Issues of the Pilot Panel Meeting of the GBS Tier III (final)

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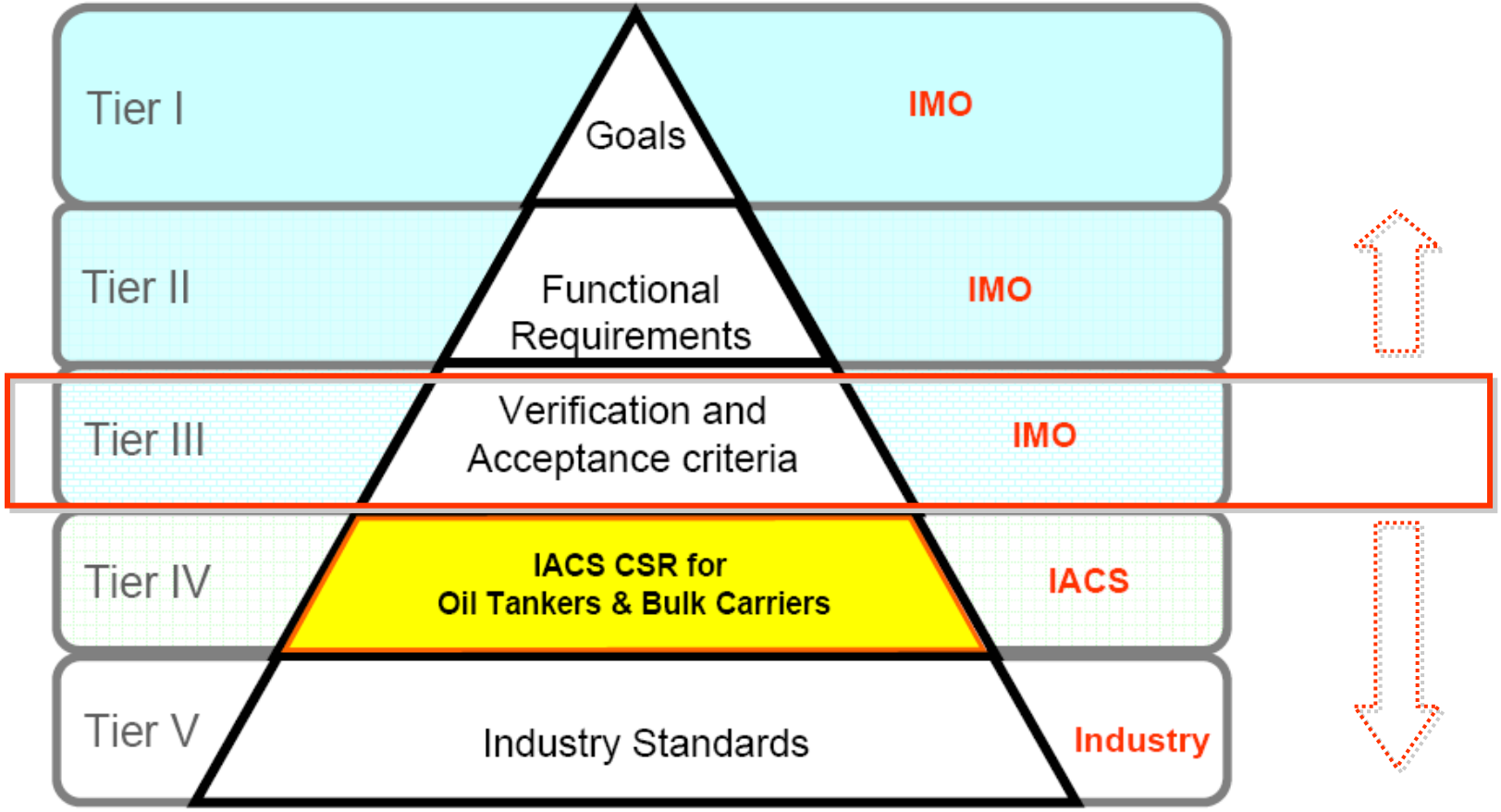
Tier III Pilot Project of IMO GBS?

- **IMO GBS Tier III?**



Procedures for demonstrating and verifying that the rules and referenced industry standards on Tier IV meets the IMO goals and functional requirements on Tier I and Tier II

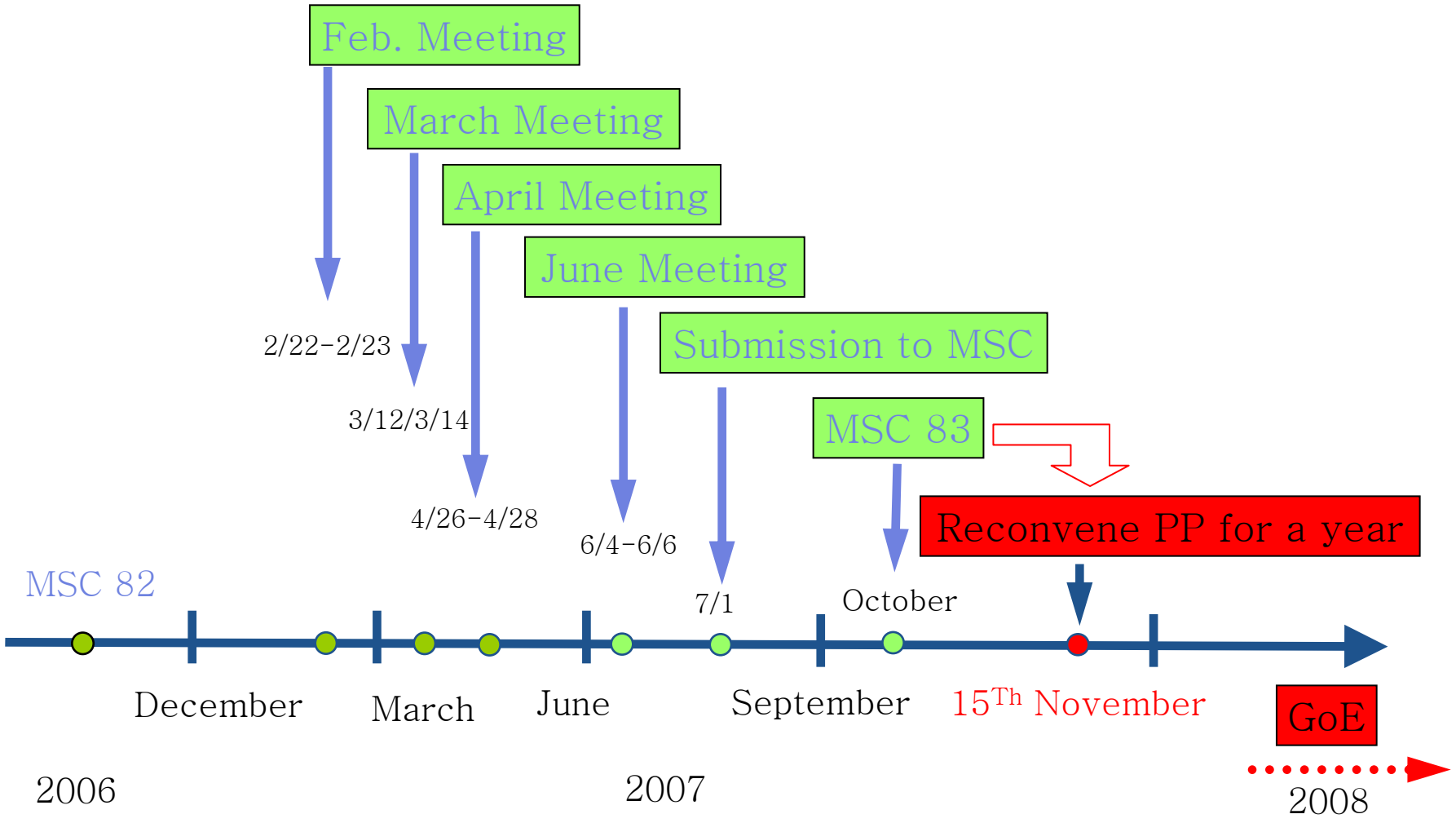
Tier III Pilot Project of IMO GBS?

- **Pilot Project?**
- **MSC 81 agreed Pilot Project would be advantageous to help uncover any issues prior to amending SOLAS**
- **MSC 82 decided that Pilot Project validates and completes the verification process/guidelines, documentation and information requirements, acceptance criteria to verify and develop Tier IV rules as well as a text of Tier III**
- **Scope of Pilot Project to be limited to tanker CSR and bulk carrier CSR**

Tier III Pilot Project of IMO GBS?

- **Pilot Panel Deliverables!**
  - **Procedures for how a Tier III verification process**
  - **Information and documentation requirements for the rules**
  - **Evaluation criteria for Group of Experts, to meet Tier I goals and Tier II functional requirements of IMO GBS**
  - **Criteria and procedures for nominating candidates of Group of Experts**
  - **Potential modifications of Tiers I and II, if identified**
  - **Reporting format for Group of Experts**

Tier III Time Table



Tier III Verification Process

- **Scope of verification:**
  - Tier IV rules satisfy the Goal-Based New Ship Construction Standards
- **Initial Verification:**
  - Administration (Rule maker) should submit rule package to Secretary General (SG) of IMO for Verification of the rules if the rule comply with Tier I and Tier II
  - SG forwards the request to Group of Expert (GoE)
  - GoE verify and submit report to Maritime Safety Committee (MSC) via SG
  - MSC decide acceptance of the rule package, and GE notifies Administration and maintain the rule
  - Submission template may be used in preparation of the submission
- **Maintenance of Verification:**
  - GoE determines maintaining and changing of the rule
  - GoE report format is provided
- **Group of Experts:**
  - MSC establishes GoE nominated by SG on a permanent basis as following back ground,
    - Ship Design and construction
    - Safety requirement
    - Environmental protection requirements
    - Ship operational efficiency
    - Survey. Inspection and maintenance regimes
  - Not employee of Class. Society

Tier III Format/Structure

A. Tier II Functional Requirement: *Tier II - title plus descriptive text*

B. Tier III Item: *Tier III.xx …..*

a. Statement of Intent:

b. Information and Documentation Requirements:

The following information should be submitted by the classification society to permit verification of compliance with this functional requirement:

1. *Information & documentation requirement 1*
2. *Information & documentation requirement 2*
3. *Information & documentation requirement 3 …*

c. Evaluation Criteria:

Information and documentation submitted by the classification society should be evaluated to ensure that:

Start with a statement of intent as to what the evaluation is to be based upon followed by more specific evaluation criteria as follows:

1. *Criteria number 1*
2. *Criteria number 2*
3. *Criteria number 3*

d. *Potential modifications to Tier I and II*

Tier III Information/Documentation Requirements and Evaluation Criteria

Ⅲ. 1 – Design life

a. Statement of intent

Confirm that the specified design life is at least 25 years and properly incorporated into the Rules.

Ⅲ.2 – Environmental conditions

a. Statement of intent

Confirm that the wave data and associated ship motions and loads are developed on basis of North Atlantic environmental conditions and the relevant sea state scatter diagram for the specified design life.

c. Evaluation criteria

2 Does the wave data properly represent North Atlantic conditions and include the regions Where the most severe conditions are expected[1]?

In no case should the data yield most probable significant wave height (extreme values) less than those obtained from IACS Recommendation No. 34

Tier III Information/Documentation Requirements and Evaluation Criteria

Ⅲ.3 – Structural strength

b. Information and documentation Requirements

1 Description of how the Rules provide net scantlings that are sufficient to avoid excessive deformation (either elastic or plastic, as appropriate) and prevent the following failures: yielding and buckling of hull girder and structural members. Include the following:

It is very hard to deal with excessive deformation, therefore it should be defined where it is required, what is excessive deformation!!!!

.8 Description of how construction tolerances and procedures, and material imperfections are accounted for in the Rules.

.11 Justification of how the Rules prevent deflections or vibration levels that will damage or impair the ship structure, equipment or machinery.

How are the material imperfections accounted?

How are deflections or vibration levels defined to prevent damage or impair the structures?

Tier III Information/Documentation Requirements and Evaluation Criteria

2 Explanation of how the Rules consider structural integrity at net scantlings for typical loading/discharging and ballast exchange scenarios, including criteria to determine acceptability and provide reasonably attainable sequences of loading, discharging and ballasting.

Ballast water exchange procedure to be properly provided to ships constructed before 2009, for example, Flow Through, Dilution, Sequential Method, etc.

Ballast Water Treatment to be provided to ships constructed after 2009.

c. Evaluation criteria

6 With regard to local strength:

.1 Is the structure in way of cargo and ballast spaces suitable for any level of filling from empty to 100% full?

Ballast water filling level shall be restricted!! For example, ballast cargo hold of Bulk Carrier.

Tier III Information/Documentation Requirements and Evaluation Criteria

Ⅲ.4 – Fatigue life

b. Information and documentation requirement

.6 Description of how the Rules take into consideration slamming and vibratory-induced fatigue effects.

consideration slamming and vibratory-induced fatigue effects means the whipping and Springing!!

It is not yet proven theoretically, therefore further discussion to be requested!!!

Ⅲ.5–Residual strength

a. Statement of intent

Confirm that the Rules provide a reasonable level of residual strength after damage (e.g., collision, grounding and flooding.)

Ⅲ6.2 – Corrosion addition

b. Information and documentation

1 Description of the methodology used to determine values for the Rule corrosion additions so that the scantling remain above net scantlings over the specified design life.

Tier III Information/Documentation Requirements and Evaluation Criteria

Ⅲ.7 Structural redundancy

a. statement of intent

Confirm that the Rules require sufficient redundancy to withstand localized damage in any one stiffening member.

Ⅲ.8 – Watertight and weathertight integrity

a. statement of intent

Confirm that the rules meet statutory requirements for watertight and weathertight integrity by requiring closing arrangements of adequate strength and securing devices of adequate redundancy.

Ⅲ-9. Human element considerations

a. statement of intent

Confirm that the Rules incorporate human element and ergonomic considerations into the structural design and arrangement to facilitate operations and maintenance activity.

Tier III Information/Documentation Requirements and Evaluation Criteria

Ⅲ.10 – Design transparency

b. Information and documentation requirements

1 Description of how the Rules require design specific information to be included in the "Ship Construction File", including:

.1 Areas requiring special attention throughout the ship's life.

.2 All design parameters limiting the operation of a ship.

.3 Any alternatives to the Rules, including structural details and equivalency calculations.

.4 Approved and stamped "as built" drawings and information.

.5 Procedures for updating the Ship Construction File over the lifetime of the ship.

2 Description of the process, requirements and criteria for assessing, documenting and communicating alternate methods as being equivalent to specific Rule requirements.

3 Description of the procedures to ensure that design related correspondence and data exchanged between the shipyard and class is made available at the request of the owner and/or flag State.

4 Description of the procedures that provide for technical correspondence between yard and equipment makers to be made available at the request of class, owner and flag State.

Tier III Information/Documentation Requirements and Evaluation Criteria

c. Evaluation criteria

1 Do the Rules establish clear and auditable requirements for including and updating design specific and critical information, including limitations, in the Ship Construction File?

2 Do the Rules establish clear criteria and techniques for assessing alternate methods used in the design? Are all equivalencies documented in the Ship Construction File and made available to the owner and flag State?

3 Are there clear and auditable Procedures to provide for design and technical correspondence and data pertaining to the ship to be made available to the owner and flag Administration upon request?

Intellectual Property Protection to be amended!!!!!

In Service Structural Monitoring Requirements

Ⅱ.16 – Structural performance monitoring

Structural performance data on corrosion/steel renewal, fractures and other structural failures, including catastrophic failures, for ships designed and constructed to the Rules should be collected [periodically] [every five years] over the service life to enable continuous reassessment of the adequacy of the Rules in attaining satisfactory structural performance. The structural performance should be compared to performance metrics and the Rules duly revised if the performance targets are not met.

a. Statement of intent

Confirm that the Rules incorporate a process for collecting and evaluation structural performance data over the service life.

In Service Structural Monitoring Requirements

b. Information and documentation requirements

1 Description of the procedures followed to record historical data on in-service corrosion and steel renewal for ships to the Rules, which will be collected, including the methods and frequency of data collection.

2 Description of the procedures followed to record historical data on fractures and other structural failures including catastrophic failures of the hull girder or other primary hull structure on ships constructed to the Rules.

3 Description of the process that will be used for evaluating these data.

4 Description of the procedures for reporting periodically to IMO the results of the data collection.

5 Description of the process that will be used for revising Rules if the structural performance on service corrosion, fractures and other structural failures fails to meet the performance targets.

6 Description of the process that will be used for revising Rules if the analysis of catastrophic structural failures of the hull girder or other primary hull structure indicates deficiencies in the Rules, or inadequacy of structural redundancy or the residual strength after damage.

In Service Structural Monitoring Requirements

c. Evaluation criteria

1 Is the information proposed for collection sufficient to enable assessment of structural performance against the structural performance target values?

2 Have the procedures for in service data collection been clearly described?

3 Is the process for evaluating structural performance data and revising the Rules clearly defined?

4 Are the reports on historical data on in service corrosion, steel renewal, fractures and other structural failures, including catastrophic failures, intended to be submitted to IMO in periods not exceeding five years?

5 Is the process to revise the Rules on the basis of the structural performance clear with respect to require changes to the Rules if either steel renewals, fractures or structural failures target limits are exceeded?

6 Is the process to revise the Rules on the basis of the analysis of catastrophic structural failures clear with respect to require change in the structural redundancy or residual strength upon the results of such analysis?

Corrosion and steel renewal assessment

At least [TBD]% of ships built to the Rules should satisfy the following steel renewal target :

Over the 25year service life, structural steel renewal due to corrosion should not exceed [TBD]% of the hull steel weight. The hull steel weight includes all hull structure except the weight of the house and casing.

Structural and fatigue failure assessment

At least [TBD]% of ships built to the Rules should satisfy the following structural failure target levels :

Over the 25 year service life, there should be no class A structural failures. A class A failure is a through-thickness fracture in the boundary of the cargo block or the outer hull exceeding 100 mm in length which either creates a pollution incident or severely threatens the structural integrity of the vessel, or a fracture or buckling of an internal strength member which severely threatens the structural integrity of the vessel.

Over the 25 year service life, there should be no more than [five] class B structural failures. A class B failure is a through-thickness fracture in the boundary of the cargo block or the outer hull less than 100 mm in length which creates a pollution incident, or a fracture that if left un-repaired for three years would result in a Class A failure.

Over the 25 year service life, there should be no more than [twenty-five] class C failures. A class C failure a fracture more than 50 mm in length that has initiated in or propagated into a strength member.

Structural Performance Monitoring

Hull girder and primary hull structure failure assessment

There should be no catastrophic hull girder failures of tankers and bulk carriers due to corrosion and structural failure (excluding accidental events such as groundings, collisions, allisions and explosions which severely compromise the hull girder structure).

Proposed Change of Tier II Functional Requirement

II.3 Structural strength (*Changed Format*)

- II.3.1 Safety margins
- II.3.2 Deformation and failure modes
- II.3.3 General design
- II.3.4 Ultimate strength

II.7 Structural redundancy (*changed details contents*)

II.13 Survey and maintenance (*changed details contents*)

Proposed Change of Tier II Functional Requirement

II.3 Structural strength

II.3.1 Safety margins

Ships should be designed with suitable safety margins:

.1 to withstand, at net scantlings**, in the intact condition, the environmental conditions anticipated for the ship's design life and the loading conditions appropriate for them, which should include full homogeneous and alternate loads, partial loads, multi-port and ballast voyage, and ballast management condition loads and occasional overruns/overloads during loading/unloading operations, as applicable to the class designation; and

.2 appropriate for all design parameters whose calculation involves a degree of uncertainty, including loads, structural modelling, fatigue, corrosion, material imperfections, construction workmanship errors, buckling and residual strength.

** The net scantlings should provide the structural strength required to sustain the design loads, assuming the structure in intact condition and excluding any addition for corrosion.

Proposed Change of Tier II Functional Requirement

II.3.2 Deformation and failure modes

The structural strength should be assessed against excessive deflection and failure modes, including but not limited to buckling, yielding and fatigue. ~~Ultimate strength calculations should include ultimate hull girder capacity and ultimate strength of plates and stiffeners.~~[1]

II.3.3 General design

The ship's structural members should be of a design that is compatible with the purpose of the space and ensures a degree of structural continuity. The structural members of ships should be designed to facilitate load/discharge for all contemplated cargoes to avoid damage by loading/discharging equipment, which may compromise the safety of the structure.

II.3.4 Ultimate strength

Ultimate strength calculations should include ultimate hull girder capacity and ultimate strength of plates and stiffeners.

Proposed Change of Tier II Functional Requirement

II.7 Structural redundancy

Ships should be of redundant design and construction so that localized damage (such as local permanent deformation, cracking or weld failure) of any ~~one~~stiffening structural member will not lead to immediate consequential ~~failure of other structural elements leading to loss of structural and watertight integrity of the ship~~ collapse of the complete stiffened panel.

II.13 Survey and maintenance

Ships should be designed and constructed to facilitate ease of survey and maintenance, in particular avoiding the creation of spaces too confined to allow for adequate survey and maintenance activities. ~~The survey plan in II.12~~ Areas should ~~also~~ be identifie~~d~~y ~~areas~~ that need special attention during surveys throughout the ship's life. ~~and~~ I~~i~~n particular, this should include all necessary in-service survey and maintenance that was assumed when selecting ship design parameters.

Net Scantlings

- PP could not come to an agreement for the footnote of Tier II.3 “net scantlings” **
  - ** The net scantlings should provide the structural strength required to sustain the design loads, assuming the structure in intact condition and excluding any addition for corrosion.
- IACS CSR(Tanker) to apply different approach to each strength modes, i.e. local, hull girder and fatigue strength
- Majority of PP members allows not excluding any addition for corrosion
- Minority of PP members insists “pure net scantlings” to be used
- Net scantling concept to be provided in GoE in the future.

Net Scantlings

MSC 83/WP.5

ANNEX 2

REVISED TIER II FUNCTIONAL REQUIREMENTS

II.3 Structural strength

II.3.1 Safety margins

Ships shall be designed with suitable safety margins:

.1 to withstand, at net scantlings**, in the intact condition, the environmental conditions anticipated for the ship's design life and the loading conditions appropriate for them, which shall include full homogeneous and alternate loads, partial loads, multi-port and ballast voyage, and ballast management condition loads and occasional overruns/overloads during loading/unloading operations, as applicable to the class designation; and

** *The net scantlings should provide the structural strength required to sustain the design loads, assuming the structure is in intact condition and accounting for the steel diminution that could be reasonably expected to occur during the life of the ship due to corrosion and wastage.*

Q & A