Pilot Panel Report of GBS Tier III Verification Process for IACS CSR

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Tier III Pilot Project of IMO GBS?

- **What is the Tier III of IMO GBS?**

Developing the Guidelines

for

"Verification Process"

&

"Information/Documentation Requirements and Evaluation Criteria"

that

Tier IV: "IACS CSR Rule for Tanker and Bulker"

meets

Tier I: "Goal" and Tier II: "Functional Requirement"

of

IMO GBS

Tier III Pilot Project of IMO GBS?

- **Pilot Panel Deliverables!**
  - **Part A: Verification Process**
  - **Part B: Information/Documentation Requirements and Evaluation Criteria** *of the rules for Group of Experts*
  - **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*

PP Meeting Time Table

- In 2007: 1st Trial Application
  - Pre-meeting: 2/22-2/23, IMO HQ, LONDON, UK
  - 1st Meeting: 3/12-3/14, IMO HQ, LONDON, UK
  - 2nd Meeting: 4/26-4/28, IMO HQ, LONDON, UK
  - 3rd Meeting: 6/4-6/6, IMO HQ, LONDON, UK
  - Panel Report Submission to IMO: 7/1
  - MSC 83: 10/3-10/12, Reconvene PP for a year at 2008

- In 2008: 2nd Trial Application
  - 1st Meeting: 2/14-2/16, IMO HQ, LONDON, UK
  - 2nd Meeting: 5/4-5/6, IMO HQ, LONDON, UK
  - 3rd Meeting: 6/10-6/14, Seagull Hotel, Shanghai, China
  - Panel Deliverables Submission to IMO: 8/29
  - Report to MSC 85 Working Group: 11/26-12/5

General Introduction

- PP did not come to consensus on **voting method of GoE**: simple or two-thirds majority
- For **recycling** II.15 and III.15 should be reserved, pending completion of the International Convention
- For Ship Construction File requirements should take into account the remaining issues included in paragraph III.10 **Design Transparency** of the Guidelines
- The PP believes the draft **Guidelines** strike the appropriate balance between specificity and flexibility on the appropriate degree of specificity of the verification criteria, and it is incumbent on the Group of Experts
- PP deleted a footnote that referenced **IACS Recommendation No.34**. The reference could serve to stifle innovation.
- PP noted that **classification society rules** would not cover all the functional requirements in Tier II. Administrations have the ultimate responsibility.

Revisions to functional requirements

- **Net scantlings** needs further clarity without corrosion margin determination of local element strength for assessing fatigue and hull girder strength a portion of the corrosion margin may be added to the net scantling
- **Acceptable probability of exceedance of the design load** for ships' structures as a functional requirement is inappropriate to prescribe limits, GoE should assess the overall formulation of the rules and exercise appropriate judgment
- **Probability of exceeding of the ship design dynamic load**, statistical uncertainty of the extreme value of the design global dynamic load may not be taken into account within the safety factors as minimum level of such safety factors due to absence of functional requirements
- In Functional Requirement "**Ultimate strength** calculations should include ultimate hull girder capacity and ultimate strength of plates and stiffeners". PP could not reach consensus whether ultimate strength should be explicitly limited to the hull girder, if not it could be interpreted as a new requirement for the ultimate strength of plates and stiffeners. (See Annex 3)
- Current IMO instruments for **Collision and Grounding** are insufficiently defined, Guidelines leave the determination of adequate residual strength, including foreseeable scenarios and assessment criteria to the classification society.

Action requested of the Committee

- **Committee is invited to approve the report of the PP:**
  - .1 Proposed Guidelines for the verification of compliance
  - .2 Square bracketed text
  - .3 Confidentiality agreement for the Group of Experts
  - .4 Ship recycling
  - .5 Net hull girder section modulus in the Ship Construction File & Harmonize Ship Construction File
  - .6 Net scantling
  - .7 Acceptable probability of exceedance of the design load
  - .8 Proposed modifications to Tier II functional requirements
  - .9 Tier III.5, Residual Strength
  - .10 Efficiency of the verification process
  - .11 Resources required to conduct a verification (GoE)

Part A: Tier III Verification Process(1)

- **Scope of verification:**
  - **Verification of compliance with Tier IV rules-the Goal Based New Ship Construction Standards for Tanker and Bulker**
- **Initial Verification:**
  - **Administration (Rule maker) should submit rule package to Secretary General (SG) of IMO for Verification of the rules**
  - **SG forwards the request to Group of Expert (GoE)**
  - **GoE verifies and submits the report to Maritime Safety Committee (MSC) via SG**
  - **MSC decides acceptance of the rule package, and GoE notifies Administration and maintain the rule**
  - **Submitter can appeal within 60 days**
  - cf. Appeal Board shall be comprised of [3] [5] members

Part A: Tier III Verification Process(2)

- **Maintenance of Verification:**
  - At least annually, GoE determines maintaining and changing of the rule, forwarded by SG.
- **Group of Experts:**
  - MSC establishes GoE nominated by SG on a permanent basis as following back ground,
    - Engineering degree in naval architecture/structural engineering
    - Scientific or engineering knowledge of tech. subjects
    - Design/construction/operating experience with ships
    - Knowledge of ship safety construction requirement
    - Knowledge of environmental protection requirements
    - Ship building and construction practice
    - Research experience in the aboves
    - Not employee of Class. Society
  - *cf*. GoE shall be comprised of [5] to [11] members

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.

b. Information and documentation requirements

1 Statement of the design life in years used in developing the Rules.

2 Description of the methodology used to incorporate design life into the Rules. This shall include but not be limited to consideration of extreme loads, design loads, fatigue and corrosion.

c. Evaluation criteria

1 Are structural strength, fatigue and corrosions additions, and any other design parameters used in the Rules based upon the specified design life?

2 Has the design life been properly applied in sections of the Rules where specified?

Ⅲ.2 - Environmental conditions

a. Statement of intent

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

b. Information and documentation requirements

1 Source of sea state data (scatter diagrams, etc) including method and date of data collection and geographical location represented by the data.

2 Justification that sea state data and predictions used to develop motions and loads are representative of North Atlantic environmental conditions.

3 Justification of the methodology used to develop ship motions and loads, including assumptions related to speed, distribution of headings, number of cycles of wave encounters, probability of exceedance of design values, sea states, wave spectral shapes, hull form and other relevant parameters. Clearly define limits of applicability, and provide guidance for assessment when outside this range.

4 Description of how the methodology used to develop ship motions and loads has been benchmarked with experimental or service history data.

Ⅲ.3 - Structural strength

a. Statement of intent

Confirm that the Rules require a ship to be designed to withstand at net scantlings the operational and environmental loads for its specified design life. Confirm that the Rules include the appropriate safety margins which reflect the degree of uncertainty.

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 failure modes including, but not limited to, those involving yielding and buckling of hull girder and structural members. Include the following:

.1 Description of the strength assessment methodology.

.2 Explanation of how the net scantlings concept is applied in the Rules for structural design.

.3 Justification of the methodologies used to obtain the global and local, static and dynamic design loads.

Excessive deformation should be defined and/or dealt at where it is required !!!!

Part B: Tier III Information/Documentation Requirements and Evaluation Criteria

.4 Justification of the acceptable limits of yielding and buckling.

.5 Explanation of how the Rules prevent deformation from compromising the integrity of the ship's structure. The term "deformation" means translational and/or rotational displacement.

.6 Explanation of the requirements for finite element structural modelling, including load application, boundary conditions, element selection and mesh size. Explanation of how primary, secondary and tertiary stresses are considered.

.7 List of the loading conditions considered in the Rules that are to be included in the structural evaluation. Justification of the loading conditions especially in terms of what parts of the structure may be critically loaded and stressed.

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

How are the material imperfections accounted?

Part B: Tier III Information/Documentation Requirements and Evaluation Criteria

.9 Justification of the rationale of the Rules for weld design and procedures.

.10 Justification of how structural continuity is taken into account in the Rules, including termination of primary structures at the fore and aft ends of the cargo block.

.11 Explanation of how the Rules consider deformations or vibration levels that may damage or impair the ship structure, equipment or machinery.

.12 Description of the safety factors in conjunction with assumed design load(s) and justification as to why they are appropriate.

.13 Description of how the strength assessment methodology has been benchmarked with experimental and service history data.

.14 Application of the Rules to representative design(s). Documentation should include drawings of the cargo region showing net and gross scantlings, as well as the background calculations used to develop the scantlings.

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

Part B: 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.

3 Justification of the methodology used for the calculation of local stresses, including stress concentration factors, if utilized.

4 Justification of how the Rules account for sloshing effects.

5 Description of how the Rules determine that the net scantlings are sufficient to provide adequate ultimate strength. Include the following:

.1 Description of the ultimate strength assessment methodology.

.2 Justification of how the net scantlings concept is applied in the Rules for ultimate strength.

.3 Justification of the loads considered for the ultimate strength analysis.

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.

Ⅲ.4 - Fatigue life

process for the selection of the structural members and typical critical design details required to be included in evaluation of ship's fatigue life.

.6 Justification of procedures for the calculation of cyclic stresses and stress ranges in structural details. Explanation of the method used to take into account stress concentrations, as may be applicable to the detail analyzed.

.7 Explanation of the requirements for finite element structural modelling, including load application, boundary conditions, element selection and mesh size. Explanation of how primary, secondary and tertiary stresses are considered

.8 Description of how construction tolerances and procedures are accounted for in the Rules. Description of how surface treatment, such as grinding and peening, are addressed in the Rules

surface treatment to be suitably incorporated in the Rule !!!

details in seawater (e.g., when the breakdown of coating leads to exposure to seawater).

.10 Description of how the Rules take into consideration slamming (e.g. whipping) and vibratory- induced fatigue effects (e.g. springing or propeller induced vibrations). Justification should be provided if not explicitly considered in fatigue assessment.

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

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

.12 Description of how the fatigue assessment methodology has been benchmarked with experimental and/or service history data.

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.)

b. Information and documentation requirements

1 Description of how ships designed to the Rules with intact structure at net scantlings have sufficient ultimate strength to sustain flooding as defined in relevant IMO instruments.

2. Justification that ships designed to the Rules have adequate residual strength to survive a casualty event. Include the following:

   .1 Description of the methodology used to assess residual strength.

   .2 Description of the flooding scenarios and the corresponding structural damage. Explanation of the relationship of the flooding scenarios with IMO instruments.

   .3 Description of the environmental conditions and period of exposure representative of the sea states expected for collision and grounding scenarios, and justification why they are appropriate.

   .4 Description of the acceptance criteria for residual strength in damaged condition, and justification if different from ultimate strength.

III6.2 - Corrosion addition

a. Statement of intent

Confirm that the Rules for corrosion addition values are rationally based and adequate for the specified design life.

b. Information and documentation

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

2 Description of how assumed corrosion rates and Rule design corrosion additions are determined based on ship type and location within the hull. Description should address how stress corrosion and any other modes of accelerated corrosion have been taken into consideration.

3 Description of any additional Rule requirements that provide special consideration for other parameters such as unusual cargoes, loadings, trading patterns, material properties, etc.

4 Description of how corrosion of welds and heat-affected zones are considered.

5 Description of the steel/structure renewal criteria.

6 Description of how the methodology to determine corrosion addition and establish steel/structure renewal criteria has been benchmarked with experimental and service history data.

III.7 Structural redundancy

a. statement of intent

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

b. information and documentation requirements

1 Demonstration that the Rules have adequate requirements to provide ship structural redundancy.

2 Description of the requirements for localized damage assessments, including where applicable, modelling in finite element structural analysis.

3 Description of how the methodology used to assess structural redundancy has been benchmarked with experimental and/or service history data.

c. Evaluation criteria

1 Does a ship designed to the Rules have sufficient structural redundancy to survive localized damage to a stiffening member?

2 Are the methods for assessing the consequences of localized damage satisfactorily described?

3 Has the methodology used to assess structural redundancy been benchmarked? Does it compare favourably with experimental or casualty history data?

Ⅲ.8 - Watertight and weathertight integrity

a. statement of intent

Confirm that the Rules require adequate watertight and weathertight integrity for North Atlantic environmental conditions, including adequate strength for the closing arrangements and adequate redundancy for the securing devices.

b. information and documentation requirements

1 Description of the Rule requirements for watertight and weathertight integrity.

2 Description of how the Rules consider criteria from IMO instruments for determining which openings in the hull envelope are required to be watertight or weathertight.

3 Explanation of the criteria used in the development of the Rules to determine that the strength and redundancy for closing arrangements, if appropriate, of the watertight and weathertight openings is adequate for the environmental conditions and specified design life

c. Evaluation criteria

1 Do the Rules satisfy all relevant IMO watertight and weathertight integrity requirements?

2 Do the Rules require sufficient strength for closing arrangements and securing devices to meet environmental conditions, design loads and specified design life? Do the Rules require securing devices to have 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, inspection and maintenance activity.

b. information and documentation requirements

1 Description of how the Rules consider human element and ergonomics during the structural design and arrangement of the ship, including:

.1 Stairs, vertical ladders, ramps, walkways and work platforms used for permanent means of access and/or for inspection and maintenance operations.

.2 Structural arrangements to facilitate the provision of adequate lighting and ventilation, and to minimize noise and vibration in spaces normally occupied or manned by shipboard personnel.

.3 Structural arrangements to facilitate the provision of adequate lighting and ventilation in tanks or closed spaces (e.g. duct keels, pipe tunnels, etc.) for periodic inspections, survey and maintenance.

.4 Structural arrangements to facilitate emergency egress of inspection personnel or ships crew from tanks, holds, voids, etc.

2 Description of how ergonomic design principles are factored into the design rules, including any guidance information provided to designers.

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.

.6 Net (renewal) scantlings for all the structural members.

.7 Minimum hull girder section modulus along the length of the ship which has to be maintained throughout the life of the ship.

Part B: Tier III Information/Documentation Requirements and Evaluation Criteria

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 procedures for ensuring that relevant design information, e. g. net scantlings, corrosion margins used, etc., is available to the owner and flag State during the construction process.

4 Description of the procedures to ensure that structural design and construction related correspondence and data exchanged between the shipyard and the classification society is made available at the request of the owner and/or flag State.

5 Description of the procedures to ensure that ships' structural related technical correspondence between shipyard and subcontractors is made available at the request of classification society, owner and/or flag State.

Part B: 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/or flag State?

3 Do the Rules establish clear and auditable procedures to provide for ship's structural related design and technical correspondence and data pertaining to the ship to be made available to the owner, classification society and/or flag State upon request?

Intellectual Property Protection to be amended!!!!!

[Ⅲ.15 – Recycling]

a. Statement of intent

Confirm that the Rules require the use of materials that are environmentally friendly at recycling.

b. Information and documentation requirements

1 Description of the Rule requirements for ships to be designed and constructed of materials that are environmentally acceptable at recycling.

2 Description of the process used to determine whether or not materials are acceptable, including:

.1 List of environmentally acceptable and unacceptable materials.

.2 Criteria for evaluating new materials for acceptability/unacceptability.

.3 Criteria for determining safety and operational efficiency.

.4 Provisions for documenting materials in Ship Construction File.

.5 Provisions for documenting changes to any of the above during the vessel's service life.

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.

II.3.3 Ultimate strength

Ships should be designed to have adequate ultimate strength. Ultimate strength calculations should include ultimate hull girder capacity and ultimate strength of plates and stiffeners, and be verified for a longitudinal bending moment based on the environmental conditions in II.2.

II.3.4 Safety margins

Ships shall be designed with suitable safety margins:

.1 to withstand, at net scantlings**, in the intact condition, the environmental conditions anticipated

** The net scantlings should provide the structural strength required to sustain the design loads, assuming the structure is in intact condition and without any corrosion margin. However, when assessing fatigue and hull girder global strength, a portion of the total corrosion margin may be added to the net scantlings to reflect the material thickness that can reasonably be expected to exist over the design life.

ANNEX 3 : PROPOSED REVISIONS TO TIER II FUNCTIONAL REQUIREMENTS

II.8 Watertight and weathertight integrity

Ships shall be designed to have adequate watertight and weathertight integrity for the intended service of the ship and adequate strength and redundancy of the associated securing devices of hull openings.

II.9 Human element considerations

Ship's structures and fittings shall be designed and arranged using ergonomic principles to ensure safety during operations, inspection and maintenance. These considerations shall include, but not be limited to, stairs, vertical ladders, ramps, walkways and standing platforms used for means of access, the work environment, inspection and maintenance and the facilitation of operation.

II.10 Design transparency

Ships shall be designed under a reliable, controlled and transparent process made accessible to the extent necessary to confirm the safety of the new as-built ship, with due consideration to intellectual property rights. Readily available documentation shall include the main goal-based parameters and all relevant design parameters that may limit the operation of the ship.

II.14 Structural accessibility

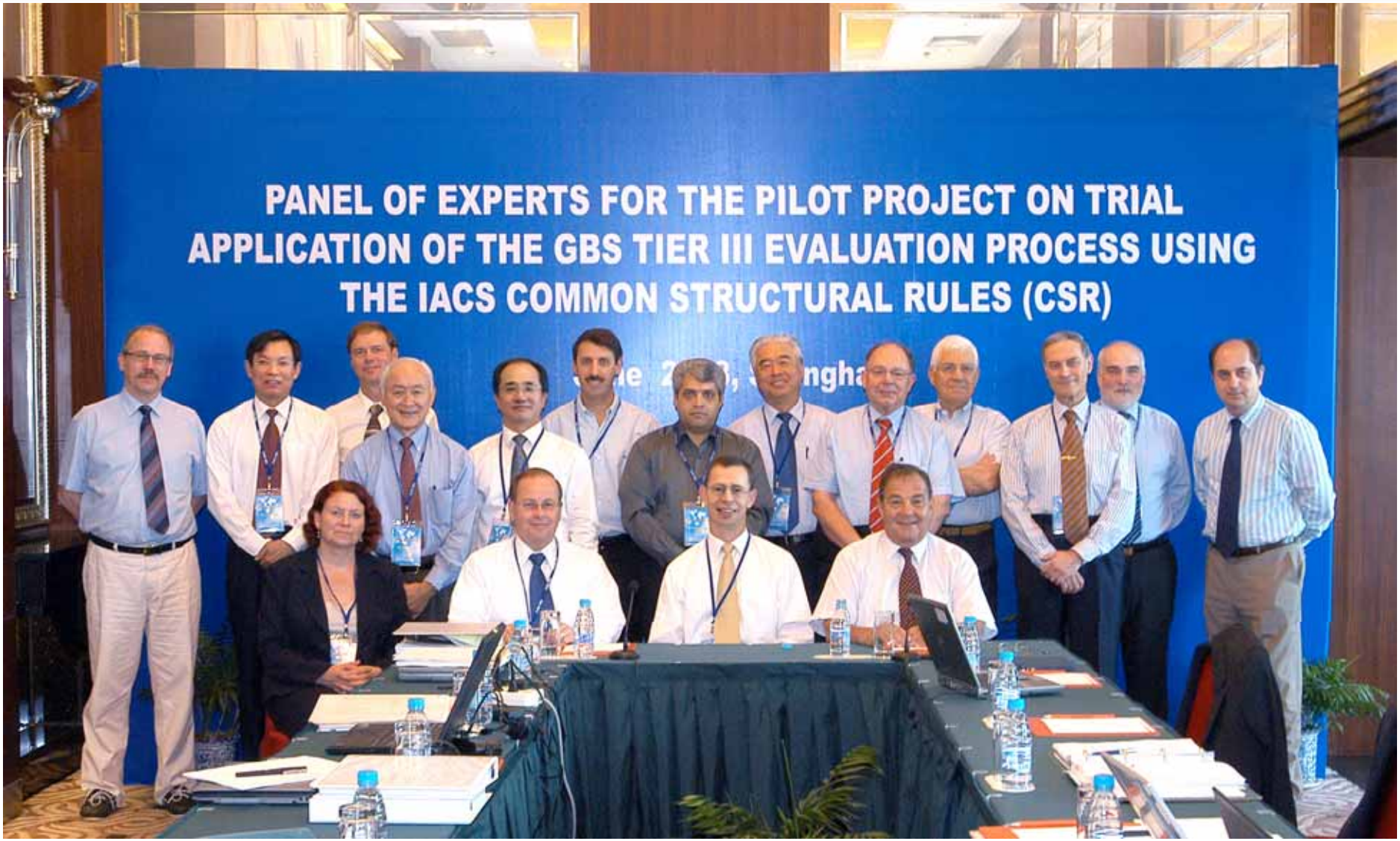
The ship shall be designed, constructed and equipped to provide adequate means of access to all internal structures to facilitate overall and close-up inspections and thickness measurements.

RECYCLING CONSIDERATIONS

[II.15 Recycling

Ships shall be designed and constructed of materials for environmentally acceptable recycling without compromising the safety and operational efficiency of the ship.*]*

Q & A


PANEL OF EXPERTS FOR THE PILOT PROJECT ON TRIAL
APPLICATION OF THE GBS TIER III EVALUATION PROCESS USING
THE IACS COMMON STRUCTURAL RULES (CSR)