GUIDE FOR

MEANS OF ACCESS TO TANKS AND HOLDS FOR INSPECTION

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Updates

March 2018 consolidation includes:

- November 2016 version plus Corrigenda/Editorials

November 2016 consolidation includes:

- April 2016 version plus Notice No. 1
Background
The maritime industry has long recognized that periodic surveys/inspections are the primary means for verifying that a vessel’s structure is maintained within applicable requirements throughout its operational life. These surveys/inspections help confirm that the vessel is free from damage such as cracks, buckling, corrosion and overloading, and that material thickness are within established limits. For surveys/inspections to be carried out effectively, suitable means of access to the vessel’s structure are required.

To address the issue of suitable access, the Maritime Safety Committee (MSC) adopted the following resolutions into SOLAS Regulation II-1/3-6 on “Access to and within spaces in the cargo area of oil tankers and bulk carriers”:

- MSC.194(80) – Adoption of Amendments to the International Convention for the Safety Of Life At Sea, 1974, as amended
- MSC.151(78) – Adoption of Amendments to the International Convention for the Safety Of Life At Sea, 1974, as amended and
- MSC.158(78) – Adoption of Amendments to the Technical Provisions

To assist in the implementation of these new IMO resolutions, the International Association of Classification Societies (IACS) developed the Unified Interpretation (UI) SC 191, for the application of amended SOLAS Regulation II-1/3-6 (Resolution MSC.151(78)) and revised Technical Provisions for Means of Access for Inspections (Resolution MSC.158(78)). In addition, the Maritime Safety Committee (MSC) has approved the interpretations of the provision of SOLAS Chapter II-1 and of the Technical provisions adopted with resolution MSC.158(78) as contained in MSC.1/Circ.1284 and in MSC.1/Circ.1464/Rev.1.


Application
The vessel types and sizes listed below, if constructed on/after 1 January 2006 are required to comply with SOLAS Regulation II-1/3-6 and Resolutions MSC.151(78) and MSC.158(78):

- Oil tankers of 500 gross tonnage
- Bulk carriers (as defined in SOLAS regulation IX/1) of 20,000 gross tonnage and over.

Scope
In support of the Statutory and IACS guidance, ABS has prepared the Guide for Means of Access to Tanks and Holds for Inspection. This Guide provides graphical illustrations and additional textual clarification of the means of access requirements. The goal is to improve the comprehension and application of the Statutory and IACS guidance.

This Guide presents two (2) levels of means of access guidance. The first provides the base criteria to meet the IMO requirements. The second, and preferred, level of guidance incorporates the application of current ergonomics practices to the means of access requirements. The application of ergonomics to the means of access requirements will enhance levels of safety as well as quality of work by providing appropriate access for survey, inspection and maintenance activities for tanks and holds.
Associated Notations

This Guide offers two optional notations related to means of access, PMA and PMA+. The PMA notation is awarded for compliance with all IMO permanent means of access requirements. The PMA+ notation is awarded for compliance with the enhanced ergonomic level of means of access guidance contained in this Guide.

This Guide becomes effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

*We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.*
GUIDE FOR

MEANS OF ACCESS TO TANKS AND HOLDS FOR INSPECTION

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SECTION 1 Introduction

1 Introduction (1 April 2016)

The ability to survey/inspect the condition of a vessel is a principal means to help verify that the vessel’s structure is maintained to comply with applicable requirements. These surveys/inspections assist Owners; flag Administrations and classification societies in determining that vessels are free from damage and that material thickness are within established limits. For surveys/inspections to be carried out safely and effectively, suitable means of access to the vessel’s structure is required.

The most recent adoptions to IMO legislation (SOLAS Reg. II-1/3-6) have established new requirements for means of access. Throughout the life of a vessel, this access enables overall and close-up inspections and material thickness measurements of the vessel’s structures. These means of access may be used by flag Administrations, classification societies, vessel personnel and others as necessary.

To assist in the implementation of these new requirements, IACS has developed Unified Interpretation (UI) SC 191 for the application of amended SOLAS regulation II-1/3-6 (resolution MSC.151 (78)) and revised Technical provisions for means of access for inspections (resolution MSC.158 (78)). In addition, the Maritime Safety Committee (MSC) has approved the interpretations of the provision of SOLAS Chapter II-1 and of the Technical provisions adopted with resolution MSC.158(78) as contained in MSC.1/Circ.1284 and in MSC.1/Circ.1464/Rev.1. In support of this document, ABS has prepared the Guide for Means of Access to Tanks and Holds for Inspection. This Guide provides additional information, via text and graphics, about the means of access requirement’s interpretation and application, as well as the criteria for the PMA and PMA+ notations.

2 Application

The means of access requirements in SOLAS and in this Guide apply to:

- **Oil tankers of 500 gross tonnage and over constructed on or after 1 January 2006.** This regulation is only applicable to oil tankers having tanks integral with the structure of the vessel which are used for carriage of oil in bulk, which is contained in the definition of oil in Annex 1 of MARPOL 73/78. Independent oil tanks can be excluded.

- **Bulk carriers (as defined in SOLAS regulation IX/1) of 20,000 gross tonnage and over, constructed on or after 1 January 2006.** SOLAS Regulation IX/1 defines a bulk carrier as a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk, and includes such types as ore carriers and combination carriers.

Note: Oil tankers of 500 gross tonnage and over constructed on or after 1 October 1994 but before 1 January 2005 shall comply with the provisions of regulation II-1/12-2 adopted by resolution MSC.27(61). Also, for oil tankers of less than 5,000 tonnes deadweight, Administrations may approve, in special circumstances, smaller dimensions for access through vertical and horizontal openings, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of the Administration.

3 Scope (1 April 2016)

To enable physical surveys, inspections, and maintenance activities to be conducted effectively, consideration needs to be given to how the vessel will be designed, in particular, means of access arrangements. The effectiveness of the design of means of access can be maximized, as illustrated in this Guide, through the application of ergonomics to the vessel’s structural designs and arrangements.
This Guide presents two (2) levels of means of access guidance. The first level provides the base criteria to meet the IMO requirements. The second, and preferred, level of guidance incorporates the application of ergonomics to the IMO means of access requirements.

This Guide overlaps, in several areas, with two existing ABS publications: the ABS Guidance Notes on the Application of Ergonomics to Marine Systems and the ABS Guide for Ergonomic Notations. These publications are recommended companion documents to further promote the application and understanding of ergonomics principles to vessel designs.

The application of ergonomics to the means of access requirements can improve overall personnel performance and safety, while reducing the potential for human error.

4 Terminology (1 April 2016)

Accessibility: The ability for personnel to access equipment that requires maintenance, inspection, removal, or replacement while wearing the appropriate clothing, including personal protective equipment, and the ability to use all necessary tools and test equipment.

Active Protection: A safety design or device that actively (or directly) requires a person to take specific actions before a potential loss, for example, donning a fall arrestor fitted to both the ladder and the climber.

Crew Member: Any person onboard a vessel, including the Master, who is not a passenger. This term is used interchangeably throughout this document with “seafarer”.

Design Load: The maximum intended load, being the total of all loads including the weight of the personnel, materials, and equipment, including the means of access structure.

Guardrail or Safety Rail: Device for protection against accidental fall or accidental access to a hazardous area, with which stairs, step ladders or landings, platforms and walkways, or deck edges/fall points may be equipped.

Handrail: Top element designed to be grasped by the hand for body support which can be used individually or as the upper part of a rail.

Maintenance: All activities necessary to keep equipment in, or restore it to, a specified level of performance.

Newton: SI unit of force. One Newton is equal to the amount of net force required to accelerate a mass of one kilogram at a rate of one meter per second squared.

Newton-Meters (N-m): SI unit of torque. One Newton-meter is equal to the torque resulting from a force of one Newton applied perpendicularly to a moment arm which is one meter long.

Seafarer: Any person onboard a vessel, including the Master, who is not a passenger. This term is used interchangeably throughout this document with “crew member”.

Shall: Expresses a provision that is mandatory.

Toeboard: Solid lower part of a guard-rail on a landing to prevent the fall of objects from a floor level.

5 Notations

This Guide offers two optional notations related to means of access, PMA and PMA+. The PMA notation is awarded for compliance with all IMO permanent means of access requirements. The PMA+ notation is awarded for compliance to the enhanced ergonomic level of means of access guidance contained in this Guide.

5.1 PMA Notation (1 April 2016)

The optional PMA notation may be assigned to vessels to signify that the vessel’s permanent means of access meets the following:

- IMO Resolution MSC.151(78) – “Adoption of Amendments to the International Convention for the Safety Of Life At Sea, 1974, as Amended”
- IMO Resolution MSC.158(78) – “Adoption of Amendments to the Technical Provisions for Means of Access for Inspections”
Section 1 Introduction

- IACS Unified Interpretation (UI) SC 191 for the application of amended SOLAS regulation II-1/3-6 (resolution MSC.151 (78)) and revised Technical provisions for means of access for inspections (resolution MSC.158 (78))

Note: The PMA notation does not include IMO requirements for alternative or temporary means of access.

5.2 PMA+ Notation (1 April 2016)

The optional PMA+ notation may be assigned to vessels meeting the PMA notation requirements plus the additional ergonomic considerations presented in this Guide. The PMA+ notation is discussed in more detail in the following Subsection.

6 Detailed Considerations for the PMA+ Notation

6.1 Overview (1 April 2016)

The PMA+ notation applies ergonomics and safety design practices to the design and arrangement of the permanent means of access requirements where allowable. These instances include those areas where the means of access requirements have prescribed minimums and/or maximums and ergonomic dimension exists within the allowable range. For those means of access requirements where no specific dimensioning is provided, ergonomic guidance and dimensioning is provided.

Note: If any PMA+ requirements are found to conflict with MSC requirements or IACS interpretations, the MSC requirements or IACS interpretations take precedence.

6.2 Example of the Application of the PMA+ Notation (1 April 2016)

For tankers, IMO states “Continuous athwartship permanent access arranged at each transverse bulkhead on the stiffened surface, at a minimum of 1.6 m to a maximum of 3 m below the deck head.” This 1.6 m (63.0 in.) minimum is below current ergonomic practices, which is a minimum of 2130 mm (84.0 in.).

The minimum overhead clearance of 1600 mm (63.0 in.) is approximately 117 mm (4.5 in.) less than the mean male stature (height) presented in Appendix 1, Figure 1, “Differences in 50th Percentile Male Stature for 12 Regions, from the Average Stature of 1717 mm (67.5 in.)” of the ABS Guidance Notes on the Application of Ergonomics to Marine Systems. Also, this mean value does not include clothing allowances of approximately 25 mm (1.0 in.) for footwear and 75 mm (3.0 in.) for safety helmets. By combining these two clothing allowances to the mean stature we have an average male height of 1817 mm (71.5 in.). This value is approximately 220 mm (8.5 in.) higher than the IMO minimum height.

For a large majority of personnel this 1600 mm (63.0 in.) minimum would increase the likelihood of head strikes against overhead surfaces, potentially causing head and neck injuries as well as causing personnel to work/walk in awkward postures causing potential upper and lower back pain, discomfort or injury.

The current ergonomic practice of a 2130 mm (84.0 in.) minimum overhead clearance will allow the vast majority of personnel to work upright without the potential for head strikes against upper surfaces or from working in awkward postures.

The way IMO states the overhead clearances, from “a minimum of 1.6 m to a maximum of 3 m” provides designers the opportunity to use the PMA+ requirement of 2130 mm (84.0 in.) as a design requirement.

6.3 Examples of PMA+ Notation Opportunities

The majority of the dimensional aspects of the means of access requirements are stated in a manner that provides the designer with some latitude with respect to dimensioning. Several examples include:

- “The minimum clear opening shall not be less than 600 mm x 600 mm” – which means that the clear opening can be greater than the dimension specified.
- “Elevated passageways forming sections of a permanent means of access, where fitted, shall have a minimum clear width of 600 mm” – which means the passageway can have a greater clear width.
- “Stanchions shall be not more than 3 m apart” – this establishes a maximum distance only. A shorter dimension is allowed.
- “Permanent inclined ladders shall be inclined at an angle of less than 70 degrees” – which means that inclined ladders cannot exceed 70 degrees, but inclined ladders can be at less of an angle.
Additionally, there are instances where no dimensional aspects of the means of access requirements are provided.

- “Inclined ladders shall be provided with handrails of substantial construction on both sides fitted at a convenient distance above the treads” – No dimensional requirements are provided for the size of the handrail or the handrail’s height above the tread or any intermediate rails.

6.4 IMO Means of Access Requirements versus Ergonomic Practices (1 April 2016)

There are other instances of IMO means of access requirements, which could be enhanced through the application of ergonomic practices, but cannot because the specific wording of the IMO means of access requirements prohibits any modification of these requirements. These instances include the design of guardrail heights, openings in horizontal stringers, and the tread design and spacing of inclined ladders. These are discussed in more detail in the following Subparagraphs.

Note: The discussion in the following Subparagraphs (1/6.4.1, “Guardrail Heights”, 1/6.4.2, “Openings in Horizontal Stringers”, 1/6.4.3, “Tread Spacing (Inclined Ladders)” and 1/6.4.4, “Tread Design (Inclined Ladders”) are not PMA+ requirements. These Subparagraphs discuss examples of where ergonomics practices should be applied but cannot due to the specific wording of the IMO means of access requirements.

6.4.1 Guardrail Heights (1 April 2016)

MSC.158 (78), Technical Provisions 3.3, requirement states that “…Guardrails shall be 1,000 mm (39.5 in.) in height and consist of a rail and an intermediate bar 500 mm in height and of substantial construction…” This specific wording allows no opportunity to apply ergonomic principles to the design of guardrails.

From an ergonomics and safety perspective a guardrail’s height should be 1070 mm (approximately 42.0 in.). The rational for this change in guardrail height is based on the biomechanics (including center of gravity) of a worker leaning or falling over a guardrail. Biomechanical analyses show that the center of gravity of a human body is approximately 75 mm (3.0 in.) above the midpoint of a person’s stature (the center of gravity varies slightly among individuals and genders).

Biomechanical analyses also show that if the center of gravity of a human body acts above a guardrail, a person falling against the rail would have a higher tendency to rotate over the top of the railing. Additionally, if the center of gravity of a human body acts below the top of a rail, a person would have a tendency to rotate under the railing. This action (rotating under) along with intermediate rail(s) will help prevent a fall to a lower surface.

To illustrate this point, a person 1830 mm (72.0 in.) tall would have a center of gravity of approximately 1000 mm (39.5 in.). This means that people with a stature greater than 1830 mm (72.0 in.), including footwear, would have a higher likelihood of rotating over the top of a 1000 mm (39.5 in.) guardrail than a 1070 mm (42.0 in.) guardrail.

The requirement for a guardrail height of at least 1000 mm (39.5 in.) is more effective for personnel less than 1830 mm (72.0 in.) tall (including footwear), leaving those workers who are taller at a safety disadvantage. Current ergonomics design practices for the height of guardrails take into consideration taller potential workers (up to 2130 mm (84.0 in.) in height). When considering the taller potential worker population, a guardrail height of 1070 mm (42.0 in.) will help protect approximately 99% of all workers.

6.4.2 Tread Spacing (Inclined Ladders)

MSC.158 (78), Technical Provisions 3.6, “…The treads shall be equally spaced at a distance apart, measured vertically, of between 200 mm and 300 mm…” From an ergonomic perspective, the range provided for the spacing of treads should be expanded to 180 mm – 300 mm (7.0 in. – 12.0 in.).

It is noted that there is not much difference between the MSC requirements and the current ergonomic practice for the tread spacing for inclined ladders. The reasoning behind the current ergonomic practice is based on designing for the 5th percentile (shorter) female and to provide a wider range and opportunity to make sure the inclined ladder treads are equally spaced throughout the flight of the ladder.
6.4.3 Tread Design (Inclined Ladders) (1 April 2016)

MSC.158 (78), Technical Provisions 3.6, “... When steel is used, the treads shall be formed of two square bars of not less than 22 mm by 22 mm in section, fitted to form a horizontal step with the edges pointing upward...”

Walking on the corner edges of square bars provides for less contact with the foot and the stepping surface and an increased opportunity for slipping. Also, standing on the corner edges for extended period of time (e.g., performing an inspection) causes pressure points and pain on the bottom of the foot.

The preferred tread design should be a solid plate or circular cross section bars. Treads should be formed of a solid step (not less than 100 mm (4.0 in.) in depth) with non-slip surface or non-slip circular cross section bars (not less than 25 mm (1.0 in.) in diameter). If the steps are constructed using circular cross-section bars (which is preferred so as to minimize sludge accumulations on treads of ladders fitted in cargo oil tanks), they should consist of two or more parallel bars arranged on the same horizontal plane, with the distance between the centers of adjacent bars being not less than 65 mm (2.5 in.) and not more than 75 mm (3.0 in.). IMO does not provide any guidance with respect to step depth or the spacing of the adjacent bars.

7 Documentation (1 April 2016)

7.1 Plans, Certifications, and Documentation

One set of the official (design and construction agents) electronic copies of the following plans and information shall be submitted to ABS Engineering for the purpose of review in the context of the notation being sought.

i) Details of arrangements of the components and structures appropriate for the notation(s) being sought

ii) Diagrammed details of each of the above components and structures

iii) Any vendor documentation or certifications pertinent to applying the requirements to the design.

For new construction, the drawings shall be provided to ABS Engineering during the detailed design phase. For existing vessels, the arrangement drawings and plans reflecting the current configurations (e.g., topsides, below decks, etc.) shall be provided to, and approved by, ABS Engineering in advance of ABS Surveyor verifications.

ABS Engineering shall review the submitted accommodations documentation. ABS Engineering shall report any deviation from criteria to the Owner/shipyard for resolution and shall also identify any criteria that the ABS Surveyors must field-verify.

The ABS Surveyor shall verify that the submitted drawings match the constructed vessel. The ABS Surveyor shall also verify any criteria that are outstanding from the ABS Engineering review and document deviations from criteria.

8 Surveys after Construction (1 April 2016)

It is intended that all surveys after construction are to be aligned with Classification Surveys. Harmonization of surveys it to be carried out at the first available opportunity.

8.1 Annual Surveys

The following information shall be reviewed by the attending ABS Surveyor for issues that could affect the PMA or PMA+ notation.

i) Hull maintenance records since the previous hull survey or date of build

ii) Repair and damage reports since the previous hull survey or date of build

iii) Previous hull classification reports

iv) Approved copy of the Ship’s Structure Access Manual
v) A list of all means of access alterations/repairs to the vessel since the previous hull survey or date of build

vi) General condition of means of access as accessible in any tanks that are internally examined as part of the applicable annual survey

During the attending ABS Surveyor’s review of the submitted information, a determination will be made as to whether changes or alterations have taken place that could affect the PMA or PMA+ notation. As a result, the details of any modification or alterations may need to be submitted for review and approval by ABS.

8.2 Intermediate Survey

In addition to the requirements of the Annual Survey, means of access are to be surveyed as part of the Intermediate Survey – Hull, as follows:

• Examination of means of access in all tanks that are examined internally as part of the intermediate hull survey.

8.3 Special Periodical Surveys

In addition to the requirements of the Annual Survey, means of access are to be surveyed as part of the Special Periodical Survey – Hull, as follows:

• Examination of all means of access in all tanks.

8.4 Requirements for Vessel Alterations

No alterations which affect or may affect the PMA or PMA+ notations being awarded are to be made to the vessel unless plans of the proposed alterations are submitted and approved by ABS before the work is commenced. If ABS determines that the alteration will affect the means of access notation, the altered vessel shall be subject to the review and verification requirements of this Guide.

9 Units of Measure (1 April 2016)

The Guide uses both SI and US units of measure. Within this document the SI unit is listed first with the US unit of measure in parentheses. The SI unit indicates the driving measure, not the US unit. The US units are provided for the convenience of general users.

To maintain consistency between other ABS ergonomics and human factors documentation, the same US unit of measure rounding scheme has been used in this document. US units of measure expressed in inches (in.) are rounded to the nearest half inch (0.5 in.). US units of measure expressed in feet (ft) are rounded to the one-half foot (0.5 ft).

10 Alternatives (1 April 2016)

10.1 General

ABS will consider alternative arrangements or criteria which can be shown to meet the intent of criteria directly cited or referred to in this Guide. The demonstration of an alternative’s acceptability can be made through either the presentation of satisfactory service experience or systematic analysis based on valid engineering principles.

10.2 Other Regulations

ABS may consider for its acceptance, alternative arrangements and details which can be shown to comply with standards recognized in the country (flag State) in which the vessel is registered or operated, provided they are deemed not less effective.
10.3 Departures from Criteria

It is recognized that unusual or unforeseen conditions may lead to a case where one or more of the parameters of interest in granting a notation may temporarily fall outside the range of acceptability.

When a departure from criteria is identified during either the notation's initial issuance or reconfirmation process, it shall be reviewed by ABS in consultation with the Owner. When the ergonomic design contains departures from the stated criteria, these will be subject to special consideration upon the receipt of details about the departure. Depending on the degree and consequences of the departure, the shipyard or Owner may be required to provide an assessment and remediation plan to obtain or maintain the notation. Failure to complete the agreed remediation by the due date will lead to withdrawal of the notation.
SECTION 2 Means of Access Requirements and Interpretations

1 Introduction

This Section presents the means of access requirements set forth in MSC Resolution MSC.151(78), MSC Resolution MSC.158(78), and the associated IACS Unified Interpretations.


Where appropriate, additional guidance, via text and graphics, has been provided to further promote the interpretation and application of the means of access requirements.

2 Associated Documentation (1 April 2016)

The following documents provide specific details about the IMO requirements for means of access contained in this Section:

- SOLAS regulation II-1/3-6, “Access to and Within Spaces in, and Forward of, the Cargo Area of Oil Tankers and Bulk Carriers”
- IMO Resolution MSC.151 (78) (adopted on 20 May 2004), “Adoption of Amendments to the International Convention for the Safety of Life at Sea, 1974, as Amended”
- IACS Unified Interpretation (UI) SC 191 for the application of amended SOLAS regulation II-1/3-6 (resolution MSC.151 (78)) and revised Technical provisions for means of access for inspections (resolution MSC.158 (78))

3 Overview of Means of Access Requirements

This Subsection summarizes the means of access requirements for oil tankers and bulk carriers as presented in MSC.158(78).

The following two (2) tables, Section 2, Table 1 “Application of Resolution MSC.158(78) Table 1 for Oil Tankers” and Section 2, Table 2, “Application of Resolution MSC.158(78) Table 2 for Bulk Carriers” were created to simplify the use and application of the extensive tables containing the MSC means of access requirements.

These tables are arranged with column and row headings for different areas of vessel tanks and holds/spaces as well as tank or hold/space dimensions (heights and widths). This format allows for the quick identification of means of access requirements.
Section 2 Mean of Access Requirements and Interpretations

To reduce potential confusion for users of this Guide who may already be familiar with the MSC.158(78) tables, the requirements contained in this Guide’s Section 2, Table 1 summarize the requirements contained in the MSC.158(78) Table 1. This Guide’s Section 2, Table 2 summarizes the requirements contained in the MSC.158(78) Table 2.

To further simplify the use of these tables, the numbering scheme used in the MSC tables has been preserved. For example, in Section 2, Table 1, in the Underdeck Structure row, tanks with a height of 6 meters or more are required to meet MSC.158(78) Table 1 requirements of 1.1.1, 1.1.2, and 1.1.3. The same rational has been applied to MSC.158(78) Table 2.

**TABLE 1**
Application of Resolution MSC.158(78) Table 1 for Oil Tankers*

<table>
<thead>
<tr>
<th>Cargo/Ballast Tanks</th>
<th>Tank Height ≥ 6 m (19.5 ft)</th>
<th>Tank Height &lt; 6 m (19.5 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underdeck Structure</td>
<td>1.1.1, 1.1.2, 1.1.3</td>
<td></td>
</tr>
<tr>
<td>Longitudinal Bulkhead</td>
<td>1.1.4 or 1.1.6*</td>
<td>1.2</td>
</tr>
<tr>
<td>Cross Tie (≥ 6 m (19.5 ft) above tank bottom)</td>
<td></td>
<td>1.1.5</td>
</tr>
<tr>
<td><strong>Ballast Tank and Double Side Skin Space</strong></td>
<td><strong>Tank/Space Width ≥ 5 m (16.5 ft)</strong></td>
<td><strong>Tank/Space Width &lt; 5 m (16.5 ft)</strong></td>
</tr>
<tr>
<td>Wall-sided Mid-Depth Portion (Between Topside and Hopper Portions)</td>
<td>1.1.4 or 1.1.6*</td>
<td>2.1</td>
</tr>
<tr>
<td>Lower Hopper Portion/Tank</td>
<td>1.1.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Fore Peak Tanks</td>
<td>1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

* = Numbers in this table correspond to MSC.158 (78) Table 1, “Means of Access for Ballast/Cargo Tanks of Oil Tankers”.
* = If Height < 17 m (56.0 ft)

**TABLE 2**
Application of Resolution MSC.158(78) Table 2 for Bulk Carriers*

<table>
<thead>
<tr>
<th>Cargo Holds</th>
<th>Hold Height ≥ 17 m (56.0 ft)</th>
<th>Hold Height &lt; 17 m (56.0 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underdeck Structure</td>
<td>1.1, 1.2, 1.3, 1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Side Shell</td>
<td>1.6 or 1.8, 1.7, 1.9*, 1.10*</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Vertical Bulkhead</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td><strong>Ballast and Double Side Skin Spaces</strong></td>
<td><strong>Tank/Space Height ≥ 6 m (19.5 ft)</strong></td>
<td><strong>Tank/Space Height &lt; 6 m (19.5 ft)</strong></td>
</tr>
<tr>
<td>Wall-sided Mid-Depth Portion (Between Topside and Hopper Portions)</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Upper Topside Tank</td>
<td>2.1, 2.2, 2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Lower Hopper Portion/Tank</td>
<td>2.5 and 2.6</td>
<td>2.7</td>
</tr>
<tr>
<td>Fore Peak Tanks</td>
<td>2.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>

* = Numbers in this table correspond to MSC.158 (78) Table 2, “Means of Access for Bulk Carriers”.
* = Single side skin construction only.
4 Specific Means of Access Requirements for Oil Tankers

The specific means of access requirements for oil tankers displayed in Section 2, Table 1 “Application of Resolution MSC.158(78) Table 1 for Oil Tankers”, as interpreted by IACS UI SC 191, are presented in this Subsection.

Note: Those requirements that relate to permanent means of access are prerequisites for the PMA notation. The PMA notation does not include the IMO requirements or allowances for alternative or temporary means of access.

Each MSC requirement is presented in its entirety along with any associated IACS unified interpretation. Graphical representations for some of the means of access requirements have been provided to help clarify or demonstrate the requirement’s intent. Also, additional guidance related to the design of the means of access is provided.

Note: Graphics are for demonstrative purposes only and are not to scale.

In some of the figures, specific dimensions are provided. These dimensions will help clarify the means of access requirement and/or the interpretation. Where appropriate, IMO, PMA and PMA+ dimensional requirements are provided. These dimensions are to be used in conjunction with the additional guidance contained in the following Sections:

- Section 3, “Walkways, Ramps and Work Platforms”,
- Section 4, “Vertical Ladders, Inclined Ladders and Handles”, and
- Section 5, “Hatches.”

4.1 Means of Access Requirements for Table 1/1.1 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>IACS Interpretation</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA Requirement</td>
<td>IACS Interpretation</td>
<td>“For tanks of which the height is 6 m and over containing internal structures, permanent means of access shall be provided in accordance with .1 to .6.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-paragraphs .1, .2 and .3 define access to underdeck structure, access to the uppermost sections of transverse webs and connection between these structures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-paragraphs .4, .5 and .6 define access to vertical structures only and are linked to the presence of transverse webs on longitudinal bulkheads.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If there are no underdeck structures (deck longitudinals and deck transverses) but there are vertical structures in the cargo tank supporting transverse and longitudinal bulkheads, access in accordance with subparagraphs from .1 through to .6 is to be provided for inspection of the upper parts of vertical structure on transverse and longitudinal bulkheads.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If there is no structure in the cargo tank, section 1.1 of Table 1 is not to be applied.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 1 of Table 1 is also to be applied to void spaces in cargo area, comparable in volume to spaces covered by the regulation II-1/3-6, except those spaces covered by Section 2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The vertical distance below the overhead structure is to be measured from the underside of the main deck plating to the top of the platform of the means of access at a given location.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The height of the tank is to be measured at each tank. For a tank the height of which varies at different bays, item 1.1 is to be applied to such bays of a tank that have height 6 m (19.5 ft) and over.</td>
</tr>
</tbody>
</table>

| PMA+ Requirement | No additional PMA+ requirements. |
| Additional Guidance | Detailed walkway design guidance is available in Section 3, “Walkways and Ramps.” |
| Additional Guidance | Detailed ladder and handle guidance is available in Section 4, guidance “Vertical Ladders, Inclined Ladders, and Handles” |
| Additional Guidance | Detailed guidance for hatch design is available in Section 5, “Hatches.” |
Mean of Access Requirements and Interpretations

4.2 Means of Access Requirements for Table 1/1.1.1 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA</td>
<td>&quot;Continuous athwartship permanent access arranged at each transverse bulkhead on the stiffened surface, at a minimum of 1.6 m to a maximum of 3 m below the deck head.&quot;</td>
<td>A Distance below deckhead</td>
<td>( \geq 1600 \text{ mm (63.0 in.) and } \leq 3 \text{ m (10.0 ft)} )</td>
</tr>
<tr>
<td>IACS Interpretation</td>
<td>&quot;The vertical distance below the overhead structure is to be measured from the underside of the main deck plating to the top of the platform of the means of access at a given location.&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Distance below deckhead</td>
<td>( \geq 2130 \text{ mm (84.0 in.) and } \leq 3 \text{ m (10.0 ft)} )</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

- Section 2, Figure 1, “Access at Transverse Bulkhead on Stiffened Side of an Underdeck Structure for Ballast/Cargo Tanks \( \geq 6 \text{ meters in Height} \)” is provided to help illustrate this requirement.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps.”
- Continuous athwartship PMA is usually arranged at the same level as integrated structural members (horizontal girders).

**FIGURE 1**

Access at Transverse Bulkhead on Stiffened Side of an Underdeck Structure for Ballast/Cargo Tanks \( \geq 6 \text{ m (19.5 ft) in Height} \)
4.3 Means of Access Requirements for Table 1/1.1.2 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“At least one continuous longitudinal permanent means of access at each side of the tank. One of these accesses shall be at a minimum of 1.6 m to a maximum of 6 m below the deck head and the other shall be at a minimum of 1.6 m to a maximum of 3 m below the deck head.”</td>
<td>A Distance below deckhead</td>
<td>≥ 1600 mm (63.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Distance below deckhead</td>
<td>≥ 1600 mm (63.0 in.) and ≤ 6 m (19.5 ft)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IACS Interpretation</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>“There is need to provide continuous longitudinal permanent means of access when the deck longitudinals and deck transverses are fitted on deck but supporting brackets are fitted under the deck.”</td>
<td>A Distance below deckhead</td>
<td>≥ 2130 mm (84.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
<tr>
<td></td>
<td>B Distance below deckhead</td>
<td>≥ 2130 mm (84.0 in.) and ≤ 6 m (19.5 ft)</td>
</tr>
</tbody>
</table>

Additional Guidance
- Section 2, Figure 2, “Continuous Longitudinal Access on Each Side of the Tank of the Underdeck Structure for Ballast/Cargo Tanks ≥ 6 meters in Height” is provided to help illustrate these requirements.
- Distances “A” and “B” below the deckhead are measured from the underside of the plating to the top of the platform.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

FIGURE 2
Continuous Longitudinal Access on Each Side of the Tank of the Underdeck Structure for Ballast/Cargo Tanks ≥ 6 m (19.5 ft) in Height
4.4 Means of Access Requirements for Table 1/1.1.3 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures)

Means of Access Requirements for Table 1/1.1.3 of MSC.158(78) for Oil Tankers

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Access between the arrangements specified in 1.1.1 and 1.1.2 and from the main deck to either 1.1.1 or 1.1.2.”</td>
</tr>
</tbody>
</table>

IACS Interpretation

“Means of access to tanks may be used for access to the permanent means of access for inspection.”

PMA+ Requirement

No additional PMA+ requirements.

Additional Guidance

- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

4.5 Means of Access Requirements for Table 1/1.1.4 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures) (1 April 2016)

Means of Access Requirements for Table 1/1.1.4 of MSC.158(78) for Oil Tankers

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Continuous longitudinal permanent means of access which are integrated in the structural member on the stiffened surface of a longitudinal bulkhead, in alignment, where possible, with horizontal girders of transverse bulkheads are to be provided for access to the transverse webs unless permanent fittings are installed at the uppermost platform for use of alternative means, as defined in paragraph 3.9 of the Technical provisions, for inspection at intermediate heights.”</td>
</tr>
</tbody>
</table>

IACS Interpretation

- “The permanent fittings required to serve alternative means of access such as wire lift platform, that are to be used by crew and Surveyors for inspection shall provide at least an equal level of safety as the permanent means of access stated by the same paragraph. These means of access shall be carried on board the ship and be readily available for use without filling of water in the tank. Therefore, rafting is not acceptable under this provision.”
- “Alternative means of access are to be part of Access Manual, which is to be approved on behalf of the Flag State.”
- For water ballast tanks of 5 m or more in width, such as on an ore carrier, side shell plating shall be considered in the same way as “longitudinal bulkhead”.

PMA+ Requirement

No additional PMA+ requirements.

Additional Guidance

- Section 2, Figure 3, “Integrated Continuous Longitudinal Access of a Longitudinal Bulkhead of Cargo Tanks or Holds”, shows two views of this requirement.
- Graphic “A” shows the intent of this requirement.
- Graphic “B” shows an alternative design if permanent fittings (e.g., to accommodate a wire lift platform) are installed at the uppermost platform to obtain access to the vertical web.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

FIGURE 3
Integrated Continuous Longitudinal Access of a Longitudinal Bulkhead of Cargo Tanks or Holds

[Diagram of integrated continuous longitudinal access]
### 4.6 Means of Access Requirements for Table 1/1.1.5 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Handrail height</td>
<td>≥ 1000 mm (39.5 in.)</td>
<td></td>
</tr>
</tbody>
</table>

**IACS Interpretation**

No interpretation provided.

**PMA+ Requirement**

A continuous walkway (as illustrated below) is provided for at least 25 percent of all cross-ties in a tank, or at least one (1) per tank, whichever is greater.

**Additional Guidance**

- Section 2, Figure 4A, “Access for Cross-ties ≥ 6 m Above the Tank Bottom of Cargo Tanks or Holds” is provided to help illustrate this requirement. This figure shows a continuous walkway extending across the cross-tie. This ergonomic improvement will help enhance inspection and facilitate quicker access to flaring brackets on both sides of the tank.

- Section 2, Figure 4B, “Access for Cross-ties ≥ 6 m Above the Tank Bottom of Cargo Tanks or Holds – Alternative Arrangement” is provided to help illustrate an alternative solution when longitudinal permanent means of access is provided at each end of the cross tie.

- An important design consideration is the distance of the walkway below the top of the cross-tie. The distance of the walkway below the cross-tie shall be approximately 1000 mm (39.5 in.). This will help eliminate a potential falling hazard.

- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

- Detailed hatch design guidance is available in Section 5, “Hatches”.

**FIGURE 4A**

Access for Cross-ties ≥ 6 m (19.5 ft) Above the Tank Bottom of Cargo Tanks or Holds

**FIGURE 4B**

Access for Cross-ties ≥ 6 m (19.5 ft) Above the Tank Bottom of Cargo Tanks or Holds – Alternative Arrangement (1 April 2016)
4.7 **Means of Access Requirements for Table 1/1.6 of MSC.158(78) for Oil Tankers (Tanks with a Height > 6 m (19.5 ft) and Containing Internal Structures)**

| Means of Access Requirements | | |
|-----------------------------|-----------------------------|
| **Means of Access Requirement** | “Alternative means as defined paragraph 3.9 in the Technical provisions may be provided for small ships as an alternative to 1.1.4 for cargo oil tanks of which the height is less than 17 m.” |
| **IACS Interpretation** | No interpretation provided. |
| **PMA+ Requirements** | No additional PMA+ requirements. |
| **Additional Guidance** | Additional guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”. |

**IACS Interpretation**
No interpretation provided.

**Additional Guidance**
Additional guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.

4.8 **Means of Access Requirements for Table 1/1.2 of MSC.158(78) for Oil Tankers (Tanks with a Height < 6 m (19.5 ft))**

| Means of Access Requirements | | |
|-----------------------------|-----------------------------|
| **Means of Access Requirement** | “For tanks of which the height is less than 6 m, alternative means as defined in paragraph 3.9 of the Technical provisions or portable means may be utilized in lieu of the permanent means of access.” |
| **IACS Interpretation** | No interpretation provided. |
| **PMA+ Requirements** | No additional PMA+ requirements. |
| **Additional Guidance** | Additional guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”. |

4.9 **Means of Access Requirements for Table 1/1.3 of MSC.158(78) for Oil Tankers (Fore Peak Tanks)**

| Means of Access Requirements | | |
|-----------------------------|-----------------------------|
| **PMA Requirement** | Means of Access Requirement |
| | “For fore peak tanks with a depth of 6 m or more at the center line of the collision bulkhead, a suitable means of access shall be provided for access to critical areas such as the underdeck structure, stringers, collision bulkhead and side shell structure.” |
| **IACS Interpretation** | No interpretation provided. |
| **PMA+ Requirements** | No additional PMA+ requirements. |
| **Additional Guidance** | • Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”. |
| | • Detailed hatch design guidance is available in Section 5, “Hatches”. |

4.10 **Means of Access Requirements for Table 1/1.3.1 of MSC.158(78) for Oil Tankers (Fore Peak Tanks)**

| Means of Access Requirements | | |
|-----------------------------|-----------------------------|
| **PMA Requirement** | Means of Access Requirement |
| | “Stringers of less than 6 m in vertical distance from the deck head or a stringer immediately above are considered to provide suitable access in combination with portable means of access.” |
| **IACS Interpretation** | No interpretation provided. |
| **PMA+ Requirements** | No additional PMA+ requirements. |
| **Additional Guidance** | • Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”. |
| | • Additional guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”. |
### 4.11 Means of Access Requirements for Table 1/1.3.2 of MSC.158(78) for Oil Tankers (Fore Peak Tanks)

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>“In case the vertical distance between the deck head and stringers, stringers or the lowest stringer and the tank bottom is 6 m or more, alternative means of access as defined in paragraph 3.9 of the Technical provisions shall be provided.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>No interpretation provided.</td>
</tr>
<tr>
<td>PMA+ Requirement</td>
<td>No additional PMA+ requirements.</td>
</tr>
<tr>
<td>Additional Guidance</td>
<td>• Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.</td>
</tr>
<tr>
<td></td>
<td>• Additional guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.</td>
</tr>
</tbody>
</table>

### 4.12 Means of Access Requirements for Table 1/2.1 of MSC.158(78) for Oil Tankers (Water Ballast Wing Tanks ≤ 5 m (16.5 ft) Width Forming Double Side Spaces and their Bilge Hopper Sections)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>“For double side spaces above the upper knuckle point of the bilge hopper sections, permanent means of access are to be provided in accordance with .1 to .3.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>“Section 2 of Table 1 (The above requirement – 4.10 MSC Requirement 1.3.2 (Fore Peak Tanks) is also to be applied to wing tanks designed as void spaces.”</td>
<td></td>
</tr>
<tr>
<td>PMA+ Requirement</td>
<td>No additional PMA+ requirements.</td>
<td></td>
</tr>
<tr>
<td>Additional Guidance</td>
<td>• Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Detailed hatch design guidance is available in Section 5, “Hatches”.</td>
<td></td>
</tr>
</tbody>
</table>
### Section 2 Mean of Access Requirements and Interpretations

#### 4.13 Means of Access Requirements for Table 1/2.1.1 of MSC.158(78) for Oil Tankers (Double Side Spaces < 5 m (16.5 ft) in Width Above the Upper Knuckle Point of the Bilge Hopper Sections) (1 April 2016)

<table>
<thead>
<tr>
<th>Means of Access Requirements for Table 1/2.1.1 of MSC.158(78) for Oil Tankers</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
<td>$\geq 1600$ mm (63.0 in.) and $\leq 3$ m (10.0 ft)</td>
</tr>
</tbody>
</table>

**PMA Requirement**

- “This paragraph (2.1.1) represents requirements for access to underdeck structures.
- For a tank the vertical distance between horizontal upper stringer and deck head of which varies at different sections item 2.1.1 is to be applied to such sections that fall under the criteria.
- The continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms as necessary on web frames. 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, platforms shall be provided on both sides of the web frames to allow safe passage through the web frame.
- Where two access hatches are required by SOLAS regulation II-1/3-6.3.2, access ladders at each end of the tank are to lead to the deck.”

**IACS Interpretation**

**PMA+ Requirement**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
</tr>
</tbody>
</table>

**Additional Guidance**

- Section 2, Figure 5, “Access Where the Vertical Distance Between the Horizontal Uppermost Stringer and Deck Hold is $\geq 6$ m (19.5 ft)” is provided to help illustrate these requirements.
- Distance “A” below the deckhead is measured from the underside of the plating to the top of the platform.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

**FIGURE 5**

**Access Where the Vertical Distance Between the Horizontal Uppermost Stringer and Deck Hold is $\geq 6$ m (19.5 ft)**
4.14 Means of Access Requirements for Table 1/2.1.2 of MSC.158(78) for Oil Tankers (Continuous Longitudinal Means of Access)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>Continuous longitudinal permanent means of access, which are integrated in the structure, at a vertical distance not exceeding 6 m (19.5 ft) apart.</td>
<td>A</td>
<td>Access height</td>
</tr>
</tbody>
</table>

- **PMA Requirement**: Continuous longitudinal permanent means of access, which are integrated in the structure, at a vertical distance not exceeding 6 m (19.5 ft) apart.
- **IACS Interpretation**: “This paragraph (2.1.2) is a requirement for access for survey and inspection of vertical structures on longitudinal bulkheads (transverse webs). The continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms as necessary on web frames. In case the vertical opening of the web is located in way of the open part between the wide longitudinal and the longitudinal on the opposite side, platforms shall be provided on both sides of the web to allow safe passage through the web. A "reasonable deviation" as noted in TP/1.4, of not more than 10% may be applied where the permanent means of access is integral with the structure itself.”

- **PMA+ Requirement**: No additional PMA+ requirements.

**Additional Guidance**
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps” and Subsection 3/3, “Work Platforms”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.
- With the Administration’s approval, “reasonable deviations” may be applied to facilitate this means of access. IACS UI (SC) 191 has interpreted this to be no more than 10% for vertical distances exceeding 6 m (19.5 ft).

4.15 Means of Access Requirements for Table 1/2.1.3 of MSC.158(78) for Oil Tankers (Continuous Longitudinal Means of Access)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>Plated stringers shall, as far as possible, be in alignment with horizontal girders of transverse bulkheads.</td>
</tr>
</tbody>
</table>

- **PMA Requirement**: Plated stringers shall, as far as possible, be in alignment with horizontal girders of transverse bulkheads.
- **IACS Interpretation**: No interpretation provided.

- **PMA+ Requirement**: No additional PMA+ requirements.

**Additional Guidance**
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
4.16 Means of Access Requirements for Table 1/2.2 of MSC.158(78) for Oil Tankers (Access for Distances $\geq 6$ m (19.5 ft) from the Tank Bottom to the Upper Knuckle Point) (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance from the top of the bilge hopper $\geq 1600$ mm (63.0 in.) and $\leq 3$ m (10.0 ft)</td>
</tr>
<tr>
<td>B</td>
<td>Hopper height $\geq 6$ m (19.5 ft)</td>
</tr>
</tbody>
</table>

IACS Interpretation

- “Permanent means of access between the longitudinal continuous permanent means of access and the bottom of the space is to be provided.
- The height of a bilge hopper tank located outside of the parallel part of vessel is to be taken as the maximum of the clear vertical distance measured from the bottom plating to the hopper plating of the tank.
- The foremost and aft most bilge hopper ballast tanks with raised bottom, of which the height is 6 m (19.5 ft) and over, a combination of transverse and vertical MA for access to the upper knuckle point for each transverse web is to be accepted in place of the longitudinal permanent means of access.”

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance from the top of the bilge hopper $\geq 2130$ mm (84.0 in.) and $\leq 3$ m (10.0 ft)</td>
</tr>
</tbody>
</table>

Additional Guidance

- Section 2, Figure 6, “Access for Bilge Hopper Sections Where the Vertical Distance from the Tank Bottom to the Upper Knuckle Point is $\geq 6$ m” is provided to help illustrate this requirement.
- Distance “A” from the top of the bilge hopper is measured from the underside of the plating to the top of the platform.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

FIGURE 6
Access for Bilge Hopper Sections Where the Vertical Distance from the Tank Bottom to the Upper Knuckle Point is $\geq 6$ m (19.5 ft)
### 4.17 Means of Access Requirements for Table 1/2.2.1 of MSC.158(78) for Oil Tankers

(Continuous Longitudinal Means of Access) *(1 April 2016)*

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Distance from the top of the bilge hopper</td>
<td>A</td>
<td>≥ 1600 mm (63.0 in.) and ≤ 3 m (10.0 ft)</td>
<td></td>
</tr>
<tr>
<td>B Hopper height</td>
<td>B</td>
<td>≥ 6 m (19.5 ft)</td>
<td></td>
</tr>
</tbody>
</table>

**IACS Interpretation**

“The bilge hopper tanks at fore and aft of cargo area narrow due to raised bottom plating and the actual vertical distance from the bottom of the tank to hopper plating of the tank is more appropriate to judge if a portable means of access could be utilized for the purpose.”

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Distance from the top of the bilge hopper</td>
<td>A</td>
<td>≥ 2130 mm (84.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
</tbody>
</table>

**Additional Guidance**

- Section 2, Figure 7, “Access for Bilge Hopper Tank” is provided to help illustrate this requirement.
- Distance “A” from the top of the bilge hopper is measured from the underside of the plating to the top of the platform.
- In this figure, “B” refers to the height of bilge hopper tank. This is the maximum of the clear vertical distance from bottom plating to hopper plating.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

**FIGURE 7**

Access for Bilge Hopper Tank
4.18 Means of Access Requirements for Table 1/2.2.2 of MSC.158(78) for Oil Tankers
(Continuous Longitudinal Means of Access) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below web ring</td>
<td>≥ 1200 mm (47.0 in.)</td>
<td></td>
</tr>
</tbody>
</table>

IACS Interpretation

“In the foremost or aft most bilge hopper tanks where the vertical distance is 6 m or over but installation of longitudinal permanent means of access is not practicable permanent means of access of combination of transverse and vertical ladders provides an alternative means of access to the upper knuckle point.”

PMA+ Requirement

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below web ring</td>
</tr>
</tbody>
</table>

Additional Guidance

- Section 2, Figure 8, “Alternative Means of Access” is provided to help illustrate this requirement.
- Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

**FIGURE 8**

Alternative Means of Access

![Alternative Means of Access Diagram]

- Critical Area for Inspection
- Portable Ladder
### 4.19 Means of Access Requirements for Table 1/2.3 of MSC.158(78) for Oil Tankers (Access for Distances < 6 m (19.5 ft) from the Tank Bottom to the Upper Knuckle Point) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>&quot;Where the vertical distance referred to in 2.2 is less than 6 m, alternative means as defined in paragraph 3.9 of the Technical provisions or portable means of access may be utilized in lieu of the permanent means of access. To facilitate the operation of the alternative means of access, in-line openings in horizontal stringers shall be provided. The openings shall be of an adequate diameter and shall have suitable protective railings.&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Handrail height ≥ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>B</td>
<td>Distance between longitudinal stringers &lt; 6 m (19.5 ft)</td>
</tr>
</tbody>
</table>

| IACS Interpretation | No interpretation provided. |

| PMA+ Requirement | No additional PMA+ requirements. |

- Section 2, Figure 9, “Access for Vertical Distances < 6 m (19.5 ft) from the Tank Bottom to the Upper Knuckle Point” is provided to help illustrate these requirements.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.
- Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.
- With the Administration’s approval, “reasonable deviations” may be applied to facilitate this means of access. IACS UI (SC) 191 has interpreted this to be no more than 10% for vertical distances exceeding 6 m (19.5 ft).

**FIGURE 9**

Access for Vertical Distances < 6 m (19.5 ft) from the Tank Bottom to the Upper Knuckle Point
5 Specific Means of Access Requirements for Bulk Carriers

The specific means of access requirements for bulk carriers are presented in this Subsection. The following table, “Application of Resolution MSC.158(78) Table 2 for Bulk Carriers”, as interpreted by IACS UI SC 191, has been duplicated (from Subsection 2/3) for the reader’s convenience.

Note: Those requirements that relate to permanent means of access are prerequisites for the PMA notation. The PMA notation does not include the IMO requirements or allowances for alternative or temporary means of access.

<table>
<thead>
<tr>
<th>Cargo Holds</th>
<th>Hold Height ≥ 17 m (56.0 ft)</th>
<th>Hold Height &lt; 17 m (56.0 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underdeck Structure</td>
<td>1.1, 1.2, 1.3, 1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Side Shell</td>
<td>1.6+ or 1.8, 1.7, 1.9+, 1.10+</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Vertical Bulkhead</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Ballast and Double Side Skin Spaces</td>
<td>Tank/Space Height ≥ 6 m (19.5 ft)</td>
<td>Tank/Space Height &lt; 6 m (19.5 ft)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall-sided Mid-Depth Portion (Between Topside and Hopper Portions)</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Upper Topside Tank</td>
<td>2.1, 2.2, 2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Lower Hopper Portion/Tank</td>
<td>2.5 and 2.6</td>
<td>2.7</td>
</tr>
<tr>
<td>Fore Peak Tanks</td>
<td>2.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>

* = Numbers in this table correspond to MSC.158 (78) Table 2, “Means of Access for Bulk Carriers”.
+ = Single side skin construction only.

Each MSC requirement is presented in its entirety along with any associated IACS unified interpretation. Graphical representations for some of the means of access requirements have been provided to help clarify or demonstrate the requirement’s intent. Also, additional guidance related to the design of the means of access is provided.

Note: Graphics are for demonstrative purposes only and are not to scale.

In some of the figures, specific dimensions are provided. These dimensions will help clarify the means of access requirement and/or the interpretation. Where appropriate, IMO, PMA and PMA+ requirements are provided. These dimensions are to be used in conjunction with the additional guidance contained in the following Sections:

- Section 3, “Walkways, Ramps and Work Platforms”,
- Section 4, “Vertical Ladders, Inclined Ladders and Handles”, and
- Section 5, “Hatches”.

ABS GUIDE FOR MEANS OF ACCESS TO TANKS AND HOLDS FOR INSPECTION • 2016
5.1 Means of Access Requirement for Table 2/1.1 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Underdeck Structure) (1 April 2016)

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means of Access Requirement</td>
<td>A</td>
<td>Distance below deckhead</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 1600 mm (63.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
</tbody>
</table>

IACS Interpretation

- “Means of access shall be provided to the crossdeck structures of the foremost and aftermost part of the each cargo hold.
- Interconnected means of access under the cross deck for access to three locations at both sides and in the vicinity of the centerline is acceptable.
- Permanent means of access fitted at three separate locations accessible independently, one at each side and one in the vicinity of the centerline is acceptable.
- Special attention is to be paid to the structural strength where any access opening is provided in the main deck or cross deck.
- The requirement for bulk carrier cross deck structure is also considered applicable to ore carriers.”

PMA Requirement

PMA+ Requirement

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
</tr>
<tr>
<td></td>
<td>≥ 2130 mm (84.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
</tbody>
</table>

Additional Guidance

- Section 2, Figure 10, “Access to Underdeck Structures ≥ 17 m (56.0 ft) in Height” is provided to help illustrate this requirement.
- Distance “A” below the deckhead is measured from the underside of the deck plating to the top of the platform.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

FIGURE 10
Access to Underdeck Structures ≥ 17 m (56.0 ft) in Height

A
5.2 Means of Access Requirement for Table 2/1.2 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Underdeck Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
<td>≥ 1600 mm (63.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
<td>≥ 2130 mm (84.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
</tbody>
</table>

Additional Guidance

- Section 2, Figure 11, “Athwartship Access Fitted on the Transverse Bulkhead ≥ 17 m (56.0 ft) in Height” is provided to help illustrate this requirement.
- Distance “A” below the deckhead is measured from the underside of the deck plating to the top of the platform.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

**FIGURE 11**
Athwartship Access Fitted on the Transverse Bulkhead ≥ 17 m (56.0 ft) in Height
5.3 Means of Access Requirement for Table 2/1.3 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Underdeck Structure)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Access to the permanent means of access to overhead structure of the cross deck may also be via the upper stool.”</td>
<td>“Particular attention is to be paid to preserve the structural strength in way of access opening provided in the main deck or cross deck.”</td>
<td>No additional PMA+ requirements.</td>
<td>Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.</td>
</tr>
</tbody>
</table>

5.4 Means of Access Requirement for Table 2/1.4 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Underdeck Structure)

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Ships having transverse bulkheads with full upper stools with access from the main deck which allows monitoring of all framing and plates from inside, do not require permanent means of access of the cross deck.”</td>
<td>“‘Full upper stools’ are understood to be stools with a full extension between top side tanks and between hatch end beams.”</td>
<td>No additional PMA+ requirements.</td>
<td>Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.</td>
</tr>
</tbody>
</table>

5.5 Means of Access Requirement for Table 2/1.5 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Underdeck Structure) (1 April 2016)

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Alternatively, movable means of access may be utilized for access to the overhead structure of cross deck if its vertical distance is 17 m or less above the tank top.”</td>
<td>• “The movable means of access to the underdeck structure of cross deck need not necessarily be carried on board the vessel. It is sufficient if it is made available when needed. • The requirement for bulk carrier cross deck structure is also considered applicable to ore carriers.”</td>
<td>No additional PMA+ requirements</td>
<td>• This movable means of access shall not be a vertical ladder, except for heights under 6 m (19.5 ft). • Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”. • Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.</td>
</tr>
</tbody>
</table>
5.6 Means of Access Requirement for Table 2/1.6 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Vertical Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance between rungs</td>
</tr>
<tr>
<td></td>
<td>≤ 350 mm (14.0 in.)</td>
</tr>
</tbody>
</table>

IACS Interpretation

- “The maximum vertical distance of the rungs of vertical ladders for access to hold frames is to be 350 mm”.
- If safety harness is to be used, means should be provided for connecting the safety harness in suitable places in a practical way.

PMA+ Requirement

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance between rungs</td>
</tr>
<tr>
<td></td>
<td>≥ 275 mm (11.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
</tbody>
</table>

Additional Guidance

- Section 2, Figure 12, “Bulk Carriers Having Transverse Bulkheads with Full Upper Stools ≥ 17 m (56.0 ft) in Height” is provided to help illustrate this requirement.
- Permanent access can be a vertical ladder or horizontal bars/rungs in the hold frames.
- Ladder rung-to-rung distance consistent for the full run of the ladder.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.

FIGURE 12
Bulk Carriers Having Transverse Bulkheads with Full Upper Stools ≥ 17 m (56.0 ft) in Height
5.7 Means of Access Requirement for Table 2/1.7 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Vertical Structures)

<table>
<thead>
<tr>
<th>Means of Access Requirement for Table 2/1.7 of MSC.158(78) for Bulk Carriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means of Access Requirement</td>
</tr>
<tr>
<td>IACS Interpretation</td>
</tr>
<tr>
<td>PMA+ Requirement</td>
</tr>
<tr>
<td>Additional Guidance</td>
</tr>
</tbody>
</table>

5.8 Means of Access Requirement for Table 2/1.8 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Vertical Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>Means of Access Requirement for Table 2/1.8 of MSC.158(78) for Bulk Carriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means of Access Requirement</td>
</tr>
<tr>
<td>IACS Interpretation</td>
</tr>
<tr>
<td>PMA+ Requirement</td>
</tr>
<tr>
<td>Additional Guidance</td>
</tr>
</tbody>
</table>

5.9 Means of Access Requirement for Table 2/1.9 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Vertical Structures)

<table>
<thead>
<tr>
<th>Means of Access Requirement for Table 2/1.9 of MSC.158(78) for Bulk Carriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA Requirement</td>
</tr>
<tr>
<td>IACS Interpretation</td>
</tr>
<tr>
<td>PMA+ Requirement</td>
</tr>
<tr>
<td>Additional Guidance</td>
</tr>
</tbody>
</table>

5.10 Means of Access Requirement for Table 2/1.10 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Vertical Structures) (1 April 2016)

<table>
<thead>
<tr>
<th>Means of Access Requirement for Table 2/1.10 of MSC.158(78) for Bulk Carriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA Requirement</td>
</tr>
<tr>
<td>IACS Interpretation</td>
</tr>
<tr>
<td>PMA+ Requirement</td>
</tr>
<tr>
<td>Additional Guidance</td>
</tr>
</tbody>
</table>
### 5.11 Means of Access Requirement for Table 2/1.11 of MSC.158(78) for Bulk Carriers (Cargo Holds – Access to Vertical Structures)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>“For double-side skin construction no vertical ladders for the inspection of the cargo hold surfaces are required. Inspection of this structure should be provided from within the double hull space.”</td>
<td>No interpretation provided.</td>
</tr>
</tbody>
</table>

**PMA+ Requirement**

No additional PMA+ requirements.

**Additional Guidance**

Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

### 5.12 Means of Access Requirement for Table 2/2.1 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Top Side Tanks) (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below deckhead</td>
</tr>
</tbody>
</table>

**Additional Guidance**

- Section 2, Figure 13, “Upper Topside Tank Access with a Height > 6 m” is provided to help illustrate this requirement.
- Distance “A” below the deckhead is measured from the underside of the plating to the top of the platform.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.

**FIGURE 13**

Upper Topside Tank Access with a Height > 6 m (19.5 ft)
5.13 Means of Access Requirement for Table 2/2.2 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Top Side Tanks)

<table>
<thead>
<tr>
<th>Means of Access Requirement for Table 2/2.2 of MSC.158(78) for Bulk Carriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PMA Requirement</strong></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>IACS Interpretation</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**
- Section 2, Figure 14, “Transverse Web Access for Bulk Carriers” is provided to help illustrate this requirement.
- Detailed guidance on the design of handles is available in Subsection 4/4, “Handles”.
- Detailed guidance for individual stairs is available in Paragraph 4/2.5, “Individual Rung Ladders”.

**FIGURE 14**
Transverse Web Access for Bulk Carriers
5.14 **Means of Access Requirement for Table 2/2.3 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Top Side Tanks)**

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>“Three permanent means of access, fitted at the end bay and middle bay of each tank, shall be provided spanning from tank base up to the intersection of the sloping plate with the hatch side girder. The existing longitudinal structure may be used as part of this means of access.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>“If the longitudinal structures on the sloping plate are fitted outside of the tank a means of access is to be provided.”</td>
<td></td>
</tr>
</tbody>
</table>
| PMA+ Requirement | No additional PMA+ requirements.
| Additional Guidance | Detailed guidance on the design of handles is available in Subsection 4/4, “Handles”.

5.15 **Means of Access Requirement for Table 2/2.4 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Top Side Tanks)**

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>“For topside tanks of which the height is less than 6 m, alternative means as defined in paragraph 3.9 of the Technical provisions or portable means may be utilized in lieu of the permanent means of access.”</th>
</tr>
</thead>
</table>
| IACS Interpretation | No interpretation provided.
| PMA+ Requirement | No additional PMA+ requirements.
| Additional Guidance | Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.

**Means of Access Requirement for Table 2/2.3 of MSC.158(78) for Bulk Carriers**

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>“If the longitudinal structures on the sloping plate are fitted outside of the tank a means of access is to be provided.”</td>
</tr>
</tbody>
</table>
| PMA+ Requirement | No additional PMA+ requirements.
| Additional Guidance | Detailed guidance on the design of handles is available in Subsection 4/4, “Handles”.

**Means of Access Requirement for Table 2/2.4 of MSC.158(78) for Bulk Carriers**

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>“For topside tanks of which the height is less than 6 m, alternative means as defined in paragraph 3.9 of the Technical provisions or portable means may be utilized in lieu of the permanent means of access.”</th>
</tr>
</thead>
</table>
| IACS Interpretation | No interpretation provided.
| PMA+ Requirement | No additional PMA+ requirements.
| Additional Guidance | Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.

**Means of Access Requirement for Table 2/2.3 of MSC.158(78) for Bulk Carriers**

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IACS Interpretation</td>
<td>“If the longitudinal structures on the sloping plate are fitted outside of the tank a means of access is to be provided.”</td>
</tr>
</tbody>
</table>
| PMA+ Requirement | No additional PMA+ requirements.
| Additional Guidance | Detailed guidance on the design of handles is available in Subsection 4/4, “Handles”.

**Means of Access Requirement for Table 2/2.4 of MSC.158(78) for Bulk Carriers**

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>“For topside tanks of which the height is less than 6 m, alternative means as defined in paragraph 3.9 of the Technical provisions or portable means may be utilized in lieu of the permanent means of access.”</th>
</tr>
</thead>
</table>
| IACS Interpretation | No interpretation provided.
| PMA+ Requirement | No additional PMA+ requirements.
| Additional Guidance | Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.

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5.16 Means of Access Requirement for Table 2/2.5 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“For each bilge hopper tank of which the height is 6 m and over, one longitudinal continuous permanent means of access shall be provided along the side shell webs and installed at a minimum of 1.2 m (47.0 in.) below the top of the clear opening of the web ring with a vertical access ladder in the vicinity of each access to the tank.”</td>
<td>A</td>
<td>Distance below web ring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IACS Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• “The height of a bilge hopper tank located outside of the parallel part of vessel is to be taken as the maximum of the clear vertical height measured from the bottom plating to the hopper plating of the tank.</td>
</tr>
<tr>
<td>• It should be demonstrated that portable means for inspection can be deployed and made readily available in the areas where needed.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below web ring</td>
<td>≥ 1500 mm (59.0 in.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Section 2, Figure 15, “Bilge Hopper Tank Access with a Height ≥ 6 m” is provided to help illustrate these requirements.</td>
</tr>
<tr>
<td>• Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps.”</td>
</tr>
</tbody>
</table>

**FIGURE 15**

Bilge Hopper Tank Access with a Height ≥ 6 m (19.5 ft)
5.17 Means of Access Requirement for Table 2/2.5.1 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“An access ladder between the longitudinal continuous permanent means of access and the bottom of the space shall be provided at each end of the tank.”</td>
<td>No interpretation provided</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Section 2, Figure 16, “Access Ladder between the Longitudinal Continuous Means of Access and the Bottom of the Space” is provided to help illustrate this requirement.</td>
</tr>
<tr>
<td></td>
<td>• Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.</td>
</tr>
<tr>
<td></td>
<td>• Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.</td>
</tr>
</tbody>
</table>

**FIGURE 16**

Access Ladder between the Longitudinal Continuous Means of Access and the Bottom of the Space

[Diagram of access ladder between longitudinal continuous means of access and the bottom of the space]
5.18 Means of Access Requirement for Table 2/2.5.2 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Alternatively, the longitudinal continuous permanent means of access can be located through the upper web plating above the clear opening of the web ring, at a minimum of 1.6 m below the deck head, when this arrangement facilitates more suitable inspection of identified structurally critical areas. An enlarged longitudinal frame can be used for the purpose of the walkway.”</td>
<td>A</td>
<td>Distance below deck head</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>Access width</td>
</tr>
</tbody>
</table>

IACS Interpretation:

“A wide longitudinal frame of at least 600 mm (23.5 in.) clear width may be used for the purpose of the longitudinal continuous permanent means of access. The foremost and aftermost bilge hopper ballast tanks with raised bottom, of which the height is 6 m and over, a combination of transverse and vertical MA for access to the sloping plate of hopper tank connection with side shell plating for each transverse web can be accepted in place of the longitudinal permanent means of access.”

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>Distance below deck head</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Access width</td>
</tr>
</tbody>
</table>

Additional Guidance:

- Section 2, Figure 17, “Alternate Bilge Hopper Tank Access with a Height 6 m” is provided to help illustrate these requirements.
- Vertical walkway clearance from a PMA+ perspective shall be measured from the top of the walking platform/surface to the lowest structure directly above the walkway (e.g., stiffener).
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.

FIGURE 17
Alternate Bilge Hopper Tank Access with a Height ≥ 6 m (19.5 ft)
5.19 Means of Access Requirement for Table 2/2.5.3 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks) (1 April 2016)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>Dimension</th>
<th>MSC.158(78) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below web ring</td>
<td>≥ 1200 mm (47.0 in.)</td>
<td></td>
</tr>
</tbody>
</table>

IACS Interpretation

No interpretation provided.

<table>
<thead>
<tr>
<th>PMA+ Requirement</th>
<th>Dimension</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance below web ring</td>
<td>≥ 1500 mm (59.0 in.)</td>
</tr>
</tbody>
</table>

Additional Guidance

- Section 2, Figure 18, “Access for Foremost and Aftmost Bilge Hopper Tanks” are provided to help illustrate these requirements.
- Vertical walkway clearance from a PMA+ perspective shall be measured from the top of the walking platform/surface to the lowest structure directly above the walkway (e.g., stiffener).
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.

**FIGURE 18**
Access for Foremost and Aftmost Bilge Hopper Tanks

Critical Area for Inspection
## 5.20 Means of Access Requirement for Table 2/2.6 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“If no access holes are provided through the transverse ring webs within 600 mm (23.5 in.) of the tank base and the web frame rings have a web height greater than 1 m (39.5 in.) in way of side shell and sloping plating, then step rungs/grab rails shall be provided to allow safe access over each transverse web frame ring.”</td>
<td>“The height of web frame rings should be measured in way of side shell and tank base.”</td>
</tr>
</tbody>
</table>

**PMA+ Requirement**

No additional PMA+ requirements.

**Additional Guidance**

- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

## 5.21 Means of Access Requirement for Table 2/2.7 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks)

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
<th>Additional Guidance</th>
</tr>
</thead>
</table>
| “For bilge hopper tanks of which the height is less than 6 m, alternative means as defined in paragraph 3.9 of the Technical provisions or portable means may be utilized in lieu of the permanent means of access. Such means of access shall be demonstrated that they can be deployed and made readily available in the areas where needed.” | No interpretation provided. | No additional PMA+ requirements. | Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.

## 5.22 Means of Access Requirement for Table 2/2.8 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Bilge Hopper Tanks – Double-skin Side Tanks)

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
<th>Additional Guidance</th>
</tr>
</thead>
</table>
|                 | “Permanent means of access shall be provided in accordance with the applicable sections of Resolution MSC158(78), Table 1” | No interpretation provided. | No additional PMA+ requirements. | Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

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**ABS GUIDE FOR MEANS OF ACCESS TO TANKS AND HOLDS FOR INSPECTION • 2016**
5.23 **Means of Access Requirement for Table 2/2.9 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Fore Peak Tanks)**

<table>
<thead>
<tr>
<th>PMA Requirement</th>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“For fore peak tanks with a depth of 6 m or more at the centerline of the collision bulkhead, a suitable means of access shall be provided for access to critical areas such as the underdeck structure, stringers, collision bulkhead and side shell structure.”</td>
<td>No interpretation provided.</td>
<td>No additional PMA+ requirements.</td>
</tr>
</tbody>
</table>

**Additional Guidance**
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

5.24 **Means of Access Requirement for Table 2/2.9.1 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Fore Peak Tanks)**

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Stringers of less than 6 m in vertical distance from the deck head or a stringer immediately above are considered to provide suitable access in combination with portable means of access.”</td>
<td>No interpretation provided.</td>
<td>No additional PMA+ requirements.</td>
</tr>
</tbody>
</table>

**Additional Guidance**
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.

5.25 **Means of Access Requirement for Table 2/2.9.2 of MSC.158(78) for Bulk Carriers (Ballast Tanks – Fore Peak Tanks)**

<table>
<thead>
<tr>
<th>Means of Access Requirement</th>
<th>IACS Interpretation</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>“In case the vertical distance between the deck head and stringers, stringers or the lowest stringer and the tank bottom is 6 m or more, alternative means of access as defined in paragraph 3.9 of the Technical provisions shall be provided.”</td>
<td>No interpretation provided.</td>
<td>No additional PMA+ requirements.</td>
</tr>
</tbody>
</table>

**Additional Guidance**
- Detailed guidance on the design and selection of alternative means of access is available in Section 6, “Alternative Means of Access”.
- Detailed walkway design guidance is available in Subsection 3/2, “Walkways and Ramps”.
- Detailed ladder design guidance is available in Section 4, “Vertical Ladders, Inclined Ladders and Handles”.
- Detailed hatch design guidance is available in Section 5, “Hatches”.
SECTION 3 Walkways, Ramps, and Work Platforms

1 General

This Section contains design guidance for walkways, ramps and work platforms. The guidance included in the figures and tables below provides the design attribute (application) and the IMO (PMA) and PMA+ dimension requirements. There are instances where IMO means of access requirements do not provide specific design dimensioning. In these instances, the PMA+ dimensions may be used as guidance.

1.1 Design Loads (1 April 2016)

IMO requirements state that the construction and materials of all means of access and their attachment to the vessel’s structure shall be to the satisfaction of the Administration and that the means of access shall be of “substantial construction” and “adequate strength and stiffness”.

The IACS SC UI 191 definition of substantial construction is as follows: “Substantial construction is taken to refer to the as-designed strength as well as the residual strength during the service life of the vessel. Durability of passageways together with guardrails shall be verified by the initial corrosion protection and inspection and maintenance during services.” This is an effective qualitative definition of “substantial construction”, but additional quantitative guidance is necessary to further warrant safe working conditions.

The design loads listed in the following Subparagraphs are design load requirements for both the PMA and PMA+ notations. Where requirements for design loads, specified by other regulatory bodies (e.g., flag Administrations and port State authorities), are greater, those requirements take precedence over this Guide.

This Guide defines “design load” as the maximum intended load, being the total of all loads including the weight of the personnel, materials, and equipment, including the means of access structure.

1.1.1 Guardrails

Guardrails shall withstand anticipated loads but not less than 90 kg (200 lbs) at any point and in any direction when applied to the top rail.

1.1.2 Walkways and Work Platforms

The minimum design loads for the landings, walkways and working platforms are:

- 2.0 kN/m² (0.29 lbf/in²) under uniform load for the structure, and
- 1.5 kN (337 lbf) concentrated load applied in the most unfavorable position over a concentrated load area of 200 mm × 200 mm (8.0 in. × 8.0 in.) for the flooring.
- When loaded with the design load, the deflection of the flooring shall not exceed 1/200th of the span and the difference between the loaded and adjacent unloaded flooring shall not exceed 4 mm (0.16 in.) in height.
2 Walkways and Ramps (1 April 2016)
This Subsection includes general principles as well as the design requirements for the arrangement of walkways, ramps, and the provision of guardrails and handrails.

2.1 General Principles
The principles listed below apply to the design of walkways and ramps and are not represented in the following figures or tables.

- Walkway width is dependent on factors such as the demand of any tasks performed on or from the walkway, frequency of use and the number of workers using the walkway at the same time.
- Guardrails shall be provided at the exposed side of any walking or standing surface that is 600 mm (23.5 in.) or higher above the adjacent surface and where a person could fall from the upper to the lower surface.
- Ramps are best used with changes in vertical elevations of less than 600 mm (23.5 in.) but may be used for any height provided that the angle of inclination to the horizontal complies with Section 3, Figure 2, “Walkway and Ramp Design”.
- Toeboards shall be considered on elevated walkways, platforms, and ramps.
- Permanent means of access shall as far as possible be integral to the structure of the vessel, thus verifying that they are robust and at the same time contributing to the overall strength of the structure of the vessel.
- Where stays are provided for supporting stanchions, they shall be fitted so as not to obstruct safe passage.
- Stanchion scantlings can be formed of flat or round bar. See Section 3, Figure 2, “Walkway and Ramp Design”
- Brackets joining the guardrail stanchions to the means of access shall be oriented in a way to avoid causing a trip hazard (e.g., parallel to direction of the walkway).
- No impediments or tripping hazards shall intrude into the transit space (for example, electrical boxes, valves, actuators, or piping).
- No impediments or tripping hazards shall impede use of a walkway or ramp (for example, piping runs, hatch covers, deck impediments (e.g., through bolts) or combings/retention barriers).

2.2 Toeboards
The use of toeboards on elevated walkways and platforms is a standard safety and ergonomics practice. Toeboards help prevent a worker’s foot, tools, parts and equipment from slipping or falling off the edge of an elevated walkway or platform.

However, the use of toeboards on walkways or platforms used for inspection in cargo tanks and holds could inhibit and delay the safe and complete off-load of cargo as well as create potential hazards on the walkways. Toeboards could retain cargo in bulk carriers as well as retain sludge in oil tankers. Each of these instances could present stepping, tripping and slipping hazards to workers who have to clear, clean or work from the walkways or platforms. As a result, PMA and PMA+ requirements do not require the use of toeboards, but their use should be considered.

Additional consideration should be given to where toeboards will prove helpful depending on the nature of the cargo and the toeboard’s potential susceptibility to damage or deterioration from the cargo.

Note: This is a departure from safety and ergonomics practices, but is acceptable for means of access for inspection purposes in cargo tanks and holds. If toeboards are to be used, see Section 3, Figure 1, “Toeboard Dimensions”.
2.3 **Walkway and Ramp Design**

The dimensions relating to the design of walkways and ramps are presented in Section 3, Figure 2, “Walkway and Ramp Design” and Section 3, Figure 3, “Web Frame Walkways”.

---

**FIGURE 1**

**Toeboard Dimensions (1 April 2016)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Height of toeboard</td>
<td>100 mm (4.0 in.)</td>
</tr>
<tr>
<td>B Gap between toeboard and surface</td>
<td>6 mm (0.25 in.)</td>
</tr>
</tbody>
</table>
### FIGURE 2
**Walkway and Ramp Design (1 April 2016)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Walkway width</td>
<td>≥ 600 mm (23.5 in.)</td>
</tr>
<tr>
<td>B</td>
<td>Distance behind handrail and any obstruction</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>C</td>
<td>Gaps between two handrail sections or other structural members (see Section 3, Figures 5 and 6)</td>
<td>≤ 50 mm (2.0 in.)</td>
</tr>
<tr>
<td>D</td>
<td>Span between to handrail stanchions</td>
<td>≤ 3.0 m (10.0 ft)</td>
</tr>
<tr>
<td>E</td>
<td>Diameter of handrail</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>F</td>
<td>Height of handrail (measured to the top of the handrail)</td>
<td>≥ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>G</td>
<td>Height of intermediate rail (measured from the bottom of the intermediate rail to the walking surface)</td>
<td>500 mm (19.5 in.)</td>
</tr>
<tr>
<td>H</td>
<td>Maximum distance between the adjacent stanchions across handrail gaps (see Section 3, Figures 5 and 6)</td>
<td>≤ 350 mm (14.0 in.)</td>
</tr>
<tr>
<td>I</td>
<td>Distance below the overhead structure (measured from the underside of the deck plating to the top of the platform)</td>
<td>≥ 1600 mm (63.0 in.) and ≤ 3 m (10.0 ft)</td>
</tr>
<tr>
<td>J</td>
<td>The maximum opening in a walkway grating under which the presence of persons is expected (i.e. persons are working and does not include occasional passage)</td>
<td>No specific requirement</td>
</tr>
<tr>
<td></td>
<td>The maximum opening in a walkway grating under which the presence of persons is not expected</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>K</td>
<td>Ramp (sloping structure) surface</td>
<td>Non-skid construction</td>
</tr>
<tr>
<td>θ</td>
<td>Ramp angle of inclination</td>
<td>≥ 5 degrees</td>
</tr>
</tbody>
</table>

---

**Diagram:**
- **A:** Walkway width
- **B:** Distance behind handrail and any obstruction
- **C:** Gaps between two handrail sections or other structural members
- **D:** Span between handrail stanchions
- **E:** Diameter of handrail
- **F:** Height of handrail (measured to the top of the handrail)
- **G:** Height of intermediate rail
- **H:** Maximum distance between adjacent stanchions
- **I:** Distance below the overhead structure
- **J:** Maximum opening in a walkway grating
- **K:** Ramp (sloping structure) surface
- **θ:** Ramp angle of inclination
- **Nearest Obstruction Behind Handrail**
FIGURE 3
Web Frame Walkways (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Walkway width around a web frame</td>
<td>≥ 450 mm (17.5 in.)</td>
</tr>
</tbody>
</table>

FIGURE 4
Discontinuous Handrail where Top and Mid Rails are Connected* (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Gaps between two handrail sections</td>
<td>≤ 50 mm (2.0 in.)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>B Distance between adjacent stanchions</td>
<td>≤ 550 mm (21.5 in.)</td>
<td>No additional requirement</td>
</tr>
</tbody>
</table>

* = Other handrail measurements apply (e.g., handrail heights and span between handrail stanchions).
FIGURE 5
Discontinuous Handrails where Top and Mid Rails are not Connected* (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 PMA* Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Gaps between two handrail sections</td>
<td>≤ 50 mm (2.0 in.)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>B  Distance between adjacent stanchions</td>
<td>≤ 350 mm (14.0 in.)</td>
<td>No additional requirement</td>
</tr>
</tbody>
</table>

* = Other handrail measurements apply (e.g., handrail heights and span between handrail stanchions).

3 Work Platforms

Work platforms shall be provided at locations where personnel must perform tasks that cannot be easily accomplished by reaching from an existing standing surface.

3.1 General Principles (1 April 2016)

The principles listed below apply to the design of work platforms.

- Platforms shall be of sufficient size (see Section 3, Figure 6, “Work Platform Dimensions”) to accommodate the task and allow for placement of any required tools, spare parts, or equipment.
- Work platforms more than 600 mm (23.5 in.) above the surrounding surface shall be provided with guard rails and handrails as described in Subsection 3/2, “Walkways and Ramps”.

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### FIGURE 6

**Work Platform Dimensions (1 April 2016)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Work platform width</td>
<td>No specific requirement</td>
</tr>
<tr>
<td></td>
<td>Work platform width (if only used for standing)</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>B</td>
<td>Work platform length</td>
<td>No specific requirement</td>
</tr>
<tr>
<td></td>
<td>Work platform length (if only used for standing)</td>
<td>No specific requirement</td>
</tr>
</tbody>
</table>
SECTION 4 Vertical Ladders, Inclined Ladders, and Handles

1 General (1 April 2016)

This Section contains guidance related to the design of the different attributes of vertical ladders, inclined ladders, individual rung ladders and handles. The guidance included in the figures and tables below provides the design attribute (application) and the IMO (PMA) and PMA+ dimension requirements. There are a few instances where IMO means of access requirements do not provide specific design dimensioning. In these instances, the PMA+ dimensions may be used as guidance.

1.1 Design Loads

IMO requirements state that the construction and materials of all means of access and their attachment to the vessel’s structure shall be to the satisfaction of the Administration and that the means of access shall be of “substantial construction” and “adequate strength and stiffness.”

The IACS SC 191 definition of substantial construction is as follows: “Substantial construction is taken to refer to the as designed strength as well as the residual strength during the service life of the vessel. Durability of passageways together with guardrails shall be verified by the initial corrosion protection and inspection and maintenance during services.” This is an effective qualitative definition of “substantial construction”, but additional quantitative guidance is necessary to further warrant safe working conditions.

The design loads listed in the following Subparagraphs are design load requirements for both the PMA and PMA+ notations. However, if requirements for design loads specified by other regulatory bodies (e.g., flag Administrations and port State authorities), are more limiting, those requirements take precedence over this Guide.

This Guide defines “design load” as the maximum intended load, being the total of all loads including the weight of the personnel, materials, equipment and means of access structure and shall be as follows:

1.1.1 Guardrails/Handrails

Guardrails and handrails shall withstand anticipated loads but not less than 90 kg (200 lbs) at any point and in any direction when applied to the top rail.

1.1.2 Vertical Ladders

For vertical ladders, the design load shall be determined by the anticipated usage of the ladder, but shall not be less than a single concentrated live load of 90 kg (200 lbs). The weight of the ladder and attached appurtenances together with the design load shall be considered in the design of rails and fastenings.

1.1.3 Inclined Ladders

Inclined ladders shall be designed and constructed to carry a load of at least three times the normal load anticipated but never of less strength than to carry safely a moving concentrated load of 225 kg (495 lbs).

1.1.4 Landings

The minimum working loads for landings are:

- 2.0 kN/m² (0.29 lbf/in²) under uniform load for the structure, and

- 1.5 kN (337 lbf) concentrated load applied in the most unfavorable position over a concentrated load area of 200 mm × 200 mm (8.0 in. × 8.0 in.) for the flooring.

- When loaded with the design load, the deflection of the flooring shall not exceed 1/200⁰ of the span and the difference between the loaded and adjacent unloaded flooring shall not exceed 4 mm (0.15 in.) in height.
1.2 Use and Selection of Ladders
Stairs, vertical ladders, inclined ladders or ramps shall be provided whenever operators or maintainers must change elevation abruptly by more than 300 mm (12.0 in.). Guidance relating to ramps can be found in Subsection 3/2, “Walkways and Ramps.” These structures shall also be used, when appropriate, for passage over low objects (e.g., pipes, lines, ridges). Though stairs are the preferred form of access/egress, their practicality in cargo tanks and holds for inspection may be limited. For further detailed guidance relating to stairs, vertical ladders, inclined ladders and ramps, please consult Section 9, “Stairs, Vertical Ladders, Ramps, Walkways and Work Platforms” of the ABS Guidance Notes for the Application of Ergonomics to Marine Systems.

The selection of vertical ladders and inclined ladders shall be based on the purpose, frequency of use, and angle of ascent. See Section 4, Table 1, “Selection of Access Type” for related guidance on angle of inclination.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclined Ladders</td>
<td>&lt; 70 degrees</td>
<td>45-60 degrees</td>
</tr>
<tr>
<td>Vertical Ladders</td>
<td>≥ 70 degrees</td>
<td>80-90 degrees</td>
</tr>
</tbody>
</table>

2 Vertical Ladders
This Subsection contains guidance on the design of vertical ladders and climber safety devices.

2.1 General Principles (1 April 2016)
The considerations listed below apply to the design of vertical ladders and are not represented in the following figures or tables:

- Permanent vertical ladders shall be attached to a permanent structure.
- Located so as not to interfere with the opening and closing of hatches, grating, or other types of access.
- No impediments shall intrude into the climbing space (for examples, electrical boxes, valves, actuators, or piping).
- If a work task requires the use of two hands, working from a vertical ladder is not appropriate. The work area shall be provided with a work platform that provides a flat, stable standing surface. See Section 4, Figure 3, “Landings (Side Mount)” and Section 4, Figure 4, “Vertical Ladders to Landings (Ladder through Platform)” for more details.
- With the Administration’s approval, “reasonable deviations” may be applied to facilitate this means of access. IACS UI (SC) 191 has interpreted this to be no more than 10% for vertical distances exceeding 6 m (19.5 ft).

2.2 Vertical Ladder Design
The following figures represent the different aspects of vertical ladders, their design and dimensioning.

- Figure 1, “Vertical Ladders (General Criteria)”
- Figure 2, “Staggered Vertical Ladder”
- Figure 3, “Vertical Ladders to Landings (Side Mount)”
- Figure 4, “Vertical Ladders to Landings (Ladder through Platform)”
### FIGURE 1
Vertical Ladders (General Criteria) *(1 April 2016)*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 <em>(PMA)</em> Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance between ladder attachments /securing devices</td>
<td>( \leq 2.5 \text{ m (8.0 ft)} )</td>
</tr>
<tr>
<td>B</td>
<td>Distance between ladder rungs (rungs evenly spaced throughout the full run of the ladder)</td>
<td>( \geq 250 \text{ mm (10.0 in.) and } \leq 350 \text{ mm (14.0 in.)} )</td>
</tr>
<tr>
<td>C</td>
<td>Distance between ladder stringers</td>
<td>( \geq 350 \text{ mm (14.0 in.)} )</td>
</tr>
<tr>
<td>D*</td>
<td>Ladder height (ladders over 6 m (19.5 ft) require intermediate/linking platforms)</td>
<td>( \leq 6.0 \text{ m (19.5 ft)} )</td>
</tr>
<tr>
<td>E</td>
<td>Stringer Design</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>F</td>
<td>Rung Design – <em>(Can be round or square bar; where square bar is fitted, orientation shall be edge up)</em></td>
<td>Square bar 22 mm (0.9 in.) ( \times ) 22 mm (0.9 in.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Round bar 25 mm (1.0 in.) diameter</td>
</tr>
<tr>
<td>G</td>
<td>Ladder distance from surface (at 90 degrees)</td>
<td>( \geq 150 \text{ mm (6.0 in.)} )</td>
</tr>
<tr>
<td>H</td>
<td>Horizontal Clearance (from ladder face and obstacles)</td>
<td>( \geq 600 \text{ mm (23.5 in.)} )</td>
</tr>
<tr>
<td>I</td>
<td>Overhead Clearance</td>
<td>2.5m (8.0 ft)**</td>
</tr>
<tr>
<td>J</td>
<td>Distance between ladder’s centerline to any object that must be reached by personnel</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>θ</td>
<td>Ladder angle of inclination from the horizontal</td>
<td>70-90 degrees</td>
</tr>
<tr>
<td>φ</td>
<td>Skew angle</td>
<td>( \leq 2 \text{ degrees} )</td>
</tr>
</tbody>
</table>

* = MSC.158(78) Table 2 requirement 1.10 allows for a single vertical ladder over 6 m (19.5 ft) in length for the inspection of the hold side frames in a single skin construction.

** = The vertical distance of the uppermost section of the vertical ladder may be between 1.6 and 3 m (63 to 118 in.), measured clear of the overhead obstructions in way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range.
## FIGURE 2
Staggered Vertical Ladder (1 November 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Stringer width</td>
<td>( \geq 350 \text{ mm (14.0 in.)} )</td>
</tr>
<tr>
<td>B</td>
<td>Horizontal separation between two vertical ladders, stringer to stringer</td>
<td>( \geq 200 \text{ mm (8.0 in.)} )</td>
</tr>
<tr>
<td>C</td>
<td>Distance between ladder rungs (rungs evenly spaced throughout the full run of the ladder)</td>
<td>( \geq 250 \text{ mm (10.0 in.)} ) ( \leq 350 \text{ mm (14.0 in.)} )</td>
</tr>
<tr>
<td>D*</td>
<td>Stringer height above landing or intermediate platform</td>
<td>( \geq 1500 \text{ mm (59.0 in.)} )</td>
</tr>
<tr>
<td>E*</td>
<td>Rung Design – (Can be round or square bar; where square bar is fitted, orientation shall be edge up)</td>
<td>Square bar 22 mm (0.9 in.) ( \times ) 22 mm (0.9 in.)</td>
</tr>
<tr>
<td>F</td>
<td>Horizontal separation between ladder and platform</td>
<td>( \geq 100 \text{ mm (4.0 in.)} ) ( \leq 300 \text{ mm (12.0 in.)} )</td>
</tr>
<tr>
<td>G</td>
<td>Landing or intermediate platform width</td>
<td>See Section 4, Figure 3 or 4*</td>
</tr>
<tr>
<td>H</td>
<td>Stringer construction</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>I</td>
<td>Platform ladder to Platform ledge</td>
<td>No specific requirement</td>
</tr>
</tbody>
</table>

* = There shall be a rung on the vertical ladder at the same height as the standing surface of the intermediate platform.

* = See Section 4, Figure 3, “Vertical Ladders to Landings (Side Mount)” and Section 4, Figure 4, “Vertical Ladders to Landings (Ladder Through the Platform)”.

* = (1 November 2016) The minimum height of the handrail of resting platform is of 1000 mm (39.5 in.) [Technical Provision, resolution MSC.158(78), paragraph 3.3].
Staggered Vertical Ladder – Side mount

Staggered Vertical Ladder – Ladder through the linking platform
FIGURE 3
Vertical Ladders to Landings (Side Mount)* (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform depth</td>
<td>Adequate dimensions</td>
<td>≥ 750 mm (29.5 in.)</td>
</tr>
<tr>
<td>Platform width</td>
<td>Adequate dimensions</td>
<td>≥ 925 mm (36.5 in.)</td>
</tr>
<tr>
<td>Ladder distance from surface</td>
<td>≥ 150 mm (6.0 in.)</td>
<td>≥ 200 mm (8.0 in.)</td>
</tr>
<tr>
<td>Horizontal separation between ladder and platform</td>
<td>≥ 100 mm (4.0 in.) and ≤ 300 mm (12.0 in.)</td>
<td>≥ 150 mm (6.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
</tbody>
</table>

* = Other vertical ladder measurements apply.
2.3 Climber Safety Devices

(1 April 2016) The use of climber safety devices is a standard safety and ergonomics practice on vertical ladders ≥ 4.5 m (15.0 ft). Cages should be used on vertical ladders over 4.5 m (15.0 ft) in height. Climber safety rails or cables should be used on vertical ladders in excess of 6.0 m (19.5 ft) whether cages are used or not since they are considered positive fall protection devices while cages are not.

However, in tanks and holds, climber safety cages could be damaged by cargo being loaded, transported, and unloaded. Safety rails and cables may also be susceptible to damage but not as likely or severely as cages since the rails and cables fit tight against the ladder rungs.

As a result, PMA and PMA+ requirements do not require the use of climber safety devices or safety gates, but their use should be considered.

Note: This is a departure from safety and ergonomics practices, but is acceptable for means of access for inspection in cargo tanks and holds. Additionally, consideration should be given to where such devices will prove helpful depending on the nature of the cargo and the device’s potential susceptibility to damage or deterioration.
2.3.1 Climber Safety Cages (1 April 2016)

The use of climber safety devices is not a PMA+ requirement. It is optional but strongly encouraged. Guidance for the construction of the safety cage is shown in Section 4, Figure 5, “Arrangement for Cage of Vertical Ladder” and Section 4, Figure 6, “Cage of Vertical Ladder – Side View.” Cages should extend 1400 mm (55 in.) above the top-landing surface. Cages equipped with intermediate landings should extend 1400 mm (55 in.) above the intermediate landing with the cage open on the side facing the landing.

Consideration should be given to providing safety cages for ladders ≤ 4.5 m (15.0 ft) in height where a fall to a level or deck below the ladder base is possible (e.g., within 1825 mm (72 in.) of the edge of a deck).

**FIGURE 5**
Arrangement for Cage of Vertical Ladder (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Distance from centerline of ladder rung to point of radius of the safety cage horizontal guards</td>
<td>350 mm (14.0 in.)</td>
</tr>
<tr>
<td>B Horizontal guard radius</td>
<td>Horizontal guard at bottom of cage – 425 mm (16.5 in.)</td>
</tr>
<tr>
<td></td>
<td>All other horizontal guards – 350 mm (14.0 in.)</td>
</tr>
<tr>
<td>C Vertical separation of horizontal guard placement</td>
<td>≤ 1200 mm (47.0 in.)</td>
</tr>
</tbody>
</table>
### FIGURE 6
Cage of Vertical Ladder – Side View (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Distance above standing surface</td>
</tr>
<tr>
<td>B</td>
<td>Vertical separation of horizontal guard placement</td>
</tr>
</tbody>
</table>

---

2.3.2 Climber Safety Rails or Cables (1 April 2016)

Listed below is guidance related to the use of climber safety rails or cables, where provided.

- For vertical ladders over 6.0 m (19.5 ft), a climber safety rail or cable should be considered, whether or not a safety cage is provided.
- Climber safety rail should be stainless steel flat bar and equipped with two safety slides, which can be attached to the flat bar or cable.
- Climber safety cables are recommended in place of rails in environments where any material may interfere with the rail itself.
- If climber safety devices are used, the ladder stringers at a top landing should be designed to allow personnel to access any associate landing without unfastening (see Section 4, Figure 7, “Ladders with Climber Safety Rails or Cables”).
### FIGURE 7
Ladders with Climber Safety Rails or Cables (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Distance to bottom of climber safety rail</td>
<td>( \geq 900 \text{ mm (35.5 in.)} )  ( \leq 950 \text{ mm (37.5 in.)} )</td>
</tr>
<tr>
<td>B Inside clearance</td>
<td>( \geq 225 \text{ mm (9.0 in.)} )  ( \leq 250 \text{ mm (10.0 in.)} )</td>
</tr>
<tr>
<td>C Inside clearance</td>
<td>380 mm (15.0 in.)</td>
</tr>
<tr>
<td>D Top of climber safety rail and handrail height above upper standing surface</td>
<td>( \geq 1070 \text{ mm (42.0 in.)} )</td>
</tr>
<tr>
<td>E Climber safety rail height above upper standing surface</td>
<td>1070 mm (42.0 in.)</td>
</tr>
<tr>
<td>F Distance from upper standing surface</td>
<td>200 mm (8.0 in.)</td>
</tr>
</tbody>
</table>

#### 2.3.3 Gates
Consideration should be given to the use of closable or self-closing gates on vertical ladders to prevent falls through ladder stingers. Chains or wire ropes do not provide the same level of safety as a gate.

#### 2.3.4 Safety Drop Bars (1 April 2016)
All fixed ladders serving elevations 760 mm (30.0 in.) or more above ground, platform or floor level should be equipped with drop bars or safety gates. Drop bars should be attached as follows:

1. Side access ladders should hinge at the ladder side.
2. Front access ladders should hinge at the right when facing the ladder from the platform side.
3. Drop bars should not be placed beyond the outer edge of the platform.
4. Chains should not be used in lieu of a drop bar.
2.3.5 Safety Gates (1 April 2016)
Where a self-closing safety gate is provided, the following should apply:

i) The self-closing safety gate should be installed at the top of each ladder and should cover the full width of the opening between the ladder stringers.

ii) The gate should open away from the person climbing up the ladder.

iii) Safety gates should be sufficiently robust to resist the full weight of a 90 kg (200 lbs) person in both the vertical and horizontal direction.

iv) Chains should not be used in lieu of a safety gate.

2.4 Fall Protection from Secondary Fall Points (1 April 2016)

2.4.1 General
The use of fall protection from secondary fall points is a standard safety and ergonomics practice on vertical ladders.

However, in tanks and holds, this additional fall protection could be damaged by cargo being loaded, transported, and unloaded.

As a result, PMA and PMA+ requirements do not require the use of fall protection from secondary fall points, but their use should be considered.

Note: This is a departure from safety and ergonomics practices, but is acceptable for means of access for inspection in cargo tanks and holds. Additionally, consideration should be given to where such fall protection will prove helpful depending on the nature of the cargo and the guardrail’s potential susceptibility to damage or deterioration.

Vertical ladders shall not be located within 1.83 m (6 ft) of other nearby potential fall points (including the deck edge, cargo holds and lower decks) without additional fall protection such as guardrails.

Additional fall protection shall be provided for the ladder climber for the case:

i) If a vertical ladder (of any height) is located within 1.83 m (6 ft) of another and nearby potential (secondary) fall point (for example overboard or to a lower deck or landing),

and

ii) If the potential fall distance is greater than 4.6 m (15 ft). (The potential fall distance is the height of the ladder plus the height of the secondary fall),

and

iii) If no active fall protection is fitted to the ladder (a safety cage is not considered to provide active protection),

then

iv) Additional fall protection to the ladder climber shall be provided, regardless of whether a climber safety cage is fitted to the ladder, as described in 4/2.4.2.

Note: Passive Fall Protection is a safety design or device that requires a person to take no specific action prior to a potential loss, for example, a safety cage permanently fitted to a ladder.

Active Fall Protection is a safety design or device that actively (or directly) requires a person to take specific actions before a potential loss, for example, donning a fall arrestor fitted to both the ladder and the climber.
2.4.2 Protection for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables

The following shall apply to vertical ladders less than 4.5 m (15.0 ft) that are not fitted with a safety cage or a safety rail.

Guardrail requirements are found in the following:

i) Section 4, Table 2, “Guardrail Requirements for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables” provides the dimensions for requirements to guardrails near the base of the ladder.

ii) Section 4, Figure 8, “Front View of Guardrail Requirements for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables” and Section 4, Figure 9, “Side View of Guardrail Requirements for Vertical Ladders with or without Safety Cages or Climber Safety Rails/Cables” provide dimensions and graphical representations.

Other designs and arrangements that serve to protect personnel from falls may also be deemed to be acceptable.

### TABLE 2
Guardrail Requirements for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of vertical guardrail</td>
<td>Height shall extend to within 760 mm (30.0 in.) of the top of the ladder.</td>
</tr>
<tr>
<td>Width of vertical guardrail</td>
<td>Protection shall be provided for a minimum of 1220 mm (48.0 in.) on each side of the centerline of the ladder, space permitting.</td>
</tr>
<tr>
<td>Distance between guardrail courses or tiers</td>
<td>A maximum of 460 mm (18.0 in.) shall be provided between guardrail courses or tiers of the guardrail extension. The measurement shall be taken from the course or tier’s outside diameter to outside diameter as shown in Section 4, Figure 8.</td>
</tr>
</tbody>
</table>
FIGURE 8
Front View of Guardrail Requirements for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Requirements*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥ 1220 mm (48.0 in.)</td>
</tr>
<tr>
<td>B</td>
<td>≤ 760 mm (30.0 in.)</td>
</tr>
<tr>
<td>C</td>
<td>≤ 380 mm (15.0 in.)</td>
</tr>
<tr>
<td>D</td>
<td>100 mm (4.0 in.)</td>
</tr>
</tbody>
</table>

* Note: Vertical ladder requirements apply (see Subsection 4/2, “Vertical Ladders”).

---

**Dimension Requirements**

A Horizontal spacing between ladder centerline and rail end

B Vertical distance from top of ladder to top of rail

C Spacing between top rail and mid-rail

D Height of toeboard

---

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FIGURE 9
Side View of Guardrail Requirements for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Horizontal distance between ladder and rails ≤ 1830 mm (72.0 in.)</td>
</tr>
<tr>
<td>B</td>
<td>Vertical distance from top of rail to top of ladder ≤ 760 mm (30.0 in.)</td>
</tr>
</tbody>
</table>
2.4.3 Protection for Vertical Ladders with Safety Cages and without Climber Safety Rails/Cables

Guardrail requirements are found in the following:

i) Section 4, Table 3, “Guardrail Requirements for Vertical Ladders with Safety Cages and without Climber Safety Rails/Cables” provides requirements for guardrails near the base of the ladder.

ii) Section 4, Figure 10, “Front View of Guardrail Requirements for Vertical Ladders with Safety Cages and without Climber Safety Rails/Cables” provides dimensions and graphical representations. Note that Dimension A of Section 4, Figure 10 also applies to Guardrail Requirements for Vertical Ladders with Safety Cages and without Climber Safety Rails/Cables.

Other designs and arrangements that serve to protect personnel from falls may also be deemed to be acceptable.

TABLE 3
Guardrail Requirements for Vertical Ladders with Safety Cages and without Climber Safety Rails/Cables (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of vertical guardrail</td>
<td>The height shall extend to within 760 mm (30.0 in.) of the lower edge of the safety cage</td>
</tr>
<tr>
<td>Width of vertical guardrail</td>
<td>Protection shall be provided for a minimum of 1220 mm (48.0 in.) on each side of the centerline of the ladder, space permitting.</td>
</tr>
<tr>
<td>Distance between guardrail extension courses or tiers</td>
<td>A maximum of 460 mm (18.0 in.) shall be provided between guardrails courses or tiers of the guardrail extension. The measurement shall be taken from the course or tier outside diameter to outside diameter as shown in Section 4, Figure 9.</td>
</tr>
<tr>
<td>Horizontal distance between ladder and rails</td>
<td>1830 mm (72.0 in.) (Refer to Dimension A of Section 4, Figure 9, “Side View of Guardrail Requirements for Vertical Ladders without Safety Cages or Climber Safety Rails/Cables”)</td>
</tr>
</tbody>
</table>
## FIGURE 10
Front View of Guardrail Requirements for Vertical Ladders with Safety Cages and without Climber Safety Rails/Cables* (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Vertical distance between safety cage and rail ≤ 760 mm (30.0 in.)</td>
</tr>
<tr>
<td>B</td>
<td>Vertical distance between the safety cage and platform 2130 mm (84.0 in.)</td>
</tr>
</tbody>
</table>

*Note:* Assumes that the potential fall distance is greater than 4575 mm (15 ft) where a safety cage, but no climber safety rail or cable is present.
2.5 Individual Rung Ladders *(1 April 2016)*

The considerations listed below are applicable to the PMA+ notation only and apply to individual rung ladders and are not represented in the following figure.

- Individual rungs may be attached directly to a bulkhead, tank or steel structure and used as a vertical ladder, but **shall** be limited to changes in vertical elevation of 3.6 m (12.0 ft) or less.
- Circular (round bar) rungs are preferred. Each rung **shall** be attached to the structure in a manner that fully supports a climber and any design loads.
- Rungs **shall** be provided with lateral support for the foot.
- It is recommended that square bar rungs **shall** also be carried through the side stringers and attached by double continuous welding. Any other design must be in accordance to an international or national standard.

Individual rung ladder design is presented in Section 4, Figure 11, “Individual Rung Ladder Design”.

### FIGURE 11
Individual Rung Ladder Design *(1 April 2016)*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Rung width</td>
<td>No specific requirement</td>
<td>≥ 400 mm (15.5 in.) and ≤ 450 mm (17.5 in.)</td>
</tr>
<tr>
<td>B Rung depth</td>
<td>≥ 150 mm (6.0 in.)</td>
<td>≥ 200 mm (8.0 in.)</td>
</tr>
<tr>
<td>C Rung design – (Can be round or square bar; where square bar is fitted, orientation shall be edge up)</td>
<td>Square bar 22 mm (0.9 in.) × 22 mm (0.9 in.)</td>
<td>Square bar 25 mm (1.0 in.) × 25 mm (1.0 in.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Round bar 25 mm (1.0 in.) diameter</td>
</tr>
<tr>
<td>D Distance between ladder rungs (rungs evenly spaced throughout the full run of the ladder)</td>
<td>No specific requirement</td>
<td>≥ 275 mm (11.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
<tr>
<td>E Height of foot slip protection</td>
<td>No specific requirement</td>
<td>50 mm (2.0 in.)</td>
</tr>
</tbody>
</table>
3 Inclined Ladders (1 April 2016)

This Subsection contains detailed guidance on the design of inclined ladders. The considerations listed below apply to the design of inclined ladders and are not represented in the following figures or tables.

3.1 General

- Inclined ladders shall be attached to a permanent structure.
- No impediments shall intrude into the climbing space (for example, electrical boxes, valves, actuators, or piping).
- Inclined ladders and handrails shall be located so as not to interfere with the opening and closing of hatches, gratings or manholes.
- Tread/steps shall also be carried through the side stringers and attached by double continuous welding.
- IMO requires all inclined ladders shall be provided with handrails of substantial construction on both sides.
- Square handrails should be avoided.

3.2 Inclined Ladder Design

The following figures represent the different aspects of inclined ladders, their design and dimensioning:

- Figure 12, “Inclined Ladders”
- Figure 13, “Inclined Ladders with Landings”
- Figure 14, “Inclined Ladder Landing/Platform”
### FIGURE 12
Inclined Ladders (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Handrail diameter</td>
<td>No specific requirement</td>
<td>≥ 40 mm (1.5 in.) ≤ 50 mm (2.0 in.)</td>
</tr>
<tr>
<td>B Handrail height (from leading edge of tread)</td>
<td>≥ 890 mm (35.0 in.)</td>
<td>≥ 915 mm (36.0 in.) and ≤ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>C Tread/step spacing – equally spaced along entire ladder</td>
<td>≥ 200 mm (8.0 in.) and ≤ 300 mm (12.0 in.)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>D Square bar step depth</td>
<td>No specific requirement</td>
<td>≥ 100 mm (4.0 in.)</td>
</tr>
<tr>
<td>E Handrail to handrail width</td>
<td>≥ 450 mm (17.5 in.) for cargo holds ≥ 400 mm (15.5 in.) for other areas</td>
<td>≥ 450 mm (17.5 in.) and ≤ 560 mm (22.0 in.)</td>
</tr>
<tr>
<td>F Rung Design – (Can be round or square bar; where square bar is fitted, orientation shall be edge up)</td>
<td>Square bar 22 mm (0.9 in.) × 22 mm (0.9 in.)</td>
<td>Square bar 25 mm (1.0 in.) × 25 mm (1.0 in.) Rounded bar 25 mm (1.0 in.) diameter</td>
</tr>
<tr>
<td>G Obstruction distance from the face of the inclined ladder</td>
<td>≥ 750 mm (29.5 in.), except that in way of an opening this clearance can be reduced to 600 mm (23.5 in.)</td>
<td>≥ 1240 mm (49.0 in.)</td>
</tr>
<tr>
<td>H Vertical obstruction height above ladder</td>
<td>No specific requirement</td>
<td>≥ 2130 mm (84.0 in.)</td>
</tr>
<tr>
<td>I Maximum continuous height</td>
<td>≤ 6 m (19.5 ft)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>J Clearance between the handrail and a bulkhead or other obstruction</td>
<td>No specific requirement</td>
<td>≥ 75 mm (3.0 in.)</td>
</tr>
<tr>
<td>θ Angle of Inclination</td>
<td>&lt; 70 degrees</td>
<td>45-60 degrees</td>
</tr>
</tbody>
</table>
### FIGURE 13
**Inclined Ladders with Landings (1 April 2016)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A*</td>
<td>Clearance above ladder platforms</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>B &amp; C</td>
<td>Maximum continuous height</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>D</td>
<td>Deck to lower landing level</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>E</td>
<td>Height of intermediate rail</td>
<td>535 mm (21.0 in.)</td>
</tr>
<tr>
<td>F</td>
<td>Height of top rail</td>
<td>535 mm (21.0 in.)</td>
</tr>
<tr>
<td>G</td>
<td>Landing/Platform dimensions</td>
<td>See Section 4, Figure 14, “Inclined Ladder Landing/Platform”</td>
</tr>
<tr>
<td>H</td>
<td>Obstruction distance from the face of the inclined ladder</td>
<td>≥ 750 mm (29.5 in.), except that in way of an opening this clearance can be reduced to 600 mm (23.5 in.)</td>
</tr>
<tr>
<td>I</td>
<td>Vertical obstruction height above ladder</td>
<td>No specific requirement</td>
</tr>
<tr>
<td>J</td>
<td>Height of handrail</td>
<td>1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>K</td>
<td>Stringer height above landing or intermediate platform</td>
<td>≥ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>θ</td>
<td>Angle of inclination</td>
<td>&lt; 70 degrees</td>
</tr>
</tbody>
</table>

* = The vertical distance of the uppermost section of the vertical ladder may be reduced to 1.6 m (63.0 in.) to 3 m (118.0 in.), measured clear of the overhead obstructions in way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range.
Section 4 Vertical Ladders, Inclined Ladders, and Handles

FIGURE 14
Inclined Ladder Landing/Platform (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Minimum landing width</td>
<td>Adequate dimensions</td>
</tr>
<tr>
<td>B+</td>
<td>Minimum landing length</td>
<td>No specific requirement</td>
</tr>
</tbody>
</table>

* = Where inclined ladders change directions, it is recommended that intermediate landings along paths for evacuating personnel stretchers be 1525 mm (60.0 in.) in length to accommodate rotating the stretcher.

3.3 Spiral Ladders
A spiral ladder is considered acceptable as an alternative for inclined ladders for Bulk Carriers. In this regard, the uppermost 2.5 m (8.0 ft) can continue to be comprised of the spiral ladder and need not change over to vertical ladders.

4 Handles
(1 April 2016) This Subsection contains detailed guidance related to the design of handles. The considerations listed below apply to the design and placement of handles and are not represented in the following figures.

4.1 General (1 April 2016)
- Handles shall be designed to accommodate personnel wearing either lightweight and medium weight gloves or cold weather gloves and mittens (see Section 4, Figure 15, “Handle Dimensions”).
- Handles are particularly useful where a vertical ladder comes up to a manhole from the deck below where the ladder does not extend through the platform [see Section 4, Figure 16, “Handle Placement (Ladder not Extending Through Platform)” or while passing through access hatches (see Section 4, Figure 17, “Handle Placement (Stepping Through a Vertical Hatch)”].
- Handles shall be accessible at all stages during climbing or traversing through access hatches (embarking and disembarking) and within reach of the shortest (e.g., 5th percentile female) user.
- To provide for safe ascending and descending, while stepping onto or from ladders, individual ladder rungs or steps and through hatches or lightening holes, suitably located handles or handgrabs shall be provided [see Section 4, Figure 18, “Handle Placement (Stepping to or from a Vertical Ladder)”].
4.2 Handle Design/Placement

The following figures represent the different aspects of handle design, placement and dimensioning.

- Figure 15, “Handle Dimensions”
- Figure 16, “Handle Placement (Ladder not Extending Through Platform)”
- Figure 17, “Handle Placement (Stepping Through a Vertical Hatch)”
- Figure 18, “Handle Placement (Stepping to or from a Vertical Ladder)”

### FIGURE 15
Handle Dimensions (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC 158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Handle width</td>
<td>No specific requirement</td>
<td>≥ 300 mm (12.0 in.) ≤ 350 mm (14.0 in.)</td>
</tr>
<tr>
<td>B Handle height</td>
<td>No specific requirement</td>
<td>100 mm (4.0 in.)</td>
</tr>
<tr>
<td>C Radius</td>
<td>No specific requirement</td>
<td>25 mm (1.0 in.)</td>
</tr>
<tr>
<td>D Round bar diameter</td>
<td>No specific requirement</td>
<td>25 mm (1.0 in.)</td>
</tr>
</tbody>
</table>
### FIGURE 16
Handle Placement (Ladder not Extending Through Platform)\(^+\) (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA(^+) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Four Horizontal Handles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A  Handle height above top of ladder</td>
<td>No specific requirement</td>
<td>≥ 275 mm (11.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
<tr>
<td>E  Round Bar Diameter</td>
<td>No specific requirement</td>
<td>25 mm (1.0 in.)</td>
</tr>
<tr>
<td><strong>Two Vertical Handles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B  Height from top deck to handle</td>
<td>No specific requirement</td>
<td>200 mm (8.0 in.)</td>
</tr>
<tr>
<td>C  Clearance between handles</td>
<td>No specific requirement</td>
<td>400 mm (15.5 in.)</td>
</tr>
<tr>
<td>D  Height of handles</td>
<td>No specific requirement</td>
<td>1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>E  Round Bar Diameter</td>
<td>No specific requirement</td>
<td>25 mm (1.0 in.)</td>
</tr>
</tbody>
</table>

\(+\) = Other vertical ladder measurements apply (see Subsection 4/2, “Vertical Ladders”).

---

![Diagram of handle placement](image-url)
### FIGURE 17
Handle Placement (Stepping Through a Vertical Hatch)\(^*\) (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA(^+) Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Handle height (above top of opening)</td>
<td>No specific requirement</td>
<td>100 mm (4.0 in.)</td>
</tr>
<tr>
<td>B Distance between lower and upper portion of the hatch</td>
<td>≥ 800 mm (31.5 in.)</td>
<td>≥ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>C Height required for a step</td>
<td>＞ 600 mm (23.5 in.)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>D Handle width</td>
<td>No specific requirement</td>
<td>≥ 300 mm (12.0 in.)</td>
</tr>
<tr>
<td>E Step height</td>
<td>No specific requirement</td>
<td>≥ 275 mm (11.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
<tr>
<td>F Step width, hatch width</td>
<td>No specific requirement</td>
<td>≥ 800 mm (31.5 in.) or ≥ Hatch width</td>
</tr>
<tr>
<td>G Step depth (not shown in figure)</td>
<td>No specific requirement</td>
<td>≥ 275 mm (11.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
</tbody>
</table>

\(^*\) = Handles and steps are placed on both sides of the hatch.
### FIGURE 18
**Handle Placement (Stepping to or from a Vertical Ladder) (1 April 2016)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC.191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Length of handle</td>
<td>No specific requirement</td>
<td>$\geq 300$ mm (12.0 in.)</td>
</tr>
<tr>
<td>B Handle height above landing or platform</td>
<td>No specific requirement</td>
<td>$\geq 1270$ mm (50.0 in.)</td>
</tr>
<tr>
<td>C Ladder stringer height above platform</td>
<td>$\geq 1500$ mm (59.0 in.)</td>
<td>$\geq 1500$ mm (59.0 in.)</td>
</tr>
<tr>
<td>D Horizontal separation between vertical ladders and platform</td>
<td>$\geq 100$ mm (4.0 in.) or $\leq 300$ mm (12.0 in.)</td>
<td>$\geq 150$ mm (6.0 in.) and $\leq 300$ mm (12.0 in.)</td>
</tr>
<tr>
<td>E Horizontal separation between vertical ladder and handle</td>
<td>No specific requirement</td>
<td>$\geq 225$ mm (9.0 in.) or $\leq 450$ mm (17.5 in.)</td>
</tr>
</tbody>
</table>

*Note: Vertical ladder requirements apply (see Subsection 4/2, “Vertical Ladders”).*
SECTION 5 Hatches

1 General (1 April 2016)

This Section contains guidance related to the design of hatches. The guidance included in the figures and tables below provides the design attributes (application) and the IMO (PMA) and PMA+ dimension requirements. There are a few instances where IMO means of access requirements do not provide specific design dimensioning. In these instances, the PMA+ dimensions may be used as guidance.

2 General Principles (1 April 2016)

The principles listed below apply to the design of hatches and lightening holes and are not represented in the following figures or tables.

- For access through horizontal hatches, the dimensions shall be sufficient to allow a person wearing a self-contained air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also provide a clear opening to facilitate the movement of an injured person through the hatch.

- Where hatch covers are heavy [e.g., above 11 kg (24.3 lbs)] or unwieldy, aids shall be provided to assist in lifting or lowering the hatch cover.

3 Hatch Design

Section 5, Figure 1, “Hatch Design” and Section 5, Figure 2, “Hatch Design (Alternative Arrangement)” represent IMO and IACS approved shapes and dimensioning and any PMA+ requirements.

Section 5, Figure 1, “Hatch Design” illustrates the dimensioning for access through vertical openings/manholes, in swash bulkheads, floors, girders and web frames providing passage through the length and breadth of the space.

Section 5, Figure 2, “Hatch Design (Alternative Arrangement)”, illustrates an IACS-approved alternative design for access. This design is subject to the verification of easy evacuation of injured or stretcher-borne personnel.
FIGURE 1
Hatch Design (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Access – vertical height</td>
<td>≥ 800 mm (31.5 in.)</td>
<td>≥ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>B  Access – horizontal width</td>
<td>≥ 600 mm (23.5 in.)</td>
<td>≥ 800 mm (31.5 in.)</td>
</tr>
<tr>
<td>C+ Height above deck or stepping tread</td>
<td>≤ 600 mm (23.5 in.)</td>
<td>No additional requirement</td>
</tr>
</tbody>
</table>

* = If a vertical opening is at a height of more than 600 mm (23.5 in.), steps and handgrips are to be provided. In such arrangements it is to be demonstrated that an injured person can be easily evacuated. For more guidance see Section 4, Figure 17, “Handle Placement (Stepping Through a Vertical Hatch)”. 

[Diagram showing hatch dimensions A, B, and C, with R300 mm (12.0") indicated]
FIGURE 2
Hatch Design (Alternative Arrangement) (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Access – vertical height</td>
<td>≥ 850 mm (33.5 in.)</td>
<td>≥ 1000 mm (39.5 in.)</td>
</tr>
<tr>
<td>B Access – horizontal width</td>
<td>≥ 620 mm (24.5 in.)</td>
<td>≥ 800 mm (31.5 in.)</td>
</tr>
<tr>
<td>C Height above deck or stepping tread</td>
<td>≤ 600 mm (23.5 in.)</td>
<td>No additional requirement</td>
</tr>
</tbody>
</table>

* = If a vertical opening is at a height of more than 600 mm, steps and handgrips are to be provided. In such arrangements it is to be demonstrated that an injured person can be easily evacuated. For more guidance see Section 4, Figure 17, “Handle Placement (Stepping Through a Vertical Hatch)”.

4 Horizontal Hatch Access Near a Coaming (1 April 2016)

For access through horizontal openings, hatches or manholes, the minimum clear opening shall not be less than 600 mm × 600 mm (23.5 in. × 23.5 in.). When access to a cargo hold is arranged through the cargo hatch, the top of the ladder shall be placed as close as possible to the hatch coaming. Access hatch coamings having a height greater than 900 mm (35.5 in.) shall also have steps on the outside in conjunction with the ladder (see Section 5, Figure 3, “Access Hatch Heights of ≥ 900 mm (35.5 in.)”).
### FIGURE 3
**Access Hatch Heights of ≥ 900 mm (35.5 in.) (1 April 2016)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>MSC.158(78)/UI SC 191 (PMA) Requirement</th>
<th>PMA+ Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>600 mm (23.5 in.)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>B</td>
<td>No specific requirement</td>
<td>≥ 275 mm (11.0 in.) and ≤ 300 mm (12.0 in.)</td>
</tr>
<tr>
<td>C</td>
<td>No specific requirement</td>
<td>See footnote 300 mm (12.0 in.) (Maximum)</td>
</tr>
<tr>
<td>D</td>
<td>≥ 900 mm (35.5 in.)</td>
<td>No additional requirement</td>
</tr>
<tr>
<td>E</td>
<td>≥ 600 mm (23.5 in.)</td>
<td>≥ 750 mm (29.5 in.)</td>
</tr>
<tr>
<td>F</td>
<td>As close as possible</td>
<td>≥ 200 mm (8.0 in.)</td>
</tr>
</tbody>
</table>

+ = The limiting height is dimension ‘A’. This height is set by the crotch height of the 5th percentile female. Thus, once ‘D’ exceeds 900 mm (35.5 in.), a step is needed. Therefore, ‘C’ could be anything from 25 mm (1.0 in.) up to 300 mm (12.0 in.).

#### 4.1 Horizontal Hatch Access through a Deck (for PMA+ Notation)

For access to the deck from a ladder below, the top of the ladder shall be placed within 50 mm (2.0 in.) of the leading edge of the hatch opening (see Section 5, Figure 4, “Horizontal Hatch Access through a Deck”). Minimum dimensions of the opening (round or square) are 810 mm (32.0 in.).
### FIGURE 4
Horizontal Hatch Access through a Deck (1 April 2016)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Dimension of Opening (Circular or Rectangular) ( \geq 810 \text{ mm (32.0 in.)} )</td>
</tr>
<tr>
<td>B</td>
<td>Ladder to edge of opening separation ( \leq 50 \text{ mm (2.0 in.)} )</td>
</tr>
</tbody>
</table>
SECTION 6  Alternative Means of Access

1 General

This Section contains guidance for the design of alternative means of access. IMO requirements, under certain circumstances, allow for the use of alternative means of access in place of permanent means of access. This Section contains no PMA or PMA+ criteria.

1.1 Definitions

*Alternative Means of Access:* A common term for portable or movable means of access provided for survey in areas otherwise not accessible, these include, but are not limited to, such devices as:

- Hydraulic arm fitted with a stable base
- Wire lift platform
- Staging
- Rafting
- Robot arm or remotely operated vehicle (ROV)
- Portable ladders
- Other means of access, approved by and acceptable to the Administration.

*Movable Means of Access:* Devices like a cherry picker or other means, which are not normally kept onboard. When such means are provided as an alternative to the permanent means of access, they shall be kept onboard and capable of being operated by the vessel’s crew.

*Portable Means of Access:* Equipment that may be hand carried by the crew (e.g., ladders, small platforms and rafts).

2 Application

SOLAS REG.II-1/3-6, “Access to and Within Spaces in, and Forward of the Cargo Area of Oil Tankers and Bulk Carriers,” allows for the use of alternative means of access to areas requiring inspection. Listed below are several excerpts:

- From SOLAS regulation II-1/3-6, 2.2 – “Where a permanent means of access may be susceptible to damage during normal cargo loading and unloading operations or where it is impracticable to fit permanent means of access, the Administration may allow, in lieu thereof, the provision of movable or portable means of access, as specified in the Technical provisions, provided that the means of attaching, rigging, suspending or supporting the portable means of access forms a permanent part of the ship's structure.”
- From MSC.158(78), Table 1 – “Means of access for oil tankers, resolution, 1.2 For tanks of which the height is less than 6 m, alternative means of as defined in paragraph 3.9 of the Technical provisions or portable means may be utilized in lieu of the permanent means of access.”
3 Associated Documentation

The following documents were used as references and provide details about IMO requirements for alternative means of access and should be used for reference:

- IACS Recommendation No. 39 – Safe Use of Rafts or Boats for Survey
- IACS Recommendation No. 42 – Guidelines for Use of Remote Survey Techniques
- IACS Recommendation No. 72 – Confined Space Safe Practice
- IACS Recommendation No. 78 – Safe Use of Portable Ladders for Close-up Surveys
- IACS Recommendation No. 91 – Guidance for Approval/Acceptance of Alternative Means of Access
- IACS Unified Requirement – Z10.1 Hull Surveys of Oil Tankers
- IACS Unified Requirement – Z10.2 Hull Surveys of Bulk Carriers
- IACS Unified Requirement – Z10.4 Hull Surveys of Double Hull Oil Tankers
- IACS Unified Requirement – Z10.5 Hull Surveys of Double Skin Bulk Carriers

Note: IACS Recommendations are occasionally updated. It is the responsibility of the reader to check and see if there have been any updates since the publication of this document. If so, the updated Recommendations should be used in conjunction with this Guide. The most current IACS Recommendations can be obtained at the following web site: http://www.iacs.org.uk

4 Guidance for Alternative Means of Access

This Subsection provides guidance for use of the alternative means of access requirements contained in MSC.158(78) “Amendments to the Technical Provisions for Means of Access for Inspections.”

4.1 Portable Ladders

(1 April 2016) Portable ladders may be used for access to structural members as supplementary and/or additional to permanent means of access in accordance with SOLAS II-1/3-6 and shall be included in the Ship Structure Access Manual.

Also, the requirements of IACS Recommendation No. 78 “Safe Use of Portable Ladders for Close-up Surveys” should be used when specified for use in the Ship Structure Safe Access Manual as a portable means of access.

4.1.1 General Guidance

- (1 April 2016) The Owner shall verify that equipment selected for temporary work affords adequate protection against the risks of falls from a height.
- A freestanding portable ladder with a maximum length of 5 m (16.4 ft) may be used for infrequent inspections.
- Ladders shall not be tied or fastened together to create longer sections.
- Step ladders, hanging ladders and portable ladders more than 5 m (16.4 ft) long shall only be utilized if fitted with a mechanical device to secure the upper end of the ladder. A mechanical device such as hooks for securing ladder at the upper end is considered an appropriate securing device if capable of preventing movement fore/aft and sideways.
- Ladders shall not be loaded beyond their maximum intended load or beyond the manufacturer’s rated capacity.
- (1 April 2016) The feet of portable ladders shall be prevented from slipping during use by securing the ladder stringers (stiles) at or near their upper and lower ends, by an anti-slip device or by other arrangements of equivalent effectiveness. Slip resistant feet alone should not be used as a substitute for the care in placing or otherwise securing a ladder upon a slippery surface.
Section 6 Alternative Means of Access

- Non-self-supporting ladders shall be used at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.

- Ladder rungs, cleats and steps shall be parallel, level and uniformly spaced when the ladder is in position for use.

- (1 April 2016) Portable ladders should be used on top of bottom or deep stringer platform so that free falling height does not exceed 6 m (19.5 ft). If it is necessary to exceed this height, there should be at least 3 m (10.0 ft) of water above the highest structural element in the bottom to provide a “cushion” or safety harnesses may be used. The free falling height above the water should not exceed 6 m (19.5 ft).

- (1 April 2016) The rungs and steps of portable ladders shall be designed to minimize slipping (e.g., corrugated, knurled, dimpled, coated with skid resistance material, etc.).

- Ladder components and surfaces shall be smooth to prevent snagging of clothing and injury from punctures or lacerations.

- Self-supporting and non-self-supporting portable ladders shall support at least four times the maximum intended load.

4.1.2 Detailed Guidance

- When portable ladders are used for access to an upper landing surface, the ladder stringers (stiles) shall extend at least 900 mm (36.0 in.) above the upper landing surface. When such an extension is not possible, the ladder must be secured and a grasping device such as a grab rail or handle shall be provided to assist workers in mounting and dismounting the ladder. A ladder extension shall not deflect under a load that would cause the ladder to slip off its supports.

- Rungs, cleats and steps of portable ladders shall not be spaced less than 275 mm (11.0 in.) apart, nor more than 300 mm (12.0 in.) apart, along the ladder’s stringers (stiles).

- (1 April 2016) Rungs, cleats and steps at the base section of extension trestle ladders shall not be less than 200 mm (8.0 in.) nor more than 450 mm (17.5 in.) apart, between centerlines of the rungs, cleats or steps. The rung spacing on the extension section shall not be less than 150 mm (6.0 in.) or greater than 300 mm (12.0 in.).

- The minimum clear distance between stringers (stiles) for all portable ladders must be at least 300 mm (12.0 in.) for ladders 3 m (10.0 ft) or less in overall length, and should increase at least 6.5 mm (0.25 in.) for each additional 600 mm (23.5 in.) of ladder length.

4.1.3 Operational Considerations

- All ladders shall be maintained free of oil, grease and other slipping hazards.

- All ladders shall be used only for their designed purpose, on stable and level surfaces unless secured to prevent accidental movement.

- (1 April 2016) The manner in which portable ladders can most safely be used by workers should be specified

- Aluminum ladders may be used in cargo tanks, but cannot be stored in the cargo area or other gas dangerous spaces.

- (1 April 2016) Portable ladders shall rest on a stable, strong, suitably sized, immobile footing so that the rungs remain horizontal. Suspended ladders should be attached in a manner so that they cannot be displaced and so that swinging is prevented.

- Suspended ladders shall be attached in a manner so that they cannot be displaced and swinging is prevented.

- Areas around the top and bottom of ladders shall be kept clear and clean.

- Ladders shall not be moved, shifted or extended while in use.
Section 6 Alternative Means of Access

- Personnel shall face the ladder when moving up or down with at least one hand to grasp the ladder when climbing. Carrying objects or loads that could cause loss of balance and falling should be avoided.

- When climbing ladders in tanks containing water, the surveying personnel shall wear “flotation” aids. A flotation aid is a simple form of lifejacket which does not impede climbing or a self-inflatable lifejacket.

- Ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Slip resistant feet alone shall not be used as the only slip prevention technique. Neither should they be a substitute for the care in placing or otherwise securing a ladder upon a slippery surface.

- The use of ladders with broken or missing rungs or steps, broken or split stringers (stiles), or other faulty or defective construction is prohibited. When ladders with such defects are discovered, they shall be immediately withdrawn from service. Inspection of metal ladders shall include checking for corrosion of interiors of open end, hollow rungs. All ladders shall be inspected prior to use.

4.2 Hydraulic Arm Vehicles

(1 April 2016) Hydraulic arm vehicles or aerial lifts (“cherry pickers”) may be used to enable the examination of the cargo hold structure on bulk carriers not accessible by permanent ladders. In the Ship Structural Access Manual, the Cherry Pickers may be accepted as movable means of access for use up to 17 m (56.0 ft) above the tank top.

4.2.1 General Guidance

- (1 April 2016) Owners are responsible for verifying that moveable means of access are suitable for the intended uses on the vessel.

- Qualified personnel shall operate the vehicle and there shall be proof that the vehicle has been properly maintained, at least to manufacturer’s requirements.

- (1 April 2016) Lift controls, including safety devices shall be serviceable and should be operated throughout the range prior to use. Operators should be trained.

- Lift controls, including safety devices shall be tested daily.

- Permissible load and reach limitations shall be understood and not exceeded.

- (1 April 2016) Operators should work from within the basket.

- The standing platform shall be fitted with anchor points for attaching fall arrest systems. Body belts (such as harnesses) with lanyards should be used.

- Raising and lowering controls are required and labeled accordingly. Lowering controls should override the raising controls. For more detail regarding the labeling of controls, see Section 8, “Labeling, Signs, Graphics and Symbols” of the ABS Guidance Notes for the Application of Ergonomics to Marine Systems.

- Whenever internal combustion engine powered equipment exhausts in enclosed spaces, tests shall be made and recorded to see that personnel are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres.

- Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains or other reciprocating, rotating or other moving parts or equipment shall be guarded if such parts are exposed to contact by personnel, or otherwise create a hazard.

4.2.2 Operational Considerations

- (1 April 2016) Unless designed otherwise, aerial lift vehicles should not be moved when the boom is elevated in a working position with personnel in the basket.

- (1 April 2016) For those vehicles equipped with a self-leveling platform, care shall be taken that the locking device is engaged after vehicle maneuvering to verify that the platform is fixed. Brakes should be set, outriggers used (if so equipped) and wheels chocked (if on an incline).
Section 6 Alternative Means of Access

- Potential crushing hazards (e.g., booming into the overhead, pinch point) shall be avoided.
- Personal flotation devices (PFD) shall be used when working over water.
- The Ship’s Safety Management System shall address the operation and training in the use of this type of equipment.

4.3 Wire Lift Platform

(1 April 2016) Wire lift platforms may be used for inspection of structural members of ballast tanks, cargo oil tanks and cargo holds. Such equipment should be rated for more than one person and be operated by suitable authorized personnel. If carried onboard and included in the Ship Structure Access Manual, designers will have to take into consideration safety aspects associated with deployment and use of such means and access. The platform and equipment, including fixed points to the vessel’s structure, should be approved on behalf of the Administration being based on a recognized International or National Standard. Approval of wire lift platforms should address the following:

- Accidental loss of balance
- Permissible weight
- Protection against overload
- Secondary means of escape
- Guardrails
- Permissible loads
- Permanent marking of loads
- Recovery in the event of power loss.

4.3.1 General Guidance

- A qualified engineer or a qualified person competent in structural design shall design the personnel platform and suspension system.
- The suspension system should be designed to prevent tipping of the platform due to movement of employees occupying the platform.
- The personnel platform shall be conspicuously posted with a plate or other permanent marking which indicates the weight of the platform, and its rated load capacity.
- Means shall be provided for using fall protection with lifelines tended above the platform.
- Whenever internal combustion engine powered equipment exhausts in enclosed spaces, tests shall be made and recorded to see that personnel are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres.
- Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by personnel, or otherwise create a hazard.

4.3.2 Detailed Guidance

- Each personnel platform shall be equipped with a guardrail system designed as depicted in Section 3, Figure 3 “Walkway and Ramp Design.”
- Access gates, if installed, should not swing outward during hoisting.
- Load lines shall be capable of supporting at least seven (7) times the maximum intended load, except that where rotation resistant rope is used, the lines shall be capable of supporting at least ten (10) times the maximum intended load.
4.3.3 Operational Considerations

- Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner with no sudden movements.

- *(1 April 2016)* Rigging of wires shall be in accordance with manufacturer’s recommendations and conducted by qualified personnel.

- *(1 April 2016)* Fix points to which the wires will be connected shall be examined before each use and verified in good condition (free of wastage, fractures, etc.).

- Wire rope shall be taken out of service when any of the following conditions exist
  - In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay
  - Wear of one-third the original diameter of outside individual wires.
  - Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure
  - Evidence of any heat damage from any cause

4.4 Portable Platforms

*(1 April 2016)* Portable platforms may be used as a portable means of access, provided that the platform and equipment, including fixed points to the vessel’s structure are specifically designed for the task and approved on behalf of the Administration based on a recognized International or National Standard.

Portable platforms not more than 3 m (10 ft) in length may be used for access between longitudinal permanent means of access and the structural member to be accessed. Guardrails (see Section 3, Figure 3, “Walkway and Ramp Design”) should be provided unless a safety harness is used in conjunction with the prearranged handles in way of the structure being accessed. Approval of portable platforms should address the following:

- Permissible loads
- Permanent markings of the loads
- Fixing arrangements
- Guardrails
- Non-skid construction

4.4.1 General Guidance

- Safety measures should be taken by the authorized person prior to survey to the satisfaction of the attending Surveyor(s)

- *(1 April 2016)* It should be confirmed that portable platforms are safely secured and supported prior to use.

- *(1 April 2016)* The maintenance of all equipment, the fixing of the equipment, its operation and training in its use should be addressed by the Ship’s Safety Management System.

4.5 Scaffolding and Staging

*(1 April 2016)* Staging is the most common means of access provided especially where repairs or renewals are being carried out. Staging is generally an option for access to any structural members to be surveyed and measured in tanks, holds and spaces, but is NOT considered as an alternative to permanent means of access under the Technical Provisions Table 1 - 1.1.4 and Table 2 - 1.8.

Staging not carried onboard is not subject to approval as part of SOLAS II-1/3-6. In this case, the Owner and/or provider of the equipment are responsible for confirming safe use.
Where staging and the associated equipment including its attachments to the vessel’s structure are specifically designed for survey and thickness measurement in accordance with SOLAS II-1/3-6, such staging should be approved on behalf of the Administration based on a recognized International or National Standard and necessary consideration is taken for the safety in the use.

Where staging is approved as a part of the Ship Structure Access Manual and carried onboard, the maintenance of all equipment the rigging of the equipment, its operation and training requirements in its use should be addressed by the Ship’s Safety Management System.

4.5.1 General Guidance

- The footing or anchorage for scaffolds shall be sound, rigid and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects such as barrels, boxes, loose brick or concrete blocks, shall not be used to support scaffolds or planks.
- Scaffolds shall have guardrails and toeboards installed on open sides and ends of the platform.
- A ladder or stairway shall be provided for proper access and egress and shall be affixed or built into the scaffold and so located that when in use it will not tip the scaffold.
- Riding on manually propelled scaffolds should not be allowed unless the following conditions exist:
  - The floor or surface is within 3 degrees of level and free from pits, holes or obstructions;
  - The minimum dimension of the scaffold base when ready for rolling is at least one-half of the height. Outriggers, if used, shall be installed on both sides of staging;
  - The wheels are equipped with rubber or similar resilient tires;
  - All tools and materials are secured or removed from the platform before the mobile scaffold is moved.

4.5.2 Detailed Guidance

- Scaffolds and their components shall be capable of supporting at least 4 times the maximum intended load.
- When freestanding mobile scaffold towers are used, the height shall not exceed four times the minimum base dimension.
- Casters are to be properly designed for strength and dimensions to support four times the maximum intended load.
- Casters are to be provided with a positive locking device to hold the scaffold in position.

4.5.3 Operational Considerations

- Scaffolding is to be erected, moved, dismantled or altered under the supervision of qualified and trained personnel.
- Any scaffold including accessories (e.g., braces, brackets, trusses, screw legs, ladders, etc.) that are damaged or weakened from any cause shall be immediately repaired or replaced.
- The force necessary to move the mobile scaffold shall be applied as close to the base as practicable and provision shall be made to stabilize the tower during movement from one location to another.
- Scaffolds shall only be moved on floors that are level and free of obstructions and openings.
- Mobile scaffolds in use by any persons shall rest upon a suitable footing and shall stand plumb. The casters or wheels shall be locked to prevent any movement.
- Slippery conditions on scaffolds shall be eliminated as soon as possible after they occur.
4.6 Rafting

Rafting is generally used as a term for surveys carried out by means of boats or rafts. Rafting may be an option for use in tanks, holds and spaces which may be filled with water provided the arrangement of internal structure is as described in IACS Recommendation No. 39 “Safe Use of Rafts or Boats for Survey.”

4.6.1 General Guidance

- Surveys of tanks or spaces by means of rafts or boats may only be undertaken with the agreement of the attending Surveyor(s), who is to take into account the safety arrangements provided, including weather forecasting and ship response in reasonable sea conditions.

- The structural arrangement shall allow easy escape to deck from any position being rafted. At least 1 m (39.0 in.) clearance above and 0.5 m (20.0 in.) clearance beyond the breadth of the raft shall be allowed for the safe passage passed any internal obstructions.

- For bulk cargo holds designed for filling of water (e.g., ballast holds) and where filling up to a height not less than 2.0 m (79.0 in.) below top of side frames is permitted (e.g., air draft holds), rafting may be utilized in lieu of permanent means of access to side frames provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water needed to survey the side shell frames.

- Rafting of cargo tanks is subject to restrictions on discharging of water in harbor and weather conditions at voyage. Rafting as an alternative means of access should therefore not be considered as “readily accessible” in oil cargo tank and do not provide an alternative to fitting of longitudinal permanent means of access as required by Table 1 - 1.1.4.

- Only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, shall be used.

- The boat or raft shall be tethered to the access ladder and an additional person shall be stationed down the access ladder with a clear view of the boat or raft.

- Appropriate lifejackets shall be available for all participants.

- The surface of water in the tank shall be calm [under all foreseeable conditions the expected rise of water within the tank shall not exceed 250 mm (10.0 inches)] and the water level stationary. On no account shall the level of the water be rising while the boat or raft is in use.

- The tank or space must contain clean ballast water only.

- When a thin sheen of oil on the water is observed, further testing of the atmosphere is to be done to verify that the tank or space is safe for entering.

- At no time shall the upside of the boat or raft be allowed to be within 1 m (39.0 in.) of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses shall only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times.

- Rafts or boats alone may be allowed for close-up survey of the under deck areas for tanks or spaces if the depth of the webs are 1.5 m (59.0 in.) or less. If the depth of the webs is more than 1.5 m (59.0 in.), rafts or boats alone may be allowed only:
  - When the coating of the under deck structure is in good condition and there is no evidence of wastage; or
  - If a permanent means of access is provided in each bay to allow safe entry and exit. This means:
    - Access direct from the deck via a vertical ladder and a small platform fitted approximately 2.0 m (79.0 in.) below the deck in each bay; or
**Section 6 Alternative Means of Access**

**ii) (1 November 2016)** Access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform shall, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3 m (118 in.) from the deck plate measured at the midspan of deck transverses and in the middle length of the tank. (See Figure below). A permanent means of access from the longitudinal permanent platform to the water level indicated above is to be fitted in each bay (e.g., permanent rungs on one of the deck webs inboard of the longitudinal permanent platform).

**4.6.2 Operational Considerations**

- Rafting should be discontinued if the motion of the vessel (rolling) makes the operation difficult or hazardous. Factors such as the degree and period of roll, head space, and expected maneuvering should be considered.

- If the tanks (or spaces) are connected by a common venting system, or inert gas system, the tank in which the boat or raft is to be used shall be isolated to prevent a transfer of gas from other tanks (or spaces).

- Personnel assigned to conduct entry into confined spaces must have authorization for such activity from a designated work authorization supervisor. All personnel conducting rafting operations in cargo tanks may conduct such operations if the tank atmosphere is tested for oxygen content, flammable vapor, and concentrations of toxic contaminants and found to be safe for entry.

- At least one personal monitor (oxygen monitor or a combination oxygen/flammability/toxic meter) shall be required when entering a confined space.

- An Emergency Escape Breathing Device (EEBD) shall be required if there is a potential for a dynamic change in the environment such as a valve being opened and cargo entering the space, a bulkhead giving way and permitting entry of cargo, a space where inerted gas may be inadvertently introduced, etc. This equipment may not normally be needed if the space is tested prior to entry and ventilation is maintained.

- **(1 April 2016)** Adequate communication arrangements and equipment shall be prepared for verifying the following:
  - The attending Surveyor(s) is always accompanied by at least one responsible person assigned by the company experienced in tank and enclosed spaces inspection. In addition, a backup team of at least two experienced persons shall be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team shall continuously observe the work in the tank or space and shall keep lifesaving and evacuation equipment ready for use;

  - A communication system shall be arranged between the survey party in the tank or space being examined, the responsible officer on deck, the navigation bridge and the personnel in charge of handling the ballast pump(s) in the pump control room. These communication arrangements shall be maintained throughout the survey;
Adequate and safe lighting shall be provided for the safe and efficient conduct of the survey; and

- Adequate protective clothing shall be made available and used (e.g., safety helmet, gloves, safety shoes, etc.) during the survey.

### 4.7 Remotely Operated Vehicle (ROV) (1 April 2016)

The interface between ROV system and support vessel/installation is defined as critical for efficient mobilization and use of ROV systems. Typical interfaces/issues include:

- Weight of unit shall be within the deck loading. The weight of all major components shall be verified and registered prior to mobilization.
- Sufficient power available and terminated in J-box.
- Connection points for communication, data transmission and video distribution.
- Easy and safe access between control station and launch location. Launch position shall be free of obstructions and at a safe distance from vessel thruster propellers (if applicable).
- Available fresh water to be used for wash-down of the system.
- Required protected area for maintenance work when required.
- System deck area shall be kept tidy and free for hazards, and all hoses on deck shall be secured and protected.

When the ROV system is intended to be operated in hazardous areas, it shall be certified for such usage. See also 4-8-4/27 of the ABS Rules for Building and Classing Steel Vessels with regard to the installation of electrical equipment in hazardous areas.
APPENDIX 1 References


4. International Association of Classification Societies, Recommendation No. 39 – Safe Use of Rafts or Boats for Survey – IACS, Rev. 3 (March 2009)


6. International Association of Classification Societies, Recommendation No. 72 – Confined Space Safe Practice – IACS, Rev. 2 (April 2007)


8. International Association of Classification Societies, Recommendation No. 78 – Safe Use of Portable Ladders for Close-up Surveys – IACS, (September 2002)


11. International Association of Classification Societies, Unified Interpretations (UI) SC [191] for the application of amended SOLAS regulation II-1/3-6 (resolution MSC.151 (78)) and revised Technical provisions for means of access for inspections (resolution MSC.158 (78))

12. International Association of Classification Societies, Unified Requirements – Z10.1 Hull Surveys of Oil Tankers

13. International Association of Classification Societies, Unified Requirements – Z10.2 Hull Surveys of Bulk Carriers


15. International Association of Classification Societies, Unified Requirements – Z10.5 Hull Surveys of Double Skin Bulk Carriers


18. International Maritime Organization, Maritime Safety Committee Resolution MSC.134(76) (adopted on 12 December 2002), Adoption of Amendments to the International Convention for the Safety Of Life At Sea
Appendix 1 References

19 Internationnal Maritime Organization. Maritime Safety Committee Resolution MSC.151(78) (adopted on 20 May 2004), Adoption of Amendments to the International Convention for the Safety of Life at Sea, 1974, as amended


21 Internationnal Maritime Organization. Maritime Safety Committee Resolution MSC.194(80) (adopted on 20 May 2005), Adoption of Amendments to the International Convention for the Safety of Life at Sea, 1974, as amended

22 Internationnal Maritime Organization, SOLAS regulation II-1/3-6, “Access to and Within Spaces in, and Forward of, the Cargo Area of Oil Tankers and Bulk Carriers


<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
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<tr>
<td>°</td>
<td>Degrees</td>
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<tr>
<td>ABS</td>
<td>American Bureau of Shipping</td>
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<td>ASTM</td>
<td>American Society of Testing and Materials</td>
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<td>IACS</td>
<td>International Association of Classification Societies</td>
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<td>mm</td>
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<tr>
<td>MSC</td>
<td>Maritime Safety Committee</td>
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<tr>
<td>PMA</td>
<td>ABS notation signifying that the vessel’s <em>permanent</em> means of access meets IMO and IACS requirements</td>
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<tr>
<td>PMA+</td>
<td>ABS notation signifying that the vessel’s <em>permanent</em> means of access meets IMO and IACS requirements plus additional ergonomic considerations</td>
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<tr>
<td>SOLAS</td>
<td>Safety of Life at Sea</td>
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