THE SHIPBUILDERS' ASSOCIATION OF JAPAN

Shipbuilders' Perspective on the Development of IACS Harmonized CSR

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5th ASEF in Busan
1st-2nd December, 2011

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❖ Current situation

Current Situation

For IACS, the development of H-CSR is a big challenge with many hurdles;

- **Harmonization of the current CSR-O/T and CSR-B/C, necessitating combination of different technical backgrounds.**
- **Implementation of the requirements of GBS, requiring solution for difficult technological subjects.**
- **Tight schedule of Harmonization work and industries review.**

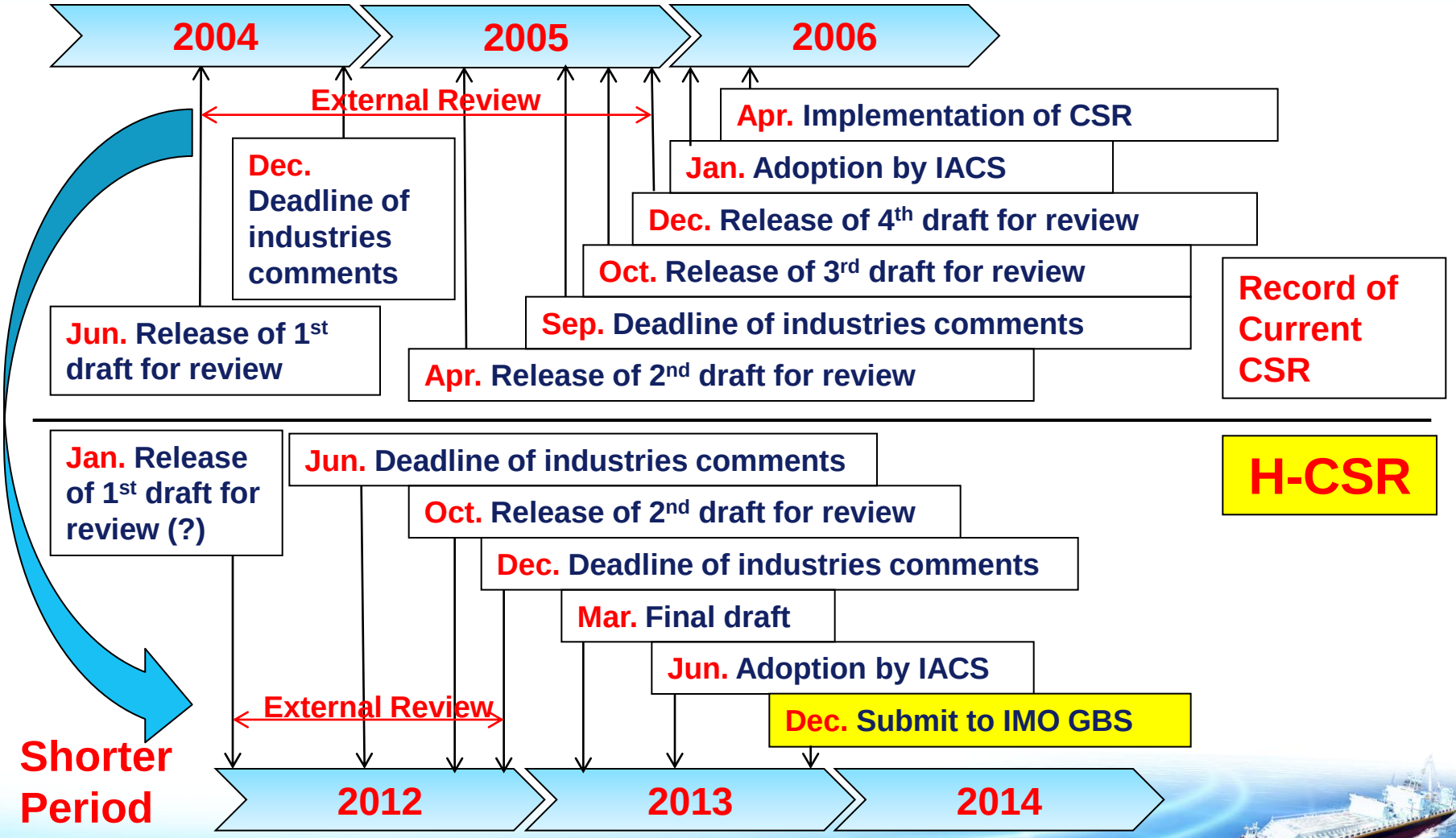
Current Situation

In the Tripartite Meeting held in Beijing on 18th-19th Nov., IACS presented ;

- **The internal draft text of the H-CSR has been completed.**
- **The software is being developed in parallel.**
- **The Consequence Assessment based on the latest draft version has not been completed.**
- **IACS Council will review the status of the harmonization project at the next Council meeting held on 6th- 8th Dec.**
- **At this Council, the final schedule of publication of the draft H-CSR to the industries will be decided.**
- **The schedule of submission to IMO will not be changed.**

❖ Schedule

Overall Schedule Comparison



Schedule of industries review

	What should be:	Worst scenario:
Schedule	External review starts without delay from Jan. 2012.	Development of H-CSR delays and external review postponed. Shorter review period is compelled and causes insufficient results.
Software	Packaged software is ready for industries in Jan. 2012, which enables easy and efficient verification of the new Rules.	Development of packaged software delays, and the industries cannot verify the new Rules within the expected time period of external review.
Quality	IACS will have already verified the new Rules internally by Jan. 2012 to a satisfactory level for industries.	Development of H-CSR delays, and internal verification within IACS is insufficient, leaving many problems involved.

Schedule of industries review

- We hope that IACS's rule development is proceeding in well-ordered manner, as described in the "what should be" column in the previous slide.

- However, if by any chance worse (but not the worst) scenario may arise, we request that:
  - Start of external review should be postponed until satisfactory (internally verified) draft and sufficient software will be prepared. Industries cannot verify unsatisfactory draft with insufficient tools, all the more for H-CSR which is foreseen to include wider scope of direct analysis than the current CSR.
  - Even if the start of external review is postponed, the total period for the external review must not be compromised. It must be absorbed by IACS's internal process.

GBS Relations

Implementation of GBS requirements

- **Several challenging requirements which have not been covered by the current classification rules are newly introduced as functional requirements of GBS, i.e.:**
  - **Residual strength after damage (e.g. collision, grounding and flooding)**
  - **Structural redundancy after localized damage in any one stiffening structural member**
  - **Human element and ergonomic considerations including access, noise and vibration**
  - **Vibration consideration to prevent damage of structure, equipment or machinery**
  - **Fatigue strength against whipping and springing**

Implementation of GBS requirements

- **We must be very careful when introducing these new requirements into H-CSR, because:**
  - **In many cases, analytical method to prove compliance is premature. State-of-the-art naval architecture has proved its soundness through long and successful experiences of actual ships in service, but premature analysis does not usually agree well with the sound experiences.**
  - **On the other hand, H-CSR must comply with the new GBS requirements, and must pass the audit by IMO. Compliance with those requirements must be demonstrated clearly without any meaningless increase of scantlings because of the application of premature analysis technologies.**

→ Some examples of our concerns follow:

Vibration considerations

- H-CSR will consider vibration levels that may damage or impair the ship structure, equipment or machinery, because GBS requires so.
- However, the control of vibration levels is not straightforward. There are various approaches including structural measures like reinforcement as well as reduction of rigidity to lower natural frequencies, reduction of exciting forces, application of balancers, dampers, phasing etc.
- Therefore prescriptive rules will not be appropriate. Flexibility is necessary to promote technical innovations.

Fatigue strength against whipping

- H-CSR will consider fatigue effects due to whipping, because GBS requires so.
- However, according to the new knowledge obtained through recent research activities, whipping phenomena are strongly related to actual ship's operations such as course change, speed reduction and navigation evading storms. It cannot be theoretically calculated. Only the successful records of actual ships in service prove structural soundness associated with sound operations.
- Theoretical approach neglecting actual operation leads to overestimation of whipping effect on fatigue !

GBS - Auditors

- Many auditors with sufficient expertise are necessary for smooth verification process by IMO.
- According to *Part A – Paragraph 23* of the *verification guideline*, auditors should have adequate knowledge of, and experience in, ship structural design and construction, the Standards and classification society rules and rule development and be able to correctly interpret the rules for correlation with relevant regulatory requirements.
- Shipbuilding industry is the most suitable for such expertise. We consider it is our obligation to nominate sufficient number of professional designers and naval architects.

For better H-CSR

Thickness effect to fatigue strength

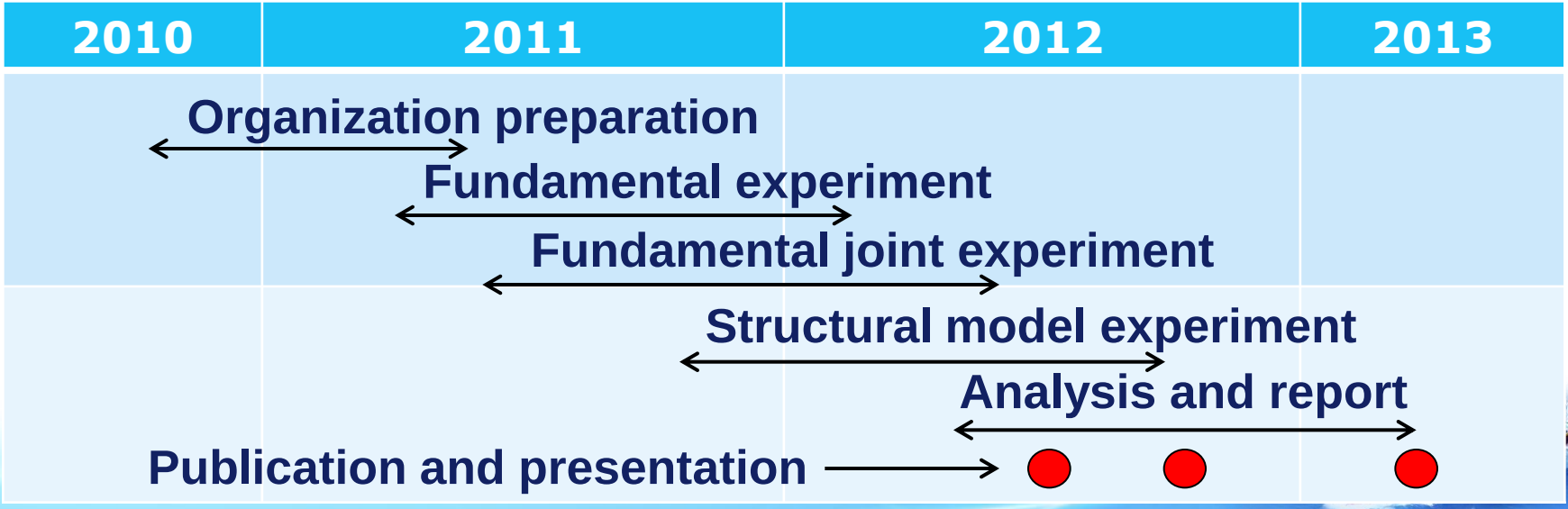
- It is commonly known as thickness effect that increase in plate thickness decreases fatigue strength.
- Current CSR accounts for this effect by 0.25 power index law as follows:

$$\log(N) = \log(K_2) - m \log\left(\frac{S_{Ri}}{(22/t_{net50})^{0.25}}\right)$$

- Recent worldwide research activities is revealing that this assumption is too conservative.

Thickness effect to fatigue strength

- To establish more reasonable and reliable method to evaluate thickness effect applicable to actual ship structural details, SAJ has organized a joint research project with steel makers, classification societies and universities. We expect that the results will be appropriately incorporated into H-CSR.



Bow deck minimum thickness

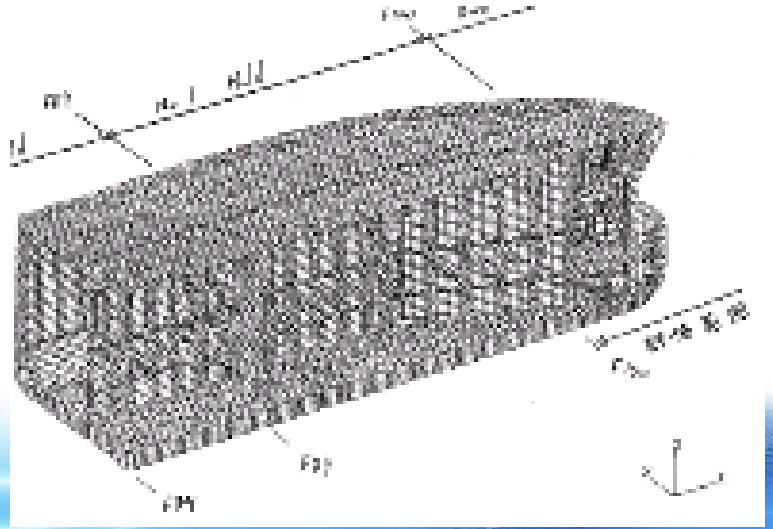
- The final rule change proposals of the current CSR are now under review process.
- Minimum thickness of bow deck plating is newly proposed by IACS as follows:

$$t_{w-net} = \frac{s}{70}\sqrt{\frac{\sigma_{yd}}{235}}$$

- Shipbuilding industries are raising serious concern about its irrationality.

Bow deck minimum thickness

- Exposed deck: governed by green sea pressure, not by buckling → The formulation almost prohibiting higher tensile steel plate is mistaken.
- Class Rules do not cover high level strength standard of bow structures. → Advanced shipyards have their own design standards against bow impact pressure, bow transverse strength, green sea pressure, etc.
- Such easy approach as the subject proposal is definitely harmful to sound technical development.
- We hope that H-CSR does not follow that easy way.



Combination with good maintenance and operation

With good maintenance

Without standard maintenance

- Ballast tank of a 21 years old bulk carrier.
- Quality of maintenance brings about this level of difference easily after many years from delivery.

Combination with good maintenance and operation

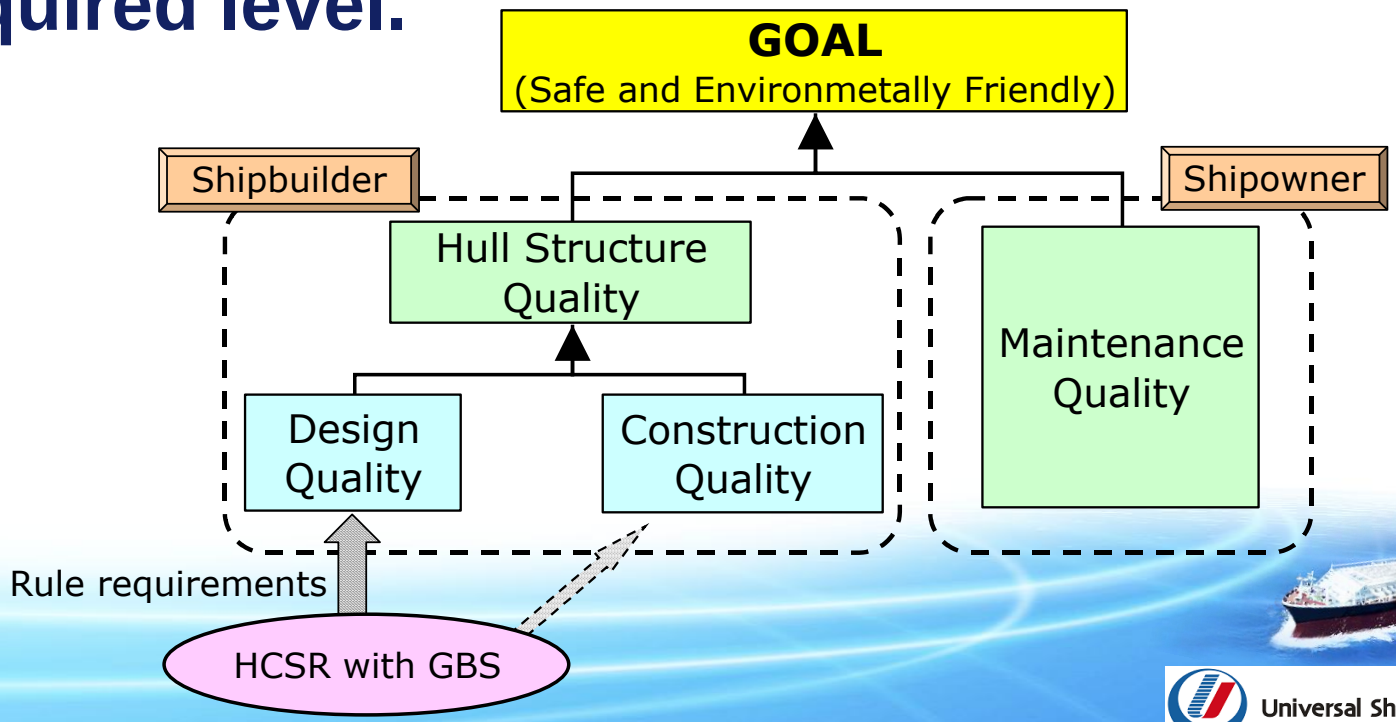
- **GOALS of GBS states:**

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

- **Proper maintenance and operation are crucial for safe and environmentally friendly ships, in combination with proper design.**

Combination with good maintenance and operation

- **Shipbuilders' responsibility to achieve the Goals of GBS is not only to comply with the Structural Rules but also to improve and keep the construction quality by ourselves to the required level.**



Conclusions

Conclusions

- **Schedule:** If any delay is envisaged,
  - Start of external review should be postponed until satisfactory (internally verified) draft and sufficient software can be prepared.
  - The total period for external review should not be compromised.
- **GBS new requirements:** Too theoretical approach may result in abnormal scantlings which cannot be explained from long successful record of actual ships in operation.
- **GBS Auditors:** Sufficient number of auditors should be nominated from shipbuilding industry.
- **For better H-CSR:** Some examples were raised which should be improved in H-CSR, such as:
  - Thickness effect to fatigue strength
  - Bow deck minimum thickness

Conclusions

- Design, maintenance and operation closely work together to achieve safe and environmentally friendly shipping.

- We hope all the cross industries cooperate together to realize excellent H-CSR, which brings safe shipping and is also technically sound.

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Thank you for your attention!

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