

General Concept for Tanker Design

Permanent Means Access to Tanks for Tanker

SOLAS Regulation II-1/3-6

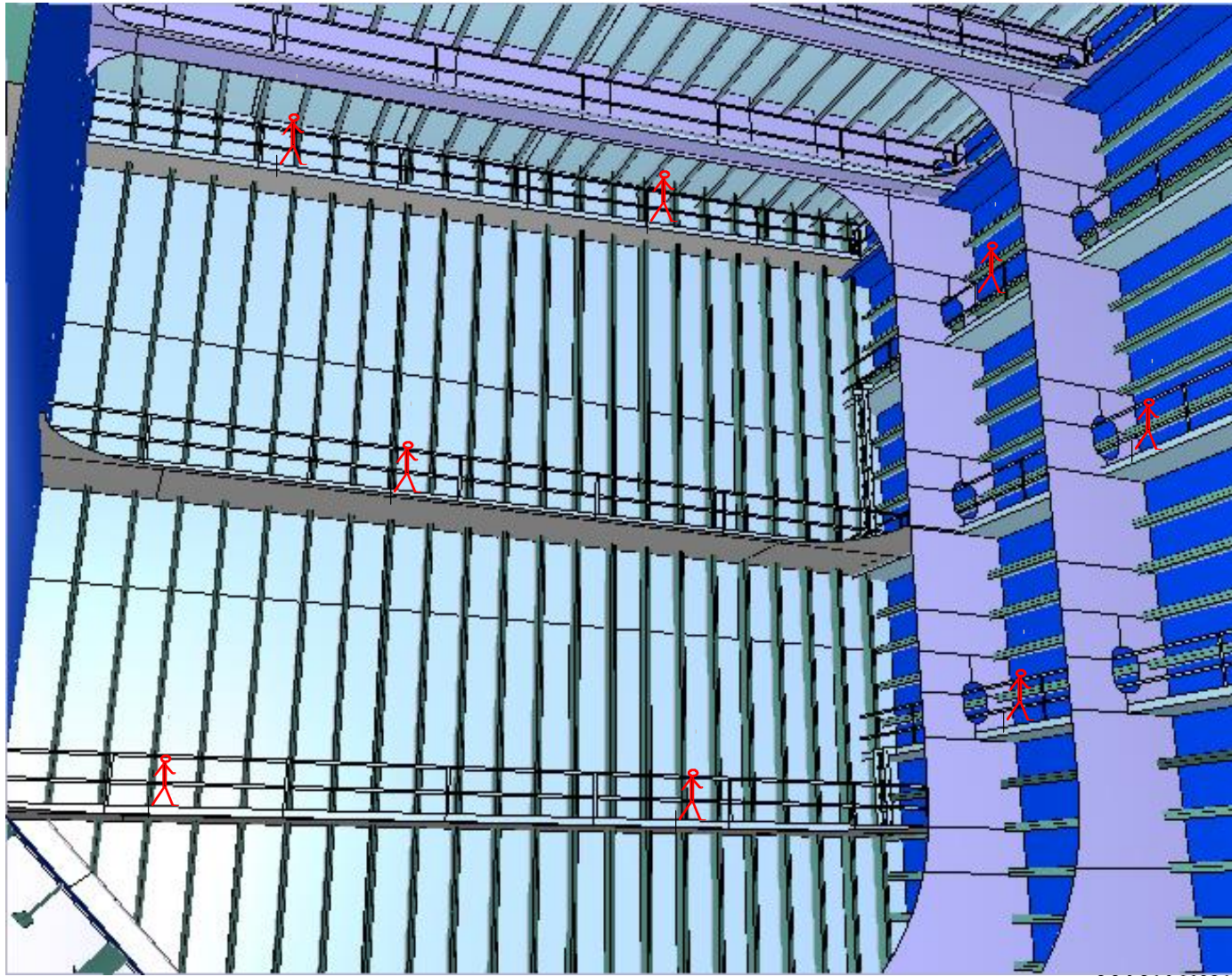
(IACS (UI) SC 191)

**Access to and within spaces in the
cargo area of oil tankers**

- For vessel which is constructed on or after 1 January 2006

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PMA (permanent means of access) applicable to;

- Cargo holds/tanks and
- Ballast tanks in cargo tank area and
- Cofferdams, void spaces and others in the cargo tank area

Access for entry shall be direct from open deck.

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PMA (permanent means of access) applicable to;

- Double bottom spaces or
- Forward ballast tanks (Fore peak tank *)

Access for entry may be from pump room, deep cofferdam, pipe tunnel and double hull or similar not intended for carriage of cargo oil.

Safe Entry into Tanks

PMA Structure and Access platform requirement :

The **construction** and **materials** of all Means of Access and their attachment to the ship's structure shall be built-in as an **integral part of the structure of the ships**.

Safe Entry into Tanks

Tanks length $< 35\text{m}$:

One Access hatchways and ladder

Inclined ladder or combination ladder

Tanks length $\geq 35\text{m}$ or tanks subdivided by swash bulkhead

Two Access hatchways and ladders

1st access hatchway : Inclined ladder

2nd access hatchway : Vertical ladder - Vertical distance $\leq 6.0\text{ m}$

Safe Entry into Tanks

Requirement for ladders

A. Vertical ladder ;

1. **Uppermost** section of the vertical ladder in way of the tank entrance, $2.5 \leq h \leq 3.0$

May be **reduced to** $h \geq 1.6$ m if the ladder **lands** on a permanent means of access fitted within that range

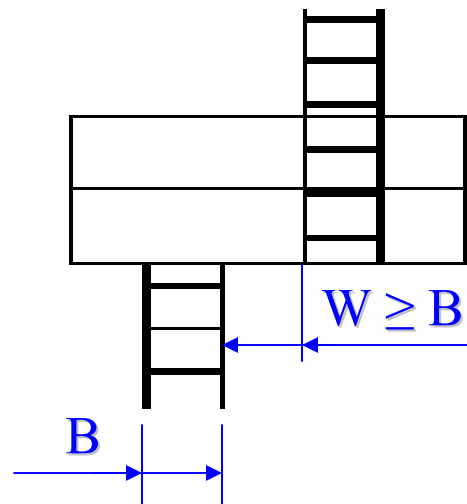
2. Vertical ladders should comprise one or more ladder **linking platforms** if the **vertical distance** is more than **6.0 m** apart vertically.

Safe Entry into Tanks

Requirement for ladders

A. Vertical ladder ;

3. Adjacent sections of the ladder should be laterally **offset** from each other at linking platforms by **at least the width** of the ladder.



Safe Entry into Tanks

Requirement for ladders

A. Vertical ladder ;

4. A **minimum climbing clearance** in width at entrance is to be **600 mm**.

5. Particular of the **vertical ladder** ;

Width between stringers ≥ 350 mm

Rung should be **single square bars** not less than 22 x 22 mm

Vertical distance between rungs = 250 ~ 350 mm

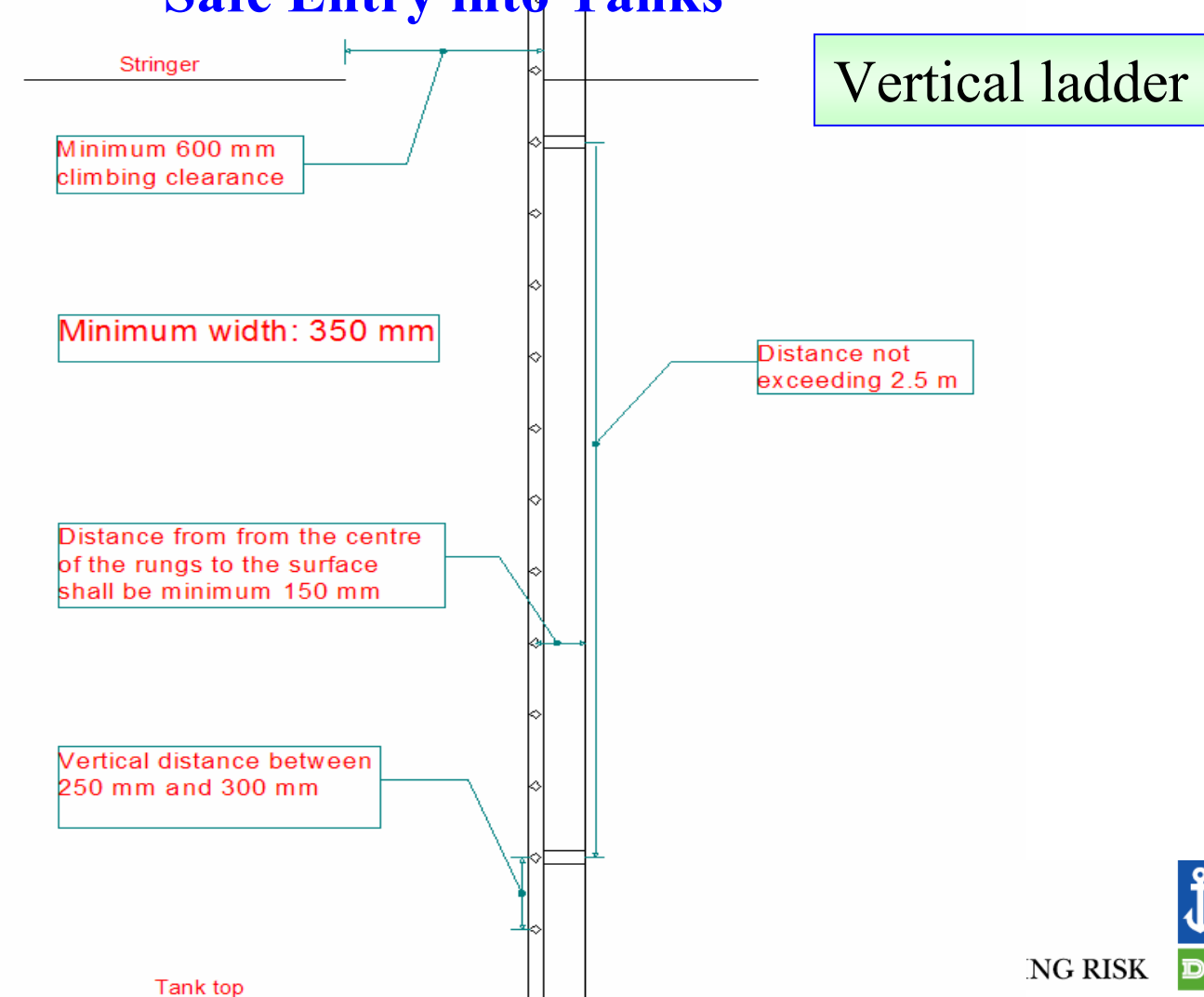
Distance from centre of rung to the surface ≥ 150 mm

Secured at intervals not exceeding **2.5 m apart**

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Safe Entry into Tanks



Safe Entry into Tanks

Requirement for ladders

B. Inclined ladder or combination of ladder ;

1. Inclined ladders should be inclined at angle $\leq 70^\circ$
2. Uppermost section of the vertical ladder in way of the tank entrance, $2.5 \leq h \leq 3.0$
May be reduced to $h \geq 1.6$ m if the ladder lands on a permanent means of access fitted within that range
3. The distance of the inclined ladders should not be more than 6 m in vertical height.

Safe Entry into Tanks

Requirement for ladders

B. Inclined ladder or combination of ladder ;

4. The **lowermost** section of the ladder may be **vertical** for vertical distance $\leq 2.5 \text{ m}$

5. Particular of the **inclined ladder** ;

Width between stringer $\geq 400 \text{ mm}$

Treads between vertical = $200 \sim 300 \text{ mm}$

tread = two square bars, $22 \text{ mm} \times 22 \text{ mm}$

Vertical height of handrails $\geq 890 \text{ mm}$

Inclined angle $\leq 70^\circ$

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Safe Entry into Tanks

Inclined ladder

Vertical distance:
200 mm - 300 mm

Treads are to be formed of two square bars of not less than 22 mm by 22 mm in section. Edges shall point upward. Treads are to penetrate through the stringers with double continuous welding.

Minimum width of 400 mm.
To comply with AMSA, minimum 450 mm width for access to a cargo hold

Depth 65 mm - 75 mm, ref AMSA

Safe Entry into Tanks

- Cargo tanks
- Ballast tanks in cargo tank area
- Cofferdams and other spaces in the cargo tank area
Safe Access for entry shall be direct from **open deck**
- Double bottom spaces
- Forward ballast tank (Fore peak tank)
Safe Access for entry may be from pump room, deep cofferdam, pipe tunnel and double hull spaces

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Safe Entry into Tanks

$2.5 (1.6) \text{ m} \leq h \leq 3.0 \text{ m}$ for both
vertical & inclined ladder

1st access inclined
unless in narrow
ballast tanks

2nd access for tanker
may be vertical
ladder with vertical
distance $\leq 6.0 \text{ m}$

May be vert. ladder, $h \leq 2.5 \text{ m}$ for
inclined ladder

$< 6.0 \text{ m}$

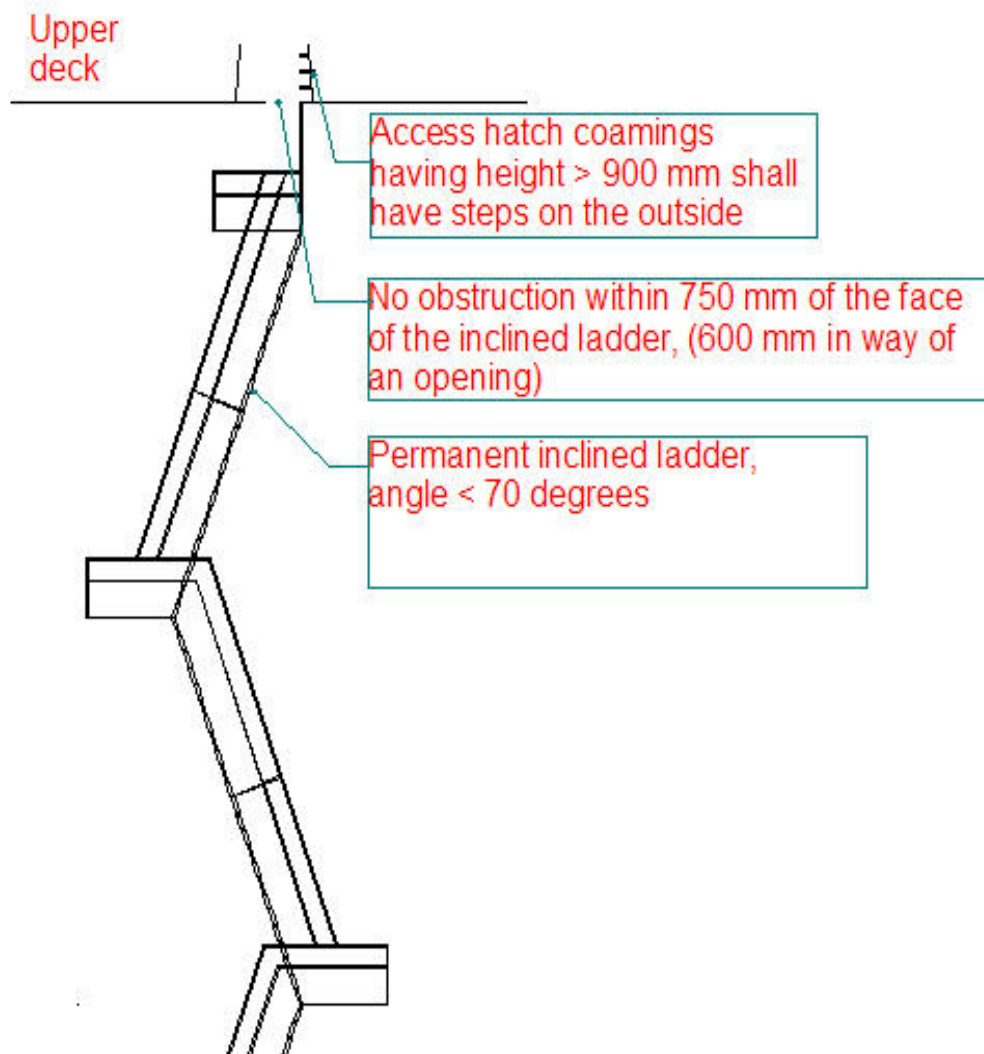


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Safe Entry into Tanks



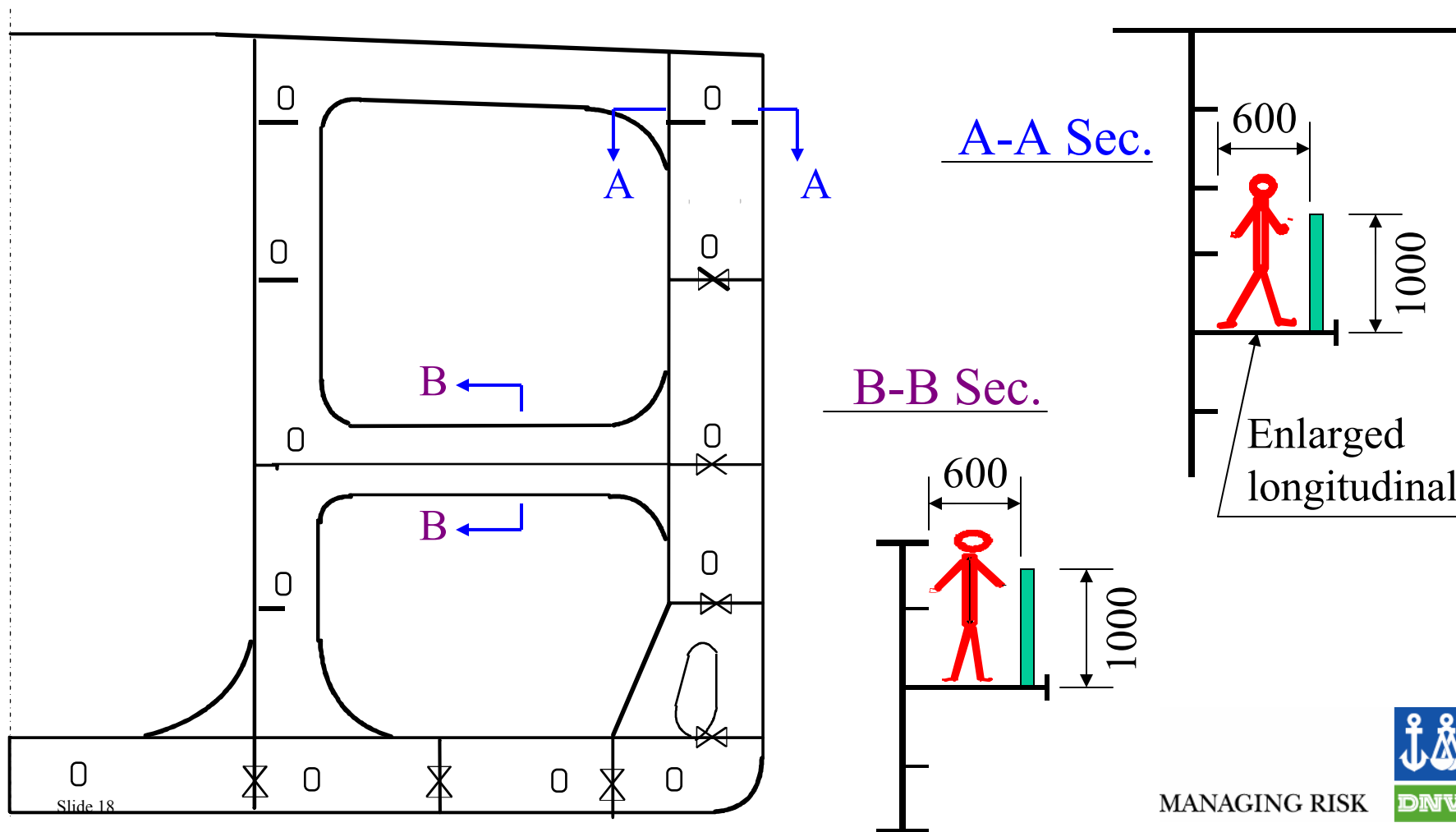
Safe Entry into Tanks

Elevated passageways forming sections within tank:

- Min. clear width of 600 mm;
- Min. width 450 mm going around vertical web structure;
- Guard rail (solid bar) 1,000 mm above platform;
- Intermediate bar 500 mm above platform;
- Stanchions not more than 3.0 m apart;
- Sloping structure (> 5 degrees) to be non-skid-type;
- Max. 50 mm gap between non-continuous handrail with the adjacent stations across the handrail not more than 350 mm.

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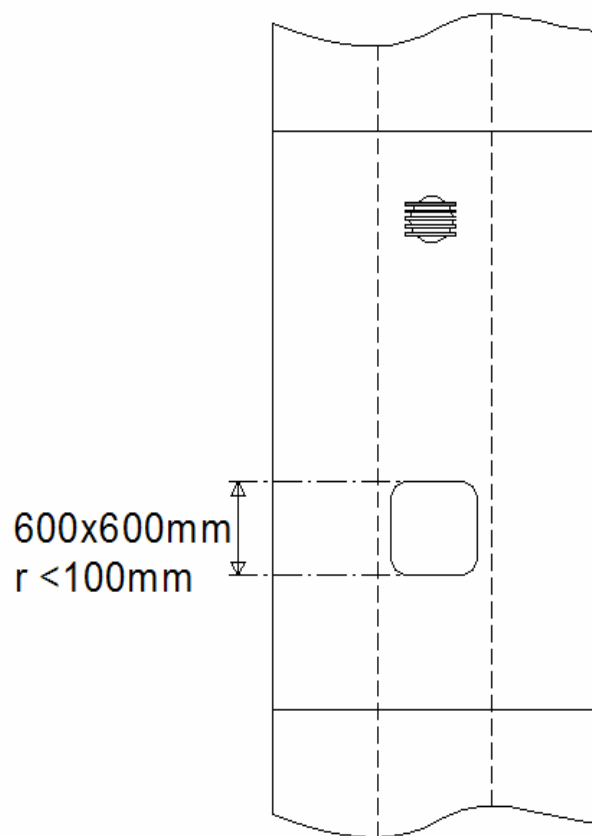
Safe Access to tanks

- **Clear opening** of horizontal access hatches and manholes shall allow a person wearing breathing apparatus to, unobstructed, enter and move around in the spaces.
- Provided access openings should facilitate the hoisting of an injured person **from the bottom of the space directly out on the open deck.**
- Horizontal openings/ways: Min. clear opening, **600 × 600 mm** with **max. 100 mm** radius
- Vertical openings/ways: Min clear opening, **600 × 800mm** with **min. 300 mm** radius

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Safe Access to tanks



Access opening : **horizontal**

All openings
protected
by bars or
rail

600x600mm
 $r < 100\text{mm}$

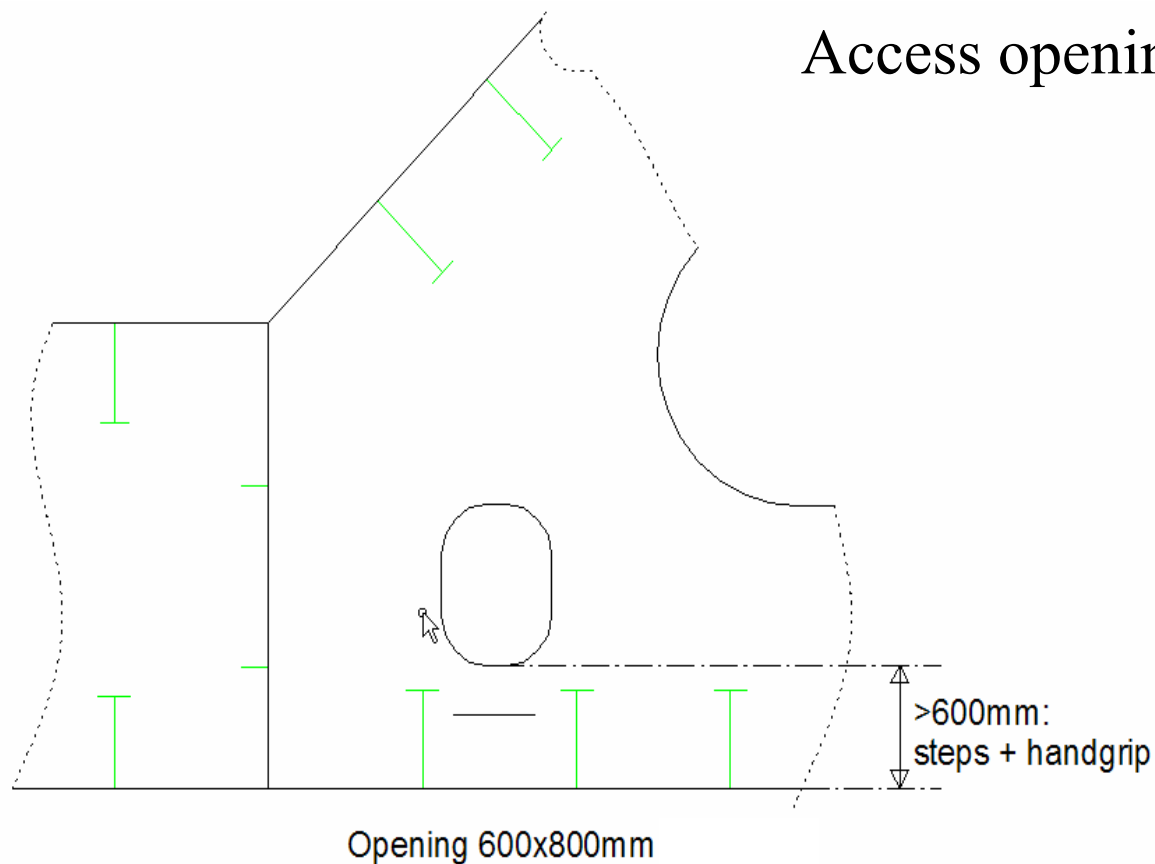
Openings for hoisting
of injured person to be
in line from bottom

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Safe Access to tanks

Access opening : **vertical**



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Safe Access to tanks

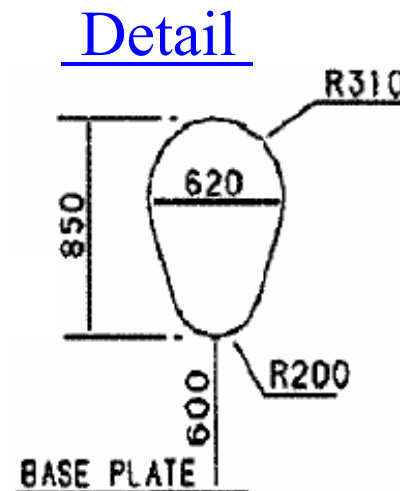
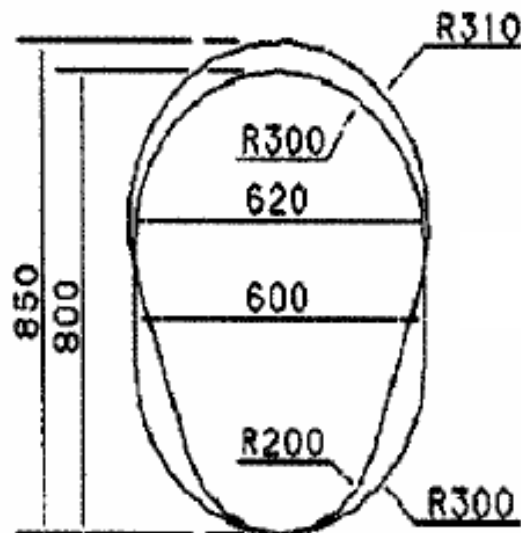
- An 600 mm in height x 800 mm in width opening may be accepted as access openings in vertical structures where it is not desirable to make large opening due to strength requirement, i.e. girders and floors in double bottom tank.

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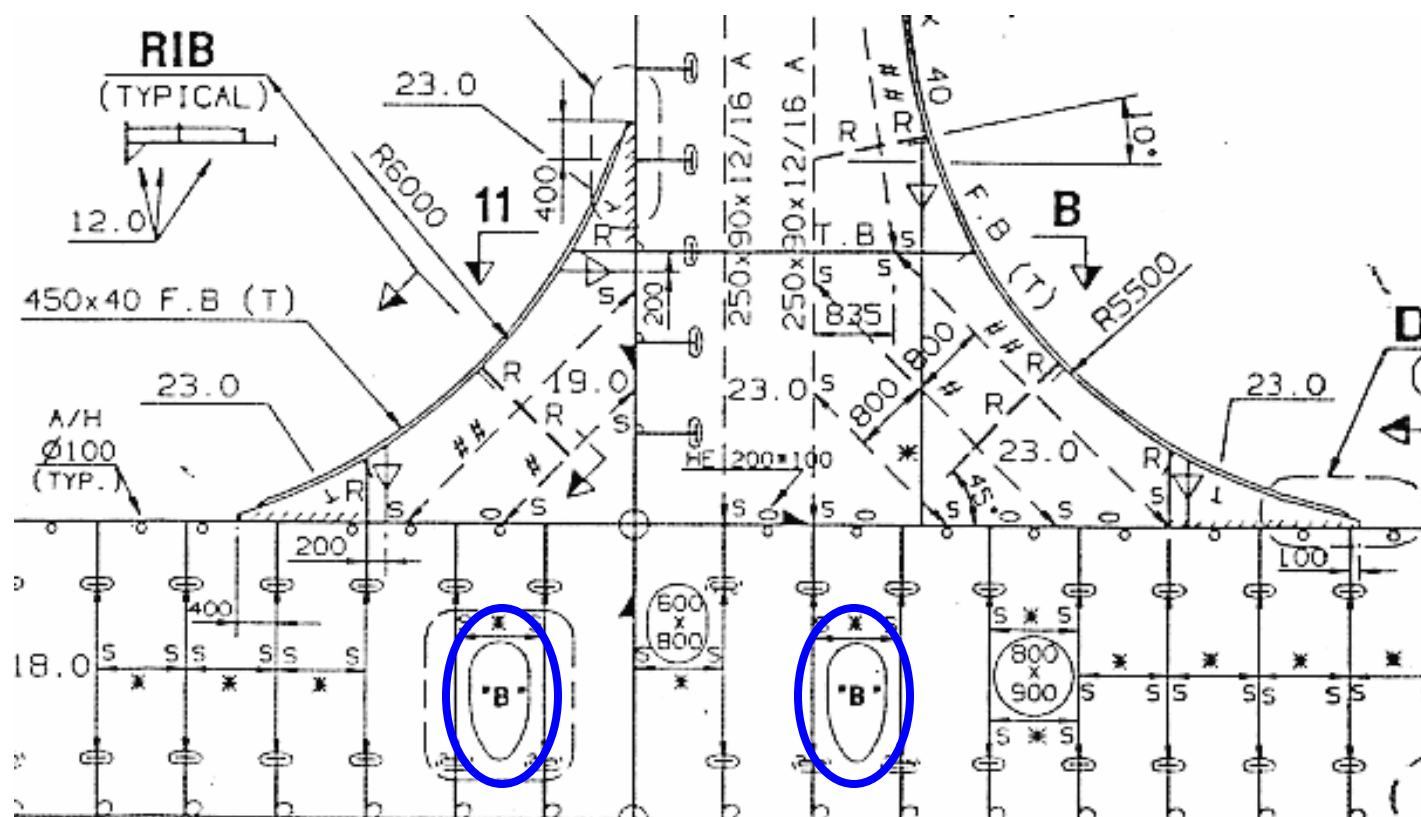
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Safe Access to tanks

- A vertical opening 850 mm x 620 mm with wider upper half than 600 mm, while the lower half may be less than 600 mm with the overall height not less than 850 mm is considered as an alternative 600 mm x 800 mm opening.



Safe Access to tanks



Safe Access to tanks

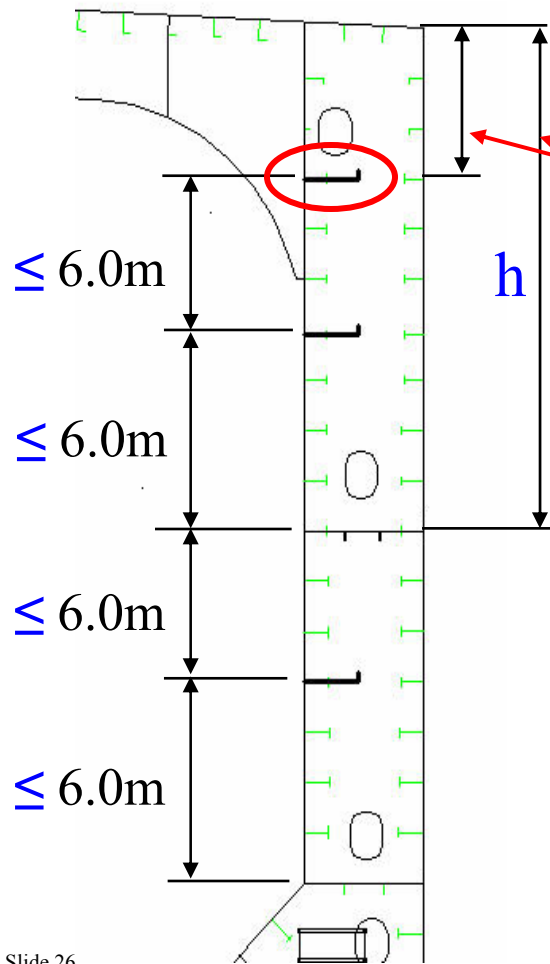
Inclined ladders:

Inclined ladders shall generally be used for entry into tanks

Vertical ladders may be used in lieu of inclined ladders for :

- Narrow ballast tanks $b < 2.5$ m
- As **second access** to cargo tanks provided vertical distance to deep stringer/bottom $h < 6.0$ m

PMA in Narrow Ballast Tanks

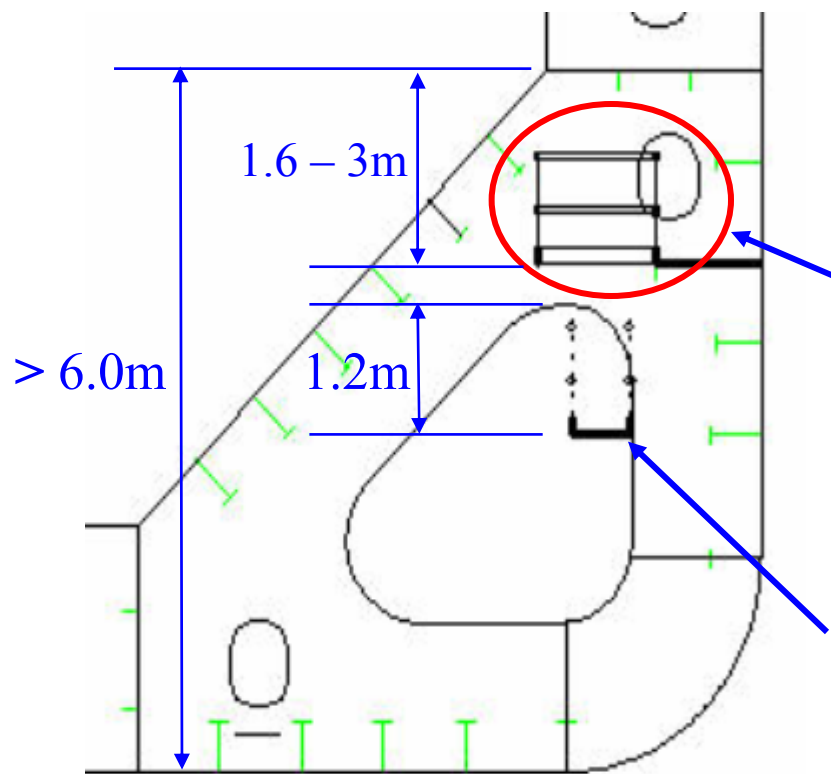


- Where the upper stringer is situated more than 6 m below the deck head, one continuous longitudinal **PMA** should be arranged at minimum 1.6 m to maximum 3 m below deck.
- Max. spacing between **PMA 6 m**.
- PMA to be **integrated** in hull structure.

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PMA in Bilge Hopper Tank



Where the vertical distance between the tank bottom and the upper hopper knuckle is **above 6 m**, **PMA** should be arranged.

Longitudinal continuous **PMA** arranged **1.6m to 3m** below top of hopper section with platform at web giving access to upper hopper knuckle.

OR

Longitudinal continuous **PMA** arranged **min. 1.2m** below top of hopper web opening allowing for use of portable means of access to reach critical areas.

PMA in Narrow Ballast Tanks

In case the **vertical opening of the web frame** is located in way of the open part between the wide longitudinal and the longitudinal on the opposite side, **platform shall be provided on both side of the web frame** to allow safe passage through the web frame.

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PMA in Narrow Ballast Tanks



Wider Longl, PMA

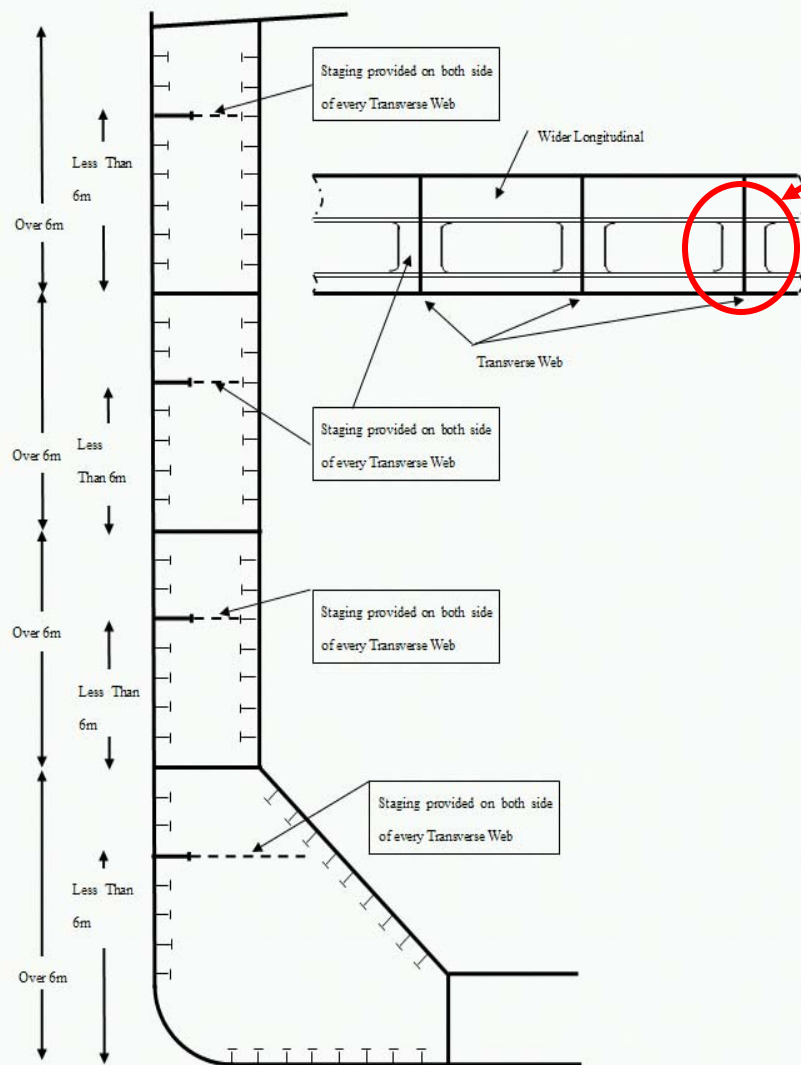


Staging provided on both side

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PMA in Narrow Ballast Tanks



A wide longitudinal with staging provided on both side of every transverse web

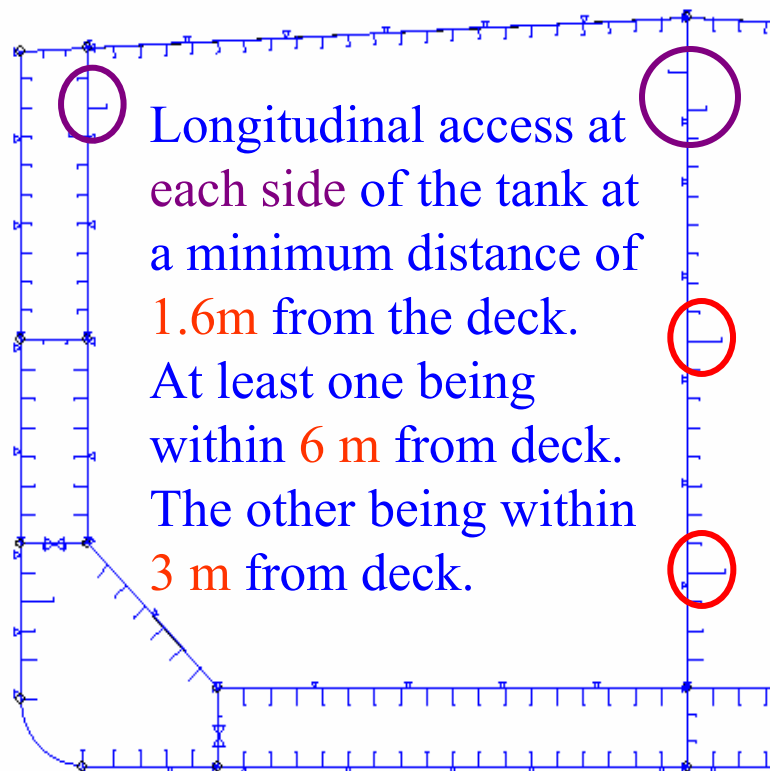
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PMA in cargo tanks and wide ballast tanks of height greater than 6m:



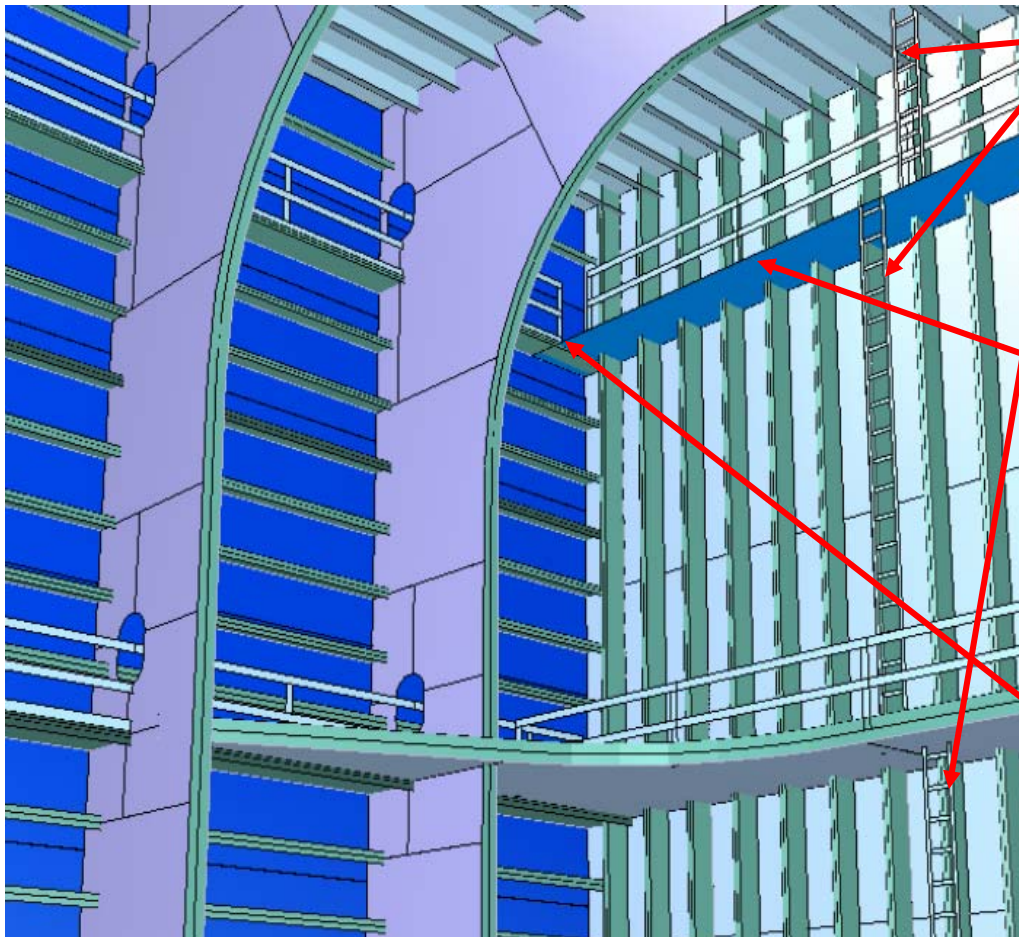
Integrated longitudinal access at This is **considered** as a future option when efficient alternative means are available.

Such alternative means should be available onboard and readily accessible for survey **without** filling of water in the cargo tank.

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Transverse PMA in large tanks



Access to PMA from open deck. between PMA provided by ladders with resting platforms spaced not more than 6.0m apart.

Permanent access platform at Deck/bulkhead connections arranged between 1.6m and 3.0m below deck at the stiffened side of the bulkhead. Arrangements for access between longitudinal PMA and PMA on trans. bulkhead to be provided.

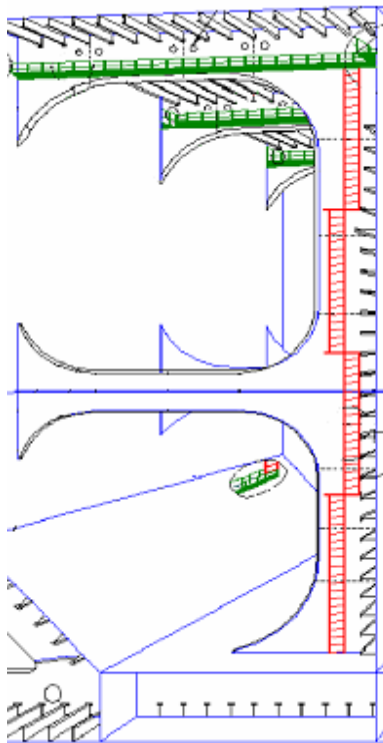
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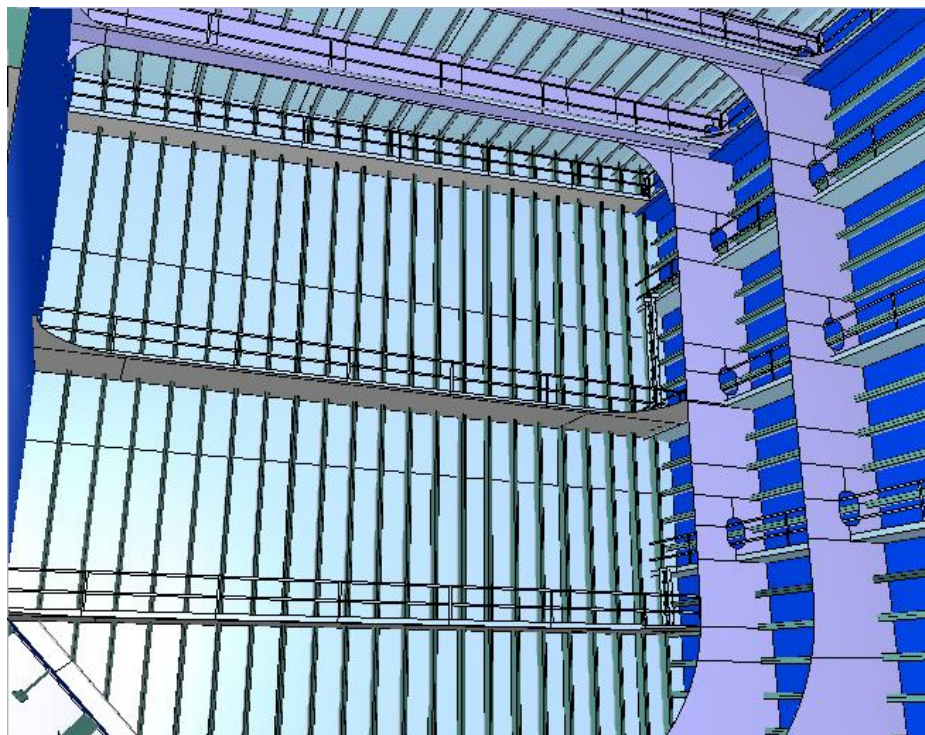
Transverse PMA in large tanks

Transverse PMA 1.6 ~ 3.0 m below deck at stiffeners side

A)



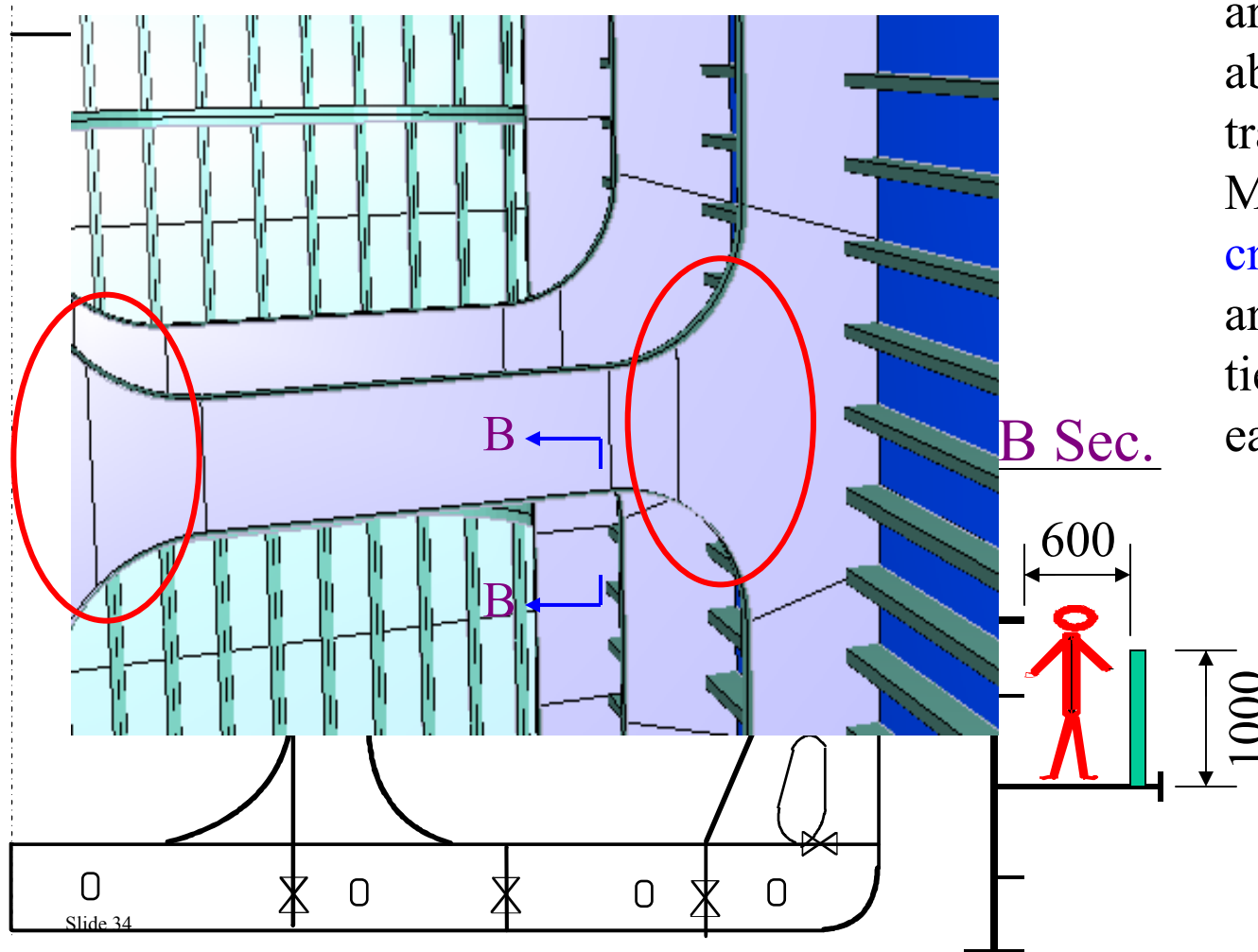
B)



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Transverse PMA in large tanks



Where cross ties are arranged **more than 6 m** above the tank bottom, transverse Permanent Means of Access on the **cross tie** should be arranged giving access to tie flaring brackets on each side of the tank

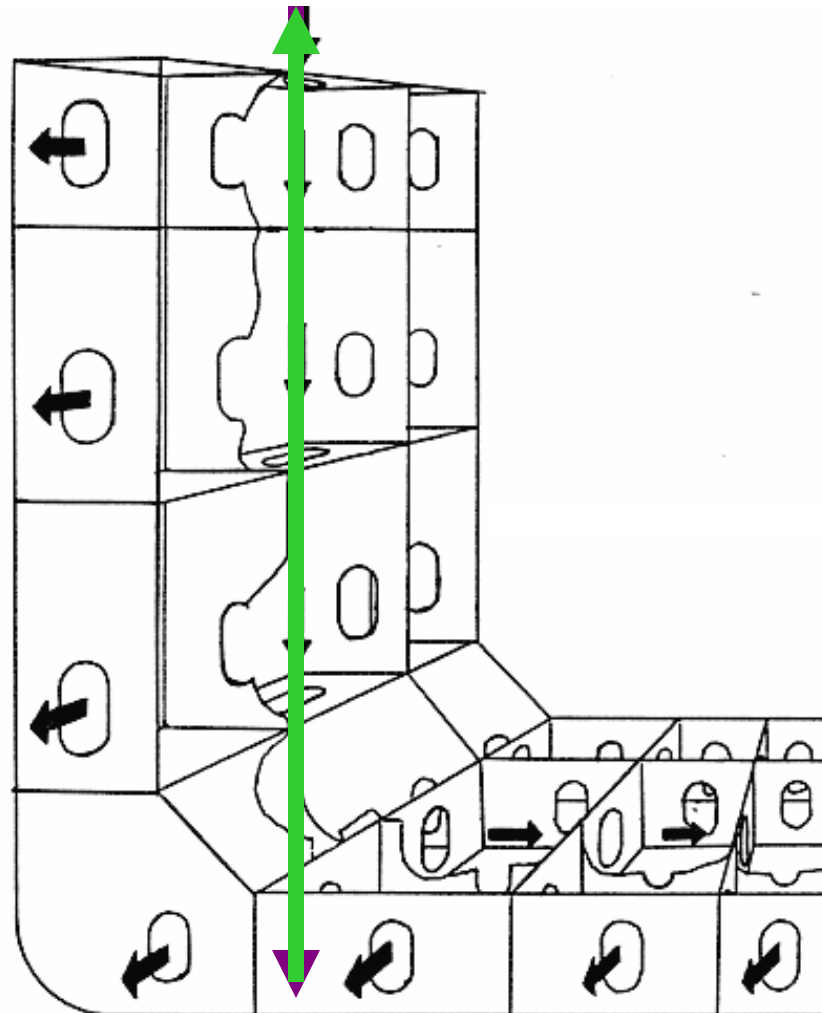


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Safe Entry in Tank and Rescue Hatch



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Ship structure access manual ;

A ship's means of access to carry out overall and close-up inspections and thickness measurements shall be described in a **Ship structure access manual** approved by the Administration, and which to be kept on board.

The **Ship structure access manual** should contain at least the following **two parts**:

Part 1 : Plans, instructions and inventory required and this part should be approved by the Administration or the organization recognized by the Administration.

Ship structure access manual ;

Part 2 : form of record of inspections and maintenance, and change of inventory of portable equipment due to additions or replacement after construction. This part should be approved for its form at new building.

Ship structure access manual ;

The following matters should be addressed in the
“ ship structure access manual”

1. the “access manual” should clearly cover scope as specified in the Regulations for using by crew, surveyors and port State control officers;
2. approval/re-approval procedure for the manual;
3. Verification of MA should be part of the safety construction survey for continued effectiveness of the MA in that space which is subject to the statutory survey;
4. Inspection of MA by the crew and/or a competent inspector of the company as a part of regular inspection and maintenance;

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Ship structure access manual ;

The following matters should be addressed in the
“ ship structure access manual”

5. Action to be taken if MA is found unsafe to use; and
6. In case of using portable equipment plans showing the means of access within each space indicating from where and how each area is the space can be inspected;

Ship structure access manual ;

Critical structural areas;

Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of similar or sister ships to be sensitive to cracking, buckling deformation or corrosion which would impair the structural integrity of the ship, and , for this ship.

Ship structure access manual ;

Critical structural areas;

The following publications for critical structural areas, will be used for reference;

- Guidance Manual for Tanker Structures by TSCF
- Resolution A.744 (18), as amended

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