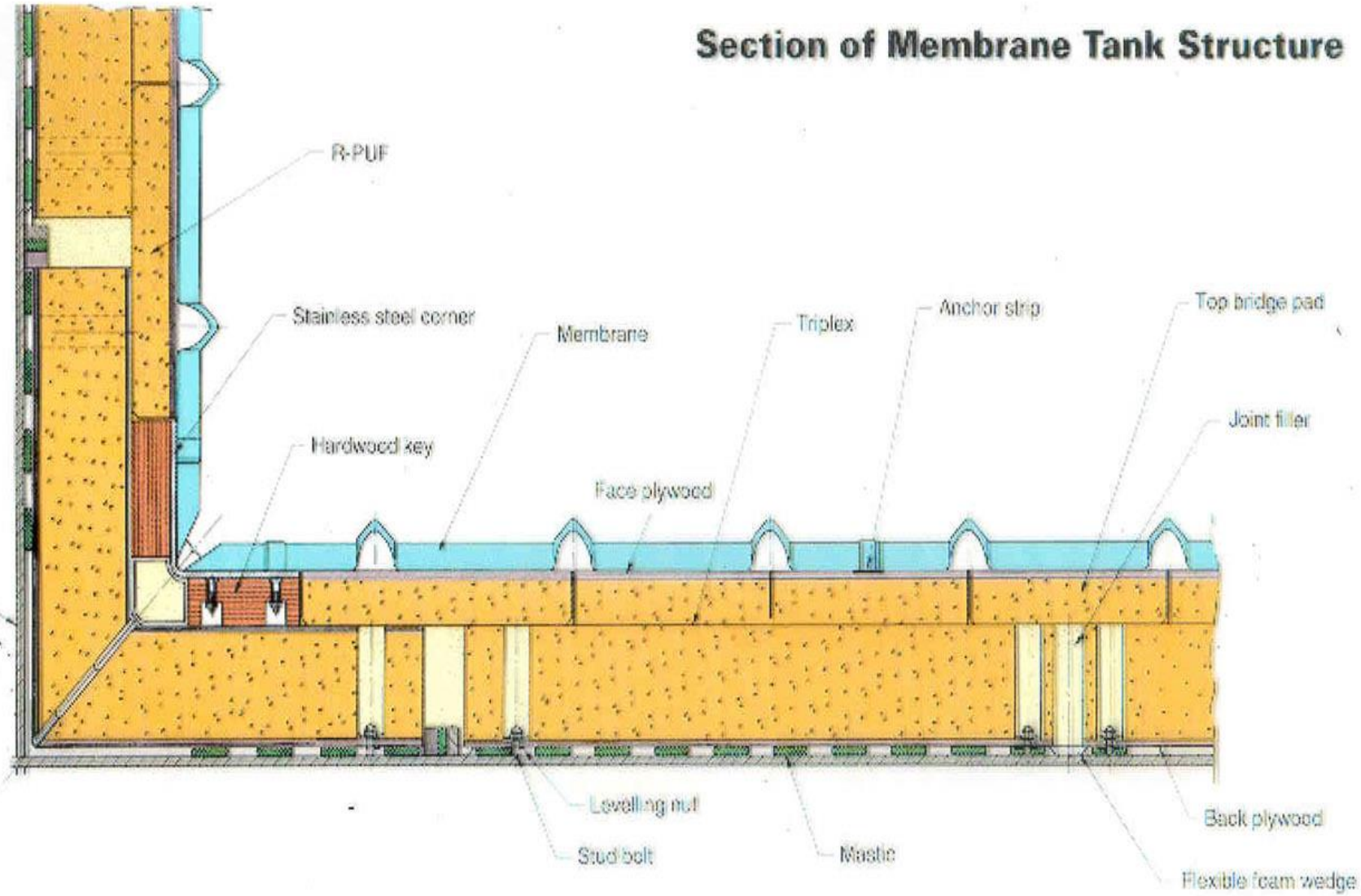
SECONDARY BARRIER  
REQUIRED IN CASE OF  
LEAKAGE



# Technigaz Mark III Construction



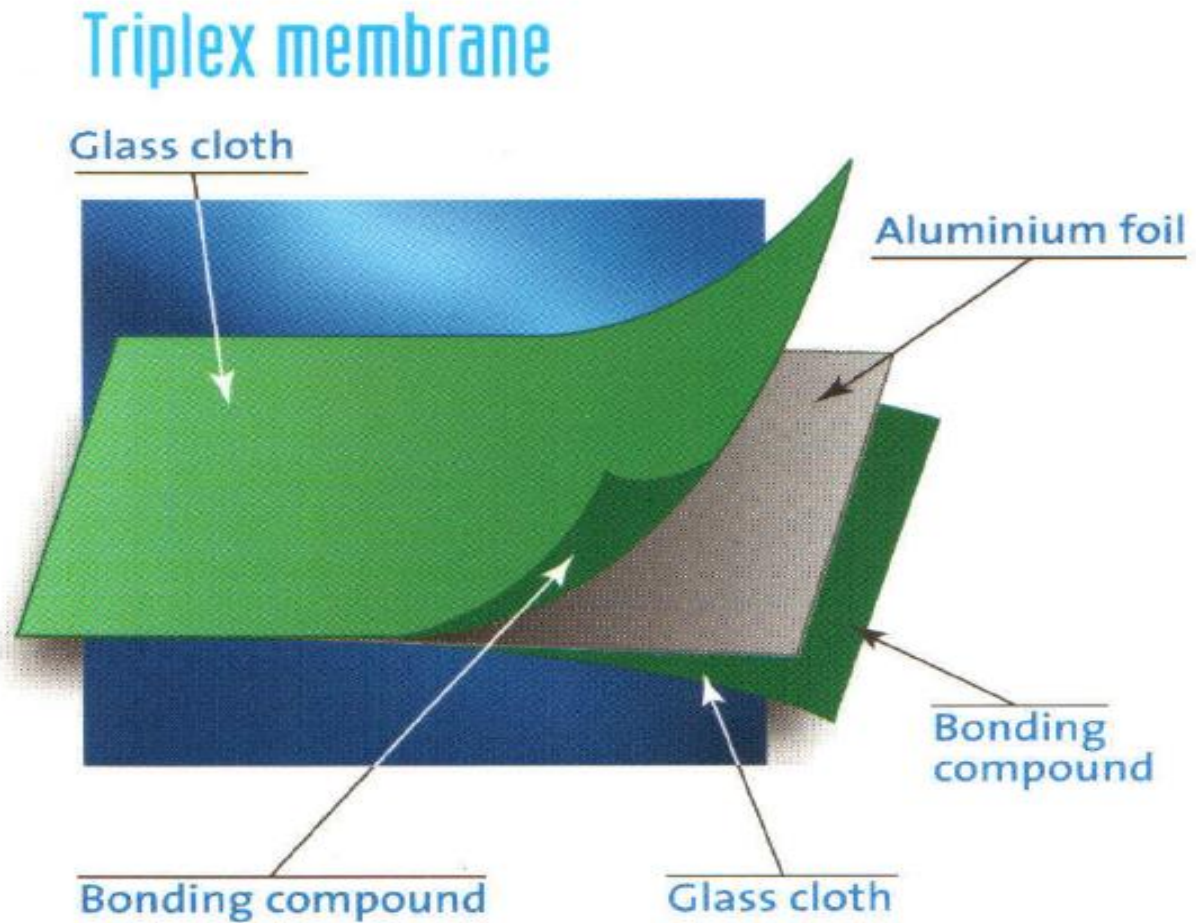
# Technigaz Mark III Construction





# Secondary Barrier of Triplex

Sandwich of  
Glass Cloth  
and  
Aluminium  
Foil



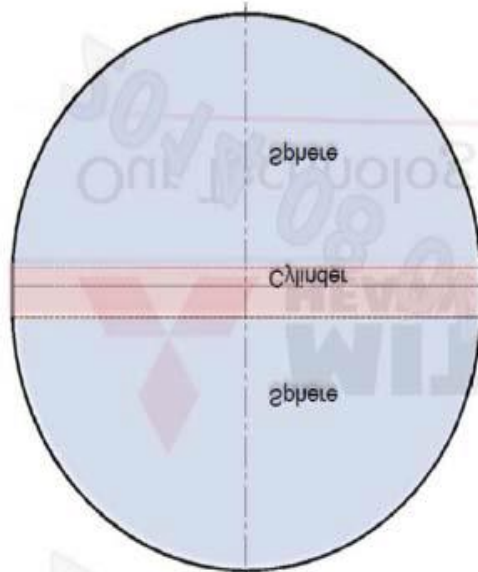
# STRETCH MOSS TANKS( SAYAENDO & SAYARINGO)

Standard MOSS 147,000 - 100%

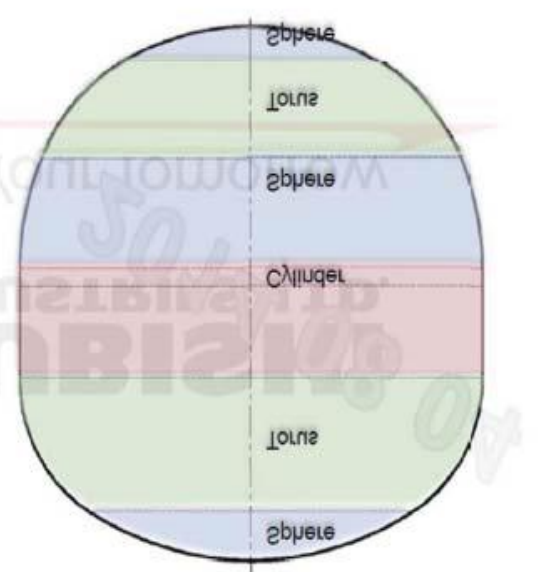
1. Stretch MOSS / SAYAENDO - 155,000 105%

2. Stretch MOSS / SAYARINGO - 180,000 122%

SAYAENDO



SAYARINGO

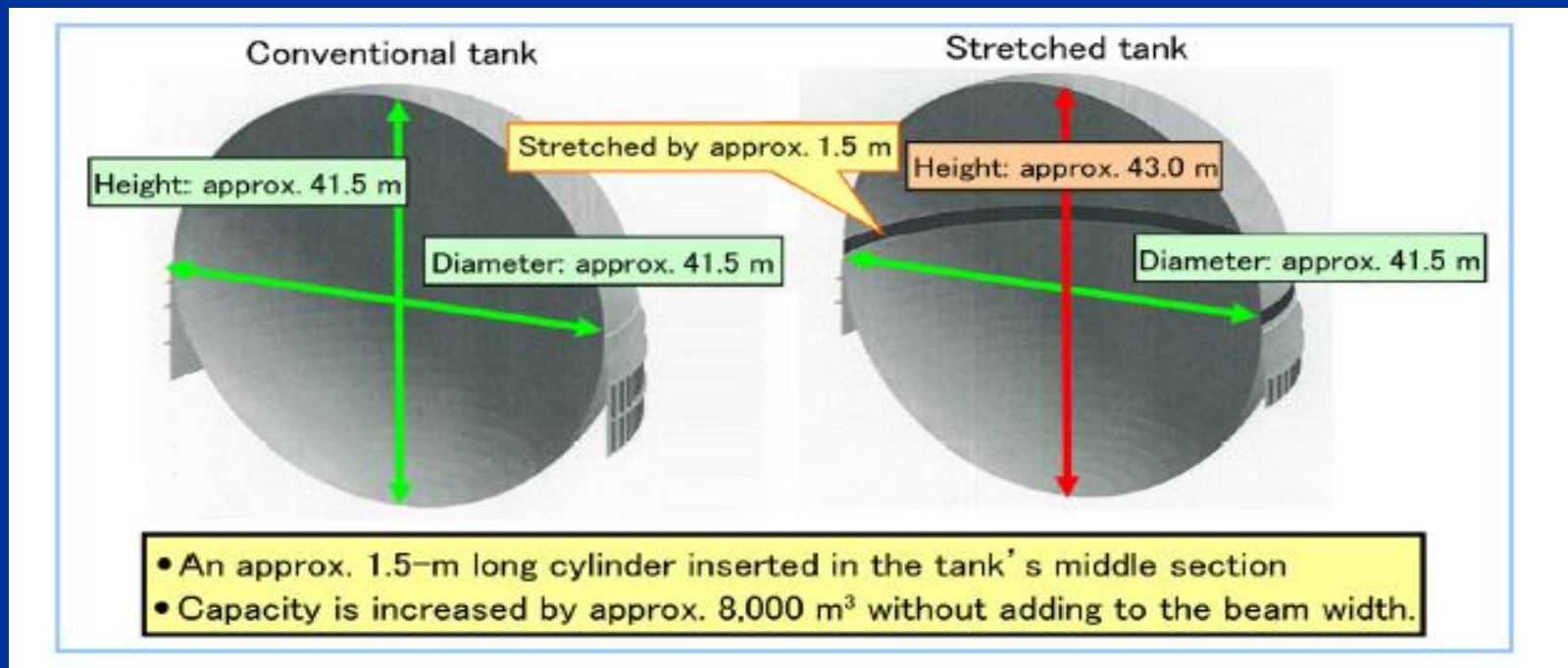


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PEAS IN A POD



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PEAS IN A POD



# SPB

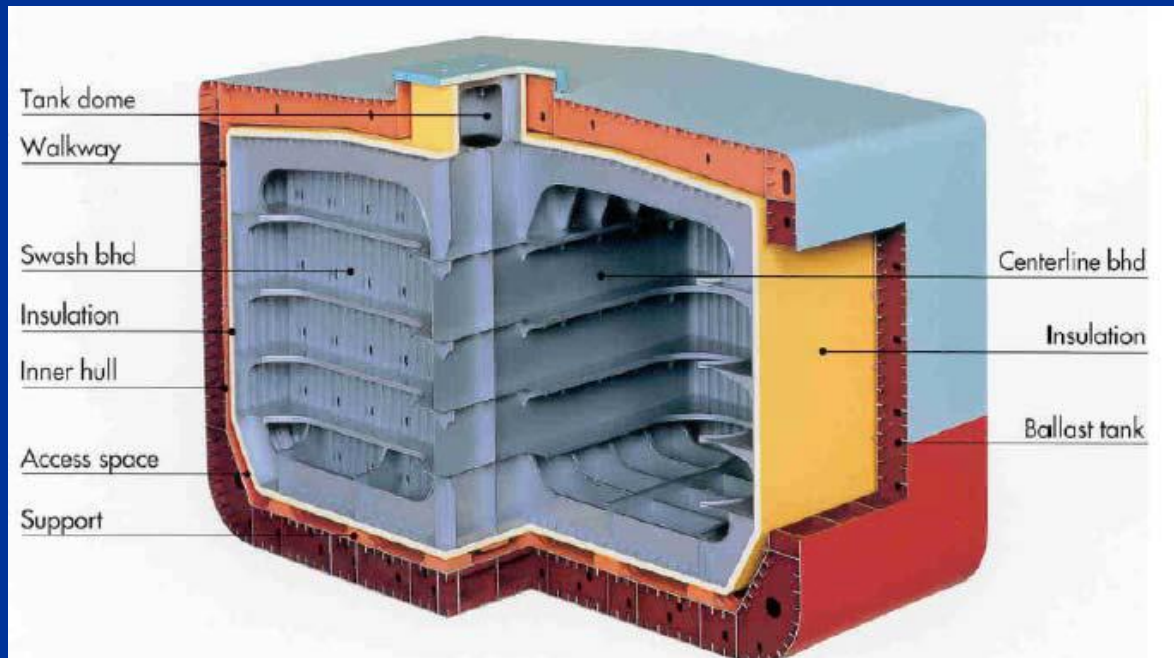
INDEPENDENT TYPE B (SELF SUPPORTING PRISMATIC)



SPB tank

# SPB

## INDEPENDENT TYPE B (SELF SUPPORTING PRISMATIC)



# SPB

INDEPENDENT TYPE B (SELF SUPPORTING PRISMATIC)



# SPB – TANK SUPPORT

INDEPENDENT TYPE B (SELF SUPPORTING PRISMATIC TYPE B)





# SPB SHIP



**THANK YOU VERY MUCH  
FOR LISTENING**