

Asian Shipbuilding Experts' Forum for International Maritime
Technical Initiative (ASEF)

**GBS – a new IMO rule making process –
How it impacts the shipbuilding industry**

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Back ground



- Some accident of collapse of structure of oil tankers happened during voyage and lead to severe pollution to environment.
- SOLAS (International Convention for the Safety of Life At Sea) chapter II-1 regulation 3-1
Ships shall be designed, constructed and maintained in compliance with the structural, mechanical and electrical requirements of a classification society which is recognized by the Administration in accordance with the provisions of regulation XI-1/1, or with applicable national standards of the Administration which provide an equivalent level of safety.
- SOLAS shall directly control the structural integrity of ships.
- IMO (International Maritime Organization) has a responsibility to prevent such accident.

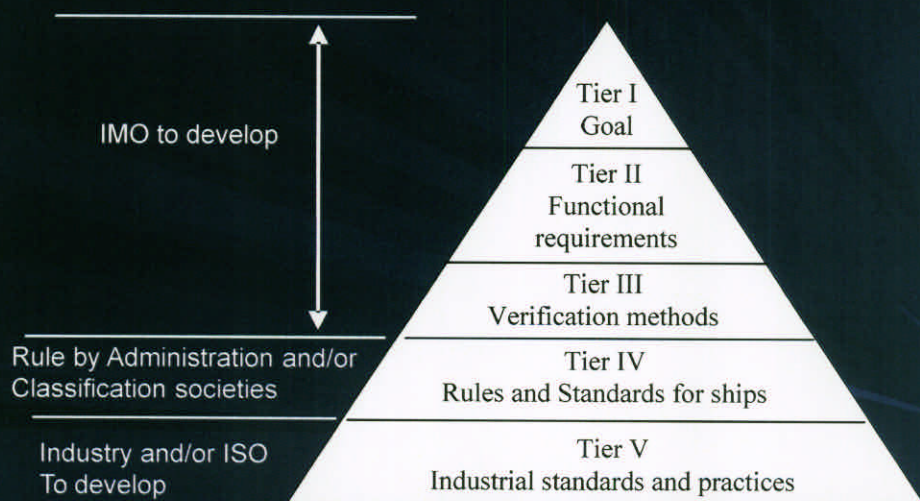


Concept of Goal-Based New Ship Construction Standard (GBS) IMO MSC 77 (May 2003) agreed to the work item.

- IMO develops a **GBS for new ship construction**.
- **GBS NSC will govern and regulate Rules for construction of ships. In other words, GBS is a standard for rules.** (This means GBS itself is NOT a direct rule for construction of ships.)
- GBS will be mandatory by being incorporated into SOLAS, such as
 "Ships shall be designed and constructed in compliance with rules (.e.g. Rules of classification society or the maritime administration) which comply with GBS."



Five Tiers Structure of GBS for New Ship Construction IMO MSC 78 (May 2004) Agreed the structure.



Application and Tier I Goal of GBS

MSC 79 (Dec. 2004) agreed

to develop GBS for Bulk carriers and oil tankers, and agreed Tier I Goal:

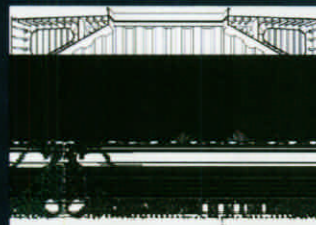
“Ships shall be designed and constructed for a specified design life to be safe and environmentally friendly, when properly operated and maintained under the envisaged operating and environmental conditions, intact and foreseeable damage conditions throughout their life. “



Tier II Functional requirements of GBS

MSC80 (May 2005) Agreed the contents of Tier II Functional requirements

- II.1 Design life: The specified design life is not to be less than 25 years.
- II.2 Environmental conditions
- II.3 Structural strength
- II.4 Fatigue life
- II.5 Residual strength
- II.6 Protection against corrosion
 - II.6.1 Coating life
 - II.6.2 Corrosion addition
- II.7 Structural redundancy
- II.8 Watertight and weathertight integrity
- II.9 Human element consideration (agreed at MSC 83)
- II.10 Design transparency
- II.11 Construction quality procedures
- II.12 Survey
- II.13 Maintenance
- II.14 Structural accessibility
- II.15 Recycling (agreed at MSC 83)



Tier III Verification methods of GBS

- First draft was prepared at MSC 81 (MSC 81 WP.7)
- MSC 82 (Dec. 2006) established Pilot Project Panel to examine and further develop Tier III through trial application of them to IACS CSR.
- MSC 83 (Oct. 2007) continued the Pilot Project Panel to finalize Tier III.
- MSC 85 (Dec. 2008) will consider and approve Tier III with a view to adopt it at MSC 86.

(Tier III will be presented by the other presenter.)



Impact to shipbuilding Industry Part-1



Tier II.1 Design life

The specified design life is not to be less than 25 years.

Tier II.2 Environmental conditions

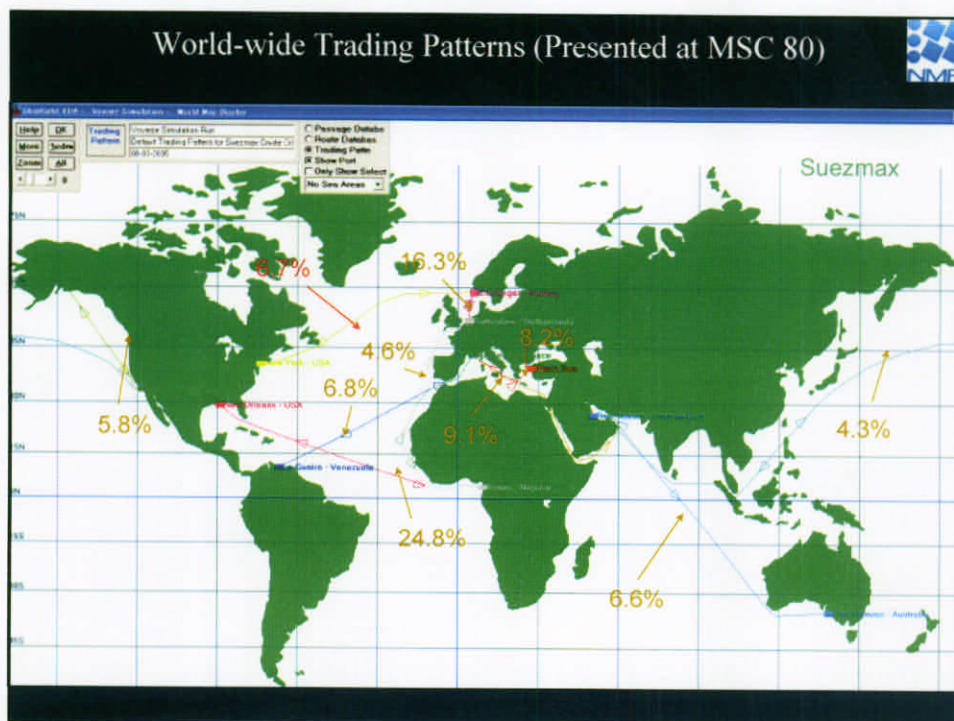
Ships shall be designed in accordance with North Atlantic environmental conditions and relevant long-term sea state scatter diagrams.

Would a ship be operated for 25 years in North Atlantic Sea?

Are ships designed, today, to be operated 25 years in North Atlantic Sea?

Are the Rules of construction of bulk carriers and/or oil tankers based upon such operation?





Impact to shipbuilding Industry Part-2-1

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
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.

How extent the Rules for ships specify or treat the involvement of uncertainty?

How the safety margins are dealt with under such uncertainty?

Impact to shipbuilding Industry Part-2-2

Net Scantling

Agreed at MSC83	<ul style="list-style-type: none"> ■ The net scantlings should provide the structural strength required to sustain the design loads, assuming the structure is in intact condition <u>and accounting for the steel diminution that could be reasonably expected to occur during the life of the vessel due to corrosion and wastage</u>
Pilot Panel's new Proposal	<ul style="list-style-type: none"> ■ The net scantlings should provide the structural strength required to sustain the design loads, assuming the structure is in intact condition. <u>However, when assessing fatigue and hull girder global strength, a portion of the 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.</u>

What parts of the structure are considered for "hull girder global strength?"

How the Rules treat corrosion addition for such structural parts?

Would the structure become thicker than those of today?

Impact to shipbuilding Industry Part-3

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 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.

II.4 Fatigue life

The design fatigue life shall not be less than the ship's design life and shall be based on the environmental conditions in II.2.

II.5 Residual strength

Ships shall be designed to have sufficient strength to withstand the wave and internal loads in **specified damaged conditions such as collision, grounding or flooding**. Residual strength calculations shall take into account the ultimate reserve capacity of the hull girder, including permanent deformation and post-buckling behaviour. Actual foreseeable scenarios shall be investigated in this regard as far as is reasonably practicable.

It has not been defined the damaged condition.



Impact to shipbuilding Industry Part-4-1

II.6 Protection against corrosion

Measures are to be applied to ensure that net scantlings required to meet structural strength provisions are maintained throughout the specified design life. Measures include, but are not limited to, coatings, corrosion additions, cathodic protection, impressed current systems, etc.

II.6.1 Coating life

Coatings shall be applied and maintained in accordance with manufacturers' specifications concerning surface preparation, coating selection, application and maintenance. **Where coating is required to be applied, the design coating life is to be specified.** The actual coating life may be longer or shorter than the design coating life, depending on the actual conditions and maintenance of the ship. Coatings shall be selected as a function of the intended use of the compartment, materials and application of other corrosion prevention systems, e.g., cathodic protection or other alternatives.

Where coating is mandatory, IMO mandatory guidelines shall apply.



Impact to shipbuilding Industry Part-4-2

II.6.2 Corrosion addition

The corrosion addition shall be added to the **net scantling** and shall be adequate for the specified design life. The corrosion addition shall be determined on the basis of exposure to corrosive agents such as water, cargo or corrosive atmosphere, or mechanical wear, and whether the structure is protected by corrosion prevention systems, e.g., coating, cathodic protection or by alternative means. The design corrosion rates (mm/year) shall be evaluated in accordance with statistical information established from service experience and/or accelerated model tests. **The actual corrosion rate may be greater or smaller than the design corrosion rate, depending on the actual conditions and maintenance of the ship.**

Progress of corrosion largely depends on the maintenance of the ship. Therefore, the Rules shall specify also the basis of maintenance to specify corrosion addition. It is not practicable and realistic that Rules specify corrosion addition based on the worst case of maintenance.



Impact to shipbuilding Industry Part-5

11.7 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 stiffening structural member will not lead to immediate consequential collapse of the complete stiffened panel.

11.8 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.

11.9 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.

Such human element consideration has not been a part of the Rules for ship's structure.



Impact to shipbuilding Industry Part-6

11.10 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.

Rules for ships may/should require design transparency by opening the design details to surveyors and ship owners.

“to surveyors” would be no problem.

“to ship owners” would create problem for the **intellectual property right**.

Therefore, this Tier II requirement has the conditions of “**with due consideration to intellectual property rights**”. This shall be kept throughout of the GBS.



Impact to shipbuilding Industry Part-7

II.11 Construction quality procedures

Ships shall be built in accordance with controlled and transparent quality production standards with due regard to intellectual property rights. The ship construction quality procedures shall include, but not be limited to, specifications for material, manufacturing, alignment, assembling, joining and welding procedures, surface preparation and coating.

II.12 Survey

A survey plan shall be developed for the construction phase of the ship, taking into account the ship type and design. The survey plan shall contain a set of requirements, including specifying the extent and scope of the construction survey(s) and identifying areas that need special attention during the survey(s), to ensure compliance of construction with mandatory ship construction standards.

Such requirements are not parts of the Rules for ship's structure.



Impact to shipbuilding Industry Part-8

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. Areas should be identified that need special attention during surveys throughout the ship's life. In particular, this should include all necessary in-service survey and maintenance that was assumed when selecting ship design parameters.

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.

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.

Such requirements are not parts of the Rules for ship's structure. Requirements for ship recycling will be developed as a separate international convention.



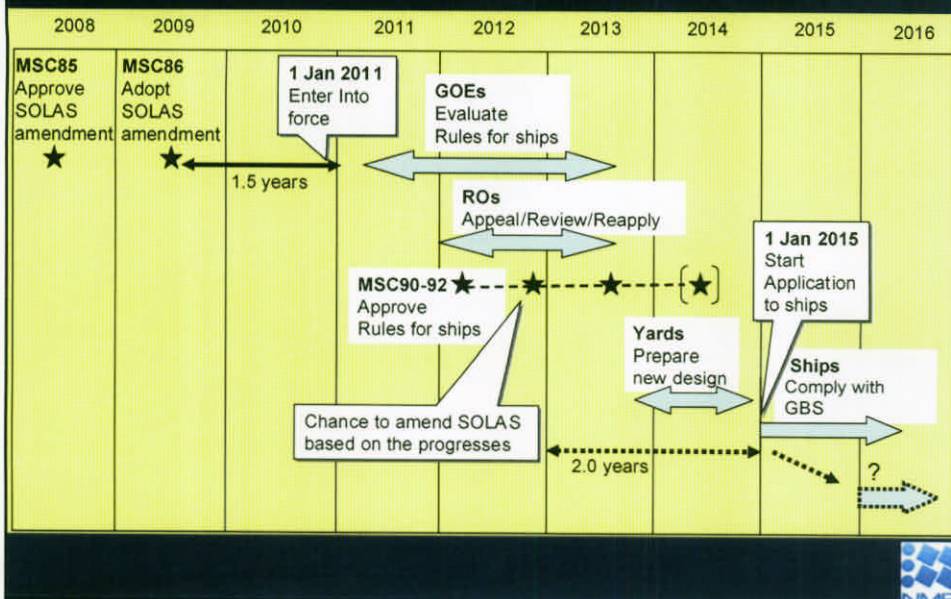
Procedures for evaluation of Rules for ship construction of under GBS for bulk carriers and oil tankers

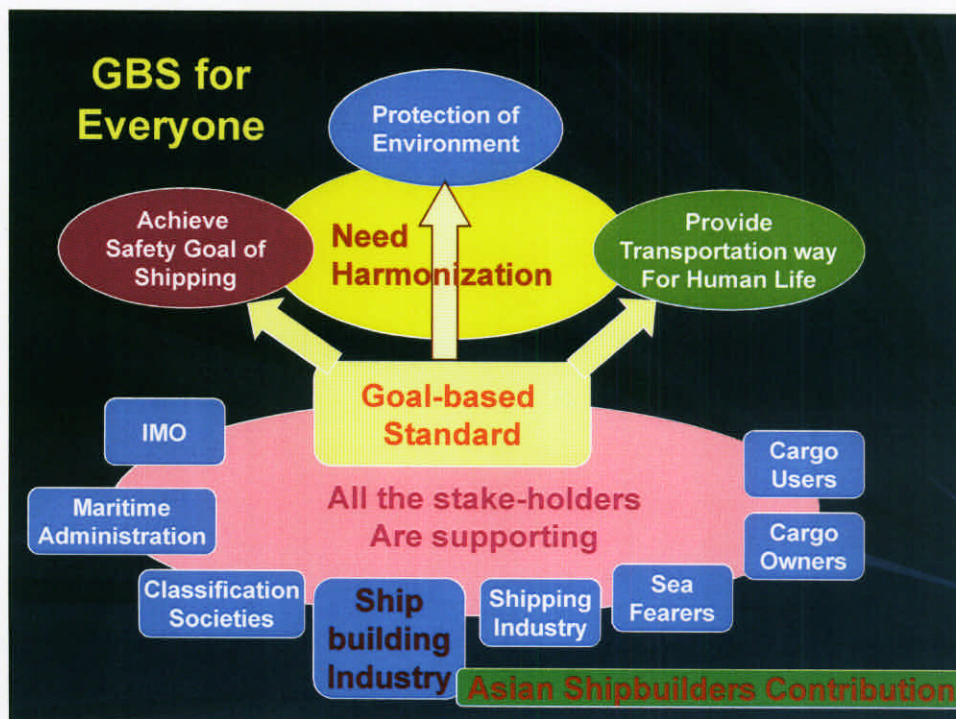
- Rule maker submit it rules to IMO.
- IMO establish a "Group of Expert (GoE)".
- The submitter shall provide required information to GoE.
- GoE evaluates the rule and report the result to IMO MSC (Maritime Safety Committee).
- MSC review the report to make decision.
- If the decision is "no", the submitter can appeal to MSC for re-evaluate.
- MSC make final decision.
- IMO issue report of approval to the submitter.

The submitter shall pay the cost of evaluation (Cost of GoE, etc.)
 The evaluation by GoE will take some period (at least several months).
 IACS CSR does not cover all the Tier II requirements. Some of them will be covered by the individual classification society.
 There are many classification societies not the member of IACS, and they may submit their rules individually to IMO.
The process of evaluation of Rules for ship construction will take extensive period of time.



Impact to shipbuilding Industry Part-8 Implementation of GBS for BC and OT





Impact to shipbuilding Industry Part-8 Implementation of GBS for Bulk Carriers and Oil Tankers

Conclusions

- Concept of design life and associated sea conditions under GBS are deferent from those of today.
- GBS is a standard for Rules of ship construction of classification societies or the administration. Therefore, ship designers shall wait for the development of such rules of classification societies or administration. Then, the designers should start or change the design.
- There should be a problem of intellectual property of ship designers under the GBS.
- Shipbuilding industry shall take part in IMO rule making process more widely and strongly.
- The voice of shipbuilding industry is smaller than shipping industries in IMO (only CESA in shipbuilding side comparing great number of shipping NGOs such as ICS, BIMCO, INTERTANKO, INTERCARGO)
- Asian shipbuilders shall send their messages to IMO more strongly and shall have a way to send such message to IMO. This means Asian shipbuilding industry shall have a NGO status in IMO.



MSC 85 Documents on GBS



Doc No.	Title	Submitted
MSC 85/5	Draft SOLAS amendments to make the GBS for bulk carriers and oil tankers mandatory and related matters	Secretariat
MSC 85/5/1	Report of the Pilot Panel on the trial application of the Tier III verification process using IACS Common Structural Rules (CSR)	Pilot Panel
MSC 85/5/2	Verification of compliance – Confidentiality statement	Secretariat
MSC 85/5/3	Definition of SLA and concept of its introduction into GBS	Japan
MSC 85/5/4	Comments on the draft SOLAS amendments for GBS	Japan
MSC 85/5/5	Ship Construction File – Protection of Intellectual Property Rights	CESA
MSC 85/5/6	Comments on net scantling concept in the report of the Pilot Panel	Japan
MSC 85/5/7	Consideration of the protection of intellectual property rights (IPR)	Japan, CESA
MSC 85/5/8	Comments on the report of the Pilot Panel on the trial application of the Tier III verification process using IACS Common Structural Rules (CSR)	Republic of Korea

Thank you



Koichi Yoshida
 National Maritime Research Institute, Japan
 Chaired IMO Fire Protection Sub-Committee from 1994 to 2003
 Chairing ISO TC92/SC1 (Fire safety/Initiation and growth of fire) since 2003
 and ISO TC8 SC2 (Marine Environment protection) since 2006