Bulker Q&As and CIs on the IACS CSR Knowledge Centre

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
205	3/1.2.3.11	Question	thickness	2006/11/30	In case of bulk carriers, thicker plates greater than 20 mm are normally used for main structural members. Since this requirement is vague, we would like to ask you to clearly explain your intention of the regulation 2.3.11 and to make clear the application of this requirement or criteria. If there is no criteria, it is better to delete the requirement to avoid confusion in design approval stage.	The reason of this requirement is the same as the one requiring D/DH for the SPECIAL elements i.e. Class III) with notes (4), (5) and (6), which are highly stressed elements. In this requirement, the notion of thickness greater than 20 mm is added to the notion of highly stressed element. This corresponds in fact D/DH for Class III elements according to Table 3.However, since the application of this requirement is already covered by Table 1 and other requirements such as 2.3.2, we propose that this requirement should be deleted according to your suggestion.	
206	3/3.1.2.1	Question	Corrosion addition	2006/11/8	According to our understanding on CSR, rules relating to corrosion addition have been harmonized with JTP. However, there is a difference in definition of tank top between JTP and JBP. Note (3) in Table 1 should be revised as follows: "Note (3) Only applicable to ballast tanks with weather deck as the tank top" from CSR for Tankers	Note (3) to be kept as it is. Example is Hopper Side Tk. not connected to TSWB Tk. Air-/Water-Mixture will be below top of tank. **"This question and answer are superseded by KC ID 638. Please refer to KC ID 638."**	
207	3/6.2.3.1	Question	hatch coaming	2006/11/30	As for hatch coamings, ClassNK approves hatch coamings having lower steel grade than that of upper deck plating, in case of the hatch coaming length being less than 0.15L. We therefore propose to delete hatch coamings from the last sentence.	First, it is to be noticed that this requirement is not dealing with steel grade, but with yield strength of the steel. Secondly, the stress in shorter hatch coamings (length much more less than 0,15L) is generally equivalent to the one in the deck. It becomes negligible only for very short hatch coaming. Some criteria could be developed, including parameters such as length and height of hatch coaming and their position along the ship. It seems quite complicated to solve this easy problem. Finally we have to keep in mind a stress check is to be carried out for the hatch coaming. Consequently, we prefer to keep the text as it is, or we may suggest to open a door by adding the word "generally" between "The same requirement" and "is applicable".	
208	3/6.2.3.1	Question	high strength steel	2006/11/29	The last sentence of 2.3.1 is excess and differs from the present application accepted by many classification societies. Higher strength steels are normally applied taking account of not only hull girder bending stresses but also local stresses. For instance, higher strength steel is used to double bottom girders taking into account local shearing stresses caused by cargo and external sea loads acting on double bottom.And some sniped longitudinal stiffeners not contributing hull girder longitudinal strength, which are mild steel, are welded on the girders to prevent panel buckling. Such design has been already approved by many classification societies. We consider that the steel grade of stiffeners not contributing hull girder longitudinal strength can be selected on a case by case basis. We would like to ask you to revise the rule taking into account the above.	The last sentence in Ch 3, Sec 6, [2.3.1] is not a matter of steel grade, but concerns the yield strength of the steel. The matter of steel grade is relevant to Ch 3, Sec 1. Having said that, it is understood that the original question is not about steel grade. Ch 3, Sec 6, [2.3.1] could be considered as the requirements in general. If the stress level due to hull girder bending, in longitudinal member not contributing to hull girder longitudinal strength, should be verified as to satisfy the requirement in Ch 5, Sec 1, [3.1.1], application of the requirements in Ch 3, Sec 6, [2.3.1] might be mitigated. As a matter of opening the door, the word "generally" should be added between "The same requirement" and "is applicable...".	
209	3/6.6.1.6	Question	scantling determina-tion	2006/11/1	As shown in the caption, main intention of this requirement is continuity of strength, not scantling. In the scantling determination of sloped bulkhead plating, yielding, buckling, grab handling and fatigue strength are taken into account. Continuity of strength can be realized by the consideration. Therefore we would like to ask you to delete the requirement.	In applying the last sentence of 6.1.6, where the scantling of lower strake of the sloped bulkhead of hopper tanks and inner bottom plate adjacent thereto are determined by the requirements on FEA and fatigue strength assessment, such structures are regarded as the satisfaction of the requirement on continuity of strength.	
210	3/6.6.4.2	Question	GRAB notation	2006/11/1	At least, please exclude the required material properties and net thickness of stool side plating by GRAB from this requirement. It is not necessary to apply the required material properties and net thickness of stool side plating by GRAB to the supporting floors.	In applying this requirement 6.4.2, the net thickness and material properties required for the bulkhead plating, or when a stool is fitted, of the stool side plating mean that they are required by the scantling requirement except for the grab loading and under flooded condition.	

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211	3/6.9.6.3	Question	extent of insert plate	2006/11/1	The extent of insert plate is larger than that of present designs. Since the stress concentration occurs in way of corner radius, we consider that the requirement should be reconsidered taking account of your experience. Please permit us to determine the extent of insert plate taking into account FEA results.	The following sentence should be added at the end of requirement 9.6.3: "For ships having length L of 150m and above, the extent of insert plate may be determined by the results of a direct strength assessment, including buckling check and of a fatigue assessment of hatch corners."	
243	3/3.1.2	Question	Corrosion addition determinatio n	2006/11/22	Corrosion addition determinationFor ships equal to and larger than 150m in length, corrosion addition for lower stool of 5.2m is very large compared with that for sloped plating of hopper tank of 3.7m. Corrosion addition for lower stool should be the same as that for sloped plating of hopper tank.	The corrosion additions are set according to the results estimated by probabilistic carrion model which are calibrated by huge amount of thickness measurement data. Therefore, the value specified in Table 1 of Chapter 3 is considered appropriate.	
244	3/6.6.1.2	Question	longi framing system	2006/11/22	Framing system; For ships larger than 120m in length, longitudinal framing system is required for bottom, double bottom and sloped bulkheads of hopper tanks in cargo hold. For fore and aft parts of cargo hold, however, it may be difficult to apply this system because of abrupt change of hull form there. So please add 'in general' to allow transverse system for these parts.	The word “in general” has been deleted from the text as far as practicable in order to eliminate the vague expression. Furthermore, from structural continuity point of view, the same framing system is desirable to adopt in whole length of cargo hold region. However, as you pointed out, we can understand that it may be difficult to apply the longitudinal framing system to fore part and aft parts of cargo hold because of abrupt change of hull form.Where it is difficult for the longitudinal system to apply to fore and aft parts of cargo hold region due to its hull form, the Society may accept on a case by case basis the changing the framing system. for such parts subject to provide an appropriate bracket or other arrangements to provide structural continuity in way of changes in the framing system.	
245	3/6.9.5.2	Editiorial	hatch end beams	2006/11/30	Hatch supporting structureHatch end beams are required to be aligned with transverse web frames in topside tanks. Partial transverse web or large bracket that is sufficient to transfer load should be considered as an alternative to transverse web. They are normal structural arrangement of existing vessels.	SOLAS XII Regulation 6.5.2 says, “effective continuity between the side shell structure and the rest of the hull structure shall be assured,” Although the application of this regulation is limited to bulk carriers of 150m in length and upwards carrying solid bulk cargoes having density of 1,000 kg/m3 and above, it is considered that the intention of this regulation is applicable to all ships. From the structural continuity point of view, the second paragraph of Ch 3 Sec 6 [9.2.4] (topside tank structure) of CSR for Bulk Carriers says “Where a double side primary supporting member is fitted outside of plane of the topside tank web frame, a large bracket is to be fitted in line with.” In addition to the side structure, to alter the large bracket in order to ensure the structural continuity between the hatch end beams and topside tank web frame seems to overdo. However, in oder to clarify whether the partial transverse web or large bracket provided in the top side tank in line with hatch end beam is acceptable instead of providing the ordinary transverse web, for clarification, we will consider a rule correction with addition of the following text: "Alternatively, the appropriate supporting structures shall be provided in top side tanks in line with the hatch end beam."	
246	3/6.9.5.3	Editiorial	hatch supporting structure	2006/11/28	Hatch supporting structureThe face plate of hatch coamings and longitudinal deck girders are required to be effectively connected. On the other hand, the face plate of hatch end beam is normally tapered at end. Please explain concrete requirements of 9.5.3.	In order to clarify this requirement, we will consider a rule correction as follows: At hatchway corners, the face plate of hatch deck girders or their extension parts and the face plates of hatch end beams on both ends are to be effectively connected so as to maintain the continuity in strength.	

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247	3/6.10.4.1	Question	UR S18	2006/11/10	Lower and upper stools of corrugated bulkheadsLower and upper stools are required for corrugated watertight bulkheads of ships equal to and larger than 150m in length. According to UR s18, stools are not required for ships less than 190m in length. In view of the fact that many existing ships having corrugated watertight bulkheads without stools less than 190m in length have been operated with successful results, we request this requirement be modified so as to be the same as UR S18.	The issue is under consideration by IACS.	
273	3/6.10.4.1	Question	corrugated BHD	2006/11/23	Lower stool with bottom width not less than 2.5 times mean depth of corrugation is required for L>=150m bulkers instead of L>=190m as defined in IACS UR S18.We think this contradiction to be corrected as editorial error in the corrigendum. If it is difficult to add new item in the corrigendum, IACS should take it in the next earliest chance. As you know, most of Handy class bulkers and also significant number of Handy max. bulkers with length between 150m < L 190m have corrugated bulkheads without lower stool and/or with rectangular lower stool which bottom width is same as corrugation depth. If the defined lower stools are installed for those vessels, necessary hold clear length about 27m for these class bulkers to load 2 rows of 40 feet length product such as pipes, etc. can not obtained. The economical loss to the shipping industry by the lower stool requirement is seemed tremendously big. Huge number of safely operating bulkers without required lower stools prove the safeness and propriety of this proposal.	The corrected text in the next Corrigenda should be: "For ships of 190 m of length and above, the transverse vertically corrugated watertight bulkheads are to be fitted with a lower stool, and generally with an upper stool is fittedbelow the deck.For ships less than 190 m in length, corrugations may extend from inner bottom to deck."	
274	3/6.10.4.8	Question	Upper stool	2006/11/22	We think that "The stool top" is correct(This comment is not for your summary but for original rule).	The right wording should be “stool top of non-rectangular stools”. This requirement comes from UR S18 (18.4.1.(b)).	
275	3/6.10.4.1	Question	Corrugated BHD	2006/11/23	Lower and upper stools are required for corrugated watertight bulkheads of ships equal to and larger than 150m in length. According to UR S18, stools are not required for ships less that 190m in length. Since there are many existing ships having corrugated watertight bulkheads without stools less thabn 190m in length and they have successful experiences, please amend as shown below:"In ships less than 190m in length, corrugations may extend from the inner botton to the deck."	The corrected text in the next Corrigenda should be: "For ships of 190 m of length and above, the transverse vertically corrugated watertight bulkheads are to be fitted with a lower stool, and generally with an upper stool is fittedbelow the deck.For ships less than 190 m in length, corrugations may extend from inner bottom to deck."	
316	3/5.1.2.2	CI	Application of CSR vs IMO PSCS(SOLAS II-1/3-2)	2006/12/7	For ships contracted for construction on or after the date of IMO adoption of the amended SOLAS regulation II-1/3-2, by which an IMO “Performance standard for protective coatings for ballast tanks and void spaces” will be made mandatory, the coatings of internal spaces subject to the amended SOLAS regulation are to satisfy the requirements of the IMO performance standard.	Interpreation: This is the date of adoption by IMO MSC 82(Maritime Safety Committee 82nd session) of the resolution amending the SOLAS regulation II-1/3-2. (Note: (1)The date of adoption is 8 December 2006; (2)IMO PSPC = IMO Resolution MSC.215(82); (3) SOLAS II-1, Part A-1, Reg.3-2 = IMO Resolution MSC.216(82))	
322	3/6.6.1.3	Question	FEA	2007/1/4	The text reads: "Unless otherwise specified, the height of double bottom is not to be less than B/20 or 2m whichever is the lesser." Does this require that the double bottom height in way of cargo holds is not to be less than B/20 or 2m whichever is the lesser IN ANY CASE? For instance, even if the strength of double bottom structures is verified by FEA, is this requirement to be maintained?	Yes, this requirement is mandatory. The double bottom height in way of cargo holds is not to be less than B/20 or 2m whichever is the lesser in any case.	

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328	3/6.5.2.1	Question	brackets	2007/3/23	The net thickness of web stiffeners and brackets are not to be less than the minimum net thickness of primary members on which they are fitted. The situation is the following one: for capesize with usual length of 275m, tmin net is 10mm. Thus tgross is ranging from 13 to 14mm due to tc of about 3 to 4mm. For primary members of wider height such as Top side frames and hopper tank frames, web stiffening are made of angles instead of flat bars. Usual angles or T shape sections have web thickness not exceeding 12mm and the current requirement can't be complied with. Additionally, there are two requirements which are applicable at C6.S2. 4.1.1 and 4.1.2. Our request: Alter the formula in C3.S6 5.2.1 to limit the tgross thickness to 12mm or restreint its field of application to only flat bars or disregard C3S6 5.2.1 should C6.S2. 4.1.1 and/ or 4.1.2. been satisfied.?	We agree with you that the requirement asking that "the net thickness of web stiffeners and brackets are not to be less than the minimum net thickness of primary members on which they are fitted" seems quite severe. Our interpretation is that "the net thickness of web stiffeners and brackets are not to be less than the minimum net thickness defined in Ch 6, Sec 2, [2.2.1]", i.e. the minimum thickness of ordinary stiffeners (3 + 0.015 L2). We will consider the Rule Change according to our interpretation	
329	Ch 3/ 3	Question	cargo hold	2007/1/12	Corrosion deduction on cross deck beams between hatches: As per corrosion deduction table – Dry bulk cargo hold area with other members in upper part - the corrosion margin is 1.8mm on each side, i.e. 4.5 mm in total. Such corrosion margin for deck beams seems too severe. Is use of this corrosion margin mandatory or may an alternative be used?	CSR doesn't allow to use an alternative for corrosion addition table. The corrosion additions are to be considered as being mandatory.	
330	3/6.6.4.2	Question	UR S18	2007/1/12	The net thickness and material properties of the supporting floors and pipe tunnel beams are to be not less than those required for the bulkhead plating or, when a stool is fitted, of the stool side plating. This requirement is similar to that of UR18 in case where there is no lower stool. CSR extends it to the case where a lower stool is arranged. This extension could lead to up to +4mm for floors underneath deep tank stools on capesize bulkers whereas all assessments show that it is not necessary. Is this requirement possible to excuse when FEM calculation is satisfied? It should be cancelled, at least for L>150m for which FE is mandatory.	In general CSR doesn't allow alternative analysis. Alternative analysis such as direct calculation could be allowed in some cases for ships greater than 150 m in length. However, it is a general question for the totality of CSR (oil or bulk) and it should be discussed as a general matter.	

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333 attc	3/6.5.2 6/2.2.2 6/2.2.3 6/4.1.5	Question	Web Stiffener	2006/12/18	Web stiffeners of primary supporting members: (1) Because there is no definition for "primary supporting member", the meaning of "web stiffener of primary supporting member" itself is unidentified. Please clarify the definition of "primary supporting members". (2) Please see the attached summary table about rule applications for web stiffeners of primary supporting members based on our understanding. It shows that which requirements should be applied to web stiffeners. Please confirm. (3) We also would like to confirm that whether the web stiffeners fitted on watertight girders, e.g. watertight centre girder and floors, should be applied to the both requirements for primary supporting members of Chapter6/Section4 and for ordinary stiffeners of Chapter6/Section2 or not. (4) If there is any needs to satisfy both requirements for primary supporting members and for members subject to lateral pressure, I would like to know whether the web stiffeners fitted on the watertight bulkheads in the topside tanks and bilge hopper tanks are treated the same or not.	(1) Primary supporting member are defined as: members of the beam, girder of stringer type which ensure the overall structural integrity of the hull envelope and tank boundaries, e.g double bottom floors and girders, transverse side structures, web frames/diaphragms in hopper side tanks, topside tanks, lower stools and upper stools, side stringers, horizontal girders/transverse web frames, hatch side/end coaming. (2) The requirements in Ch 6, Sec2, [2.2] adn [2.3] are not applicable to web stiffeners but to ordinary stiffeners, The only requirements applicatle to web stiffeners in CSR for bulk carriers are the following ones:- Ch 3, Sec6 [5.2.1] for the net thickness of such stiffeners, which refers to the minimum net thickness of the primary members on which they are fitted, i.e. to Ch 6, Sec 4, [1.5.1], and - Ch 6, Sec 2 [4] for the net scantlings of web stiffeners of primary supporting members. (3) The same requirements as stated in (2) above apply to web stiffeners fitted on watertight side girders, centre girders and floors, i.e. Ch 3, Sec 6, [5.2.1]for the net thickness of such stiffeners (and so Ch 6, Sec 4, [1.5.1] and Ch 6, Sec 2, [4]. (4) See our comment in (1) as we consider that stiffeners on these bulkheads are considered as ordinary stiffeners and not as web stiffeners.	Y
337	3/6.10.4.7 & 11/2.2.4.3	Question	S18	2007/2/22	For the weld of corrugations and stool side plating to the stool top plate, only full penetration is accepted in the requirement of Ch 3, Sec 6, 10.4.7. On the other hand, not only full penetration but deep penetration is accepted in the requirement of Ch 11, Sec 2, 2.4.3. It is considered that this requirement is based on IACS UR 18.4.1(a), as follows: The stool side plating is to be connected to the stool top plate and the inner bottom plating by either full penetration or deep penetration welds. Therefore, the requirement of Ch 3, Sec 6, 10.4.7 should be changed to be consistent with Ch 13, Sec 2, 2.4.3 and IACS UR. Please confirm.	We will consider the editorial correction according to UR S18. **Also Included in Corrigenda 5**	
362	3/4.2.4.1	Question	hull girder	2007/3/20	"Longitudinal strength of hull girder in cargo hold flooded condition is to be assessed in accordance with Ch 5 Sec 2." Reference to Sec 1 should also be given for longitudinal strength in hold flooding, which is however limited to BC-A and BC-B. Sec.2 is about ultimate strength of hull girder for ships with length equal to 150 m in length L and above, i.e., including BC-C. Please confirm.	Yes, your understanding is correct.	
363	3/4.2.4.3	Question	cargo hold	2007/2/22	"Bulkhead structure in cargo hold flooded condition is to be assessed in accordance with Ch 6 Sec 4." Sec 4 does not give any requirement for bulkhead structure in flooding scenario. Is this a typo error of Sec 1 and Sec 2?	Yes, it is typo and the correct wordings are "Sec 1 and Sec 2" instead of "Sec.4".	

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388	3/5.1.2.2	Question	PSPC	2007/2/5	Since PSPC has been adopted by IACS as of Dec. 8, 2006, not by IMO, if the Builder and Ship owner agreed not to apply PSPC, is it acceptable to the Class or not?	On 8 December 2006, IMO adopted amendments to SOLAS by resolution MSC. 216(82) which mandate compliance with the new IMO "Performance Standard for Protective Coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers", (IMO PSPC, Resolution MSC. 215(82)). Compliance with the IMO PSPC is required by the IACS Common Structural Rules for Bulk Carriers and for Oil Tankers for ships subject to those Rules which are contracted for construction between ship builder and ship owner on or after 8 December 2006. The relevant Rule references are the following: - IACS CSR for Bulk Carriers Chapter 3, Section 5, 1.2.2; - IACS CSR for double hull oil tankers, Section 6, 2.1.1.2. Therefore, for such ships (i.e. ships subject to CSR) the answer is "PSPC is to be applied if they are contracted for construction between ship builder and ship owner on or after 8 December 2006". For other ships, the answer is that PSPC is to be applied in accordance with IMO Resolution MSC 215(82) and IMO MSC 216(82).	
398 attc	3/6.2.3.1	Question	Structural Design	2007/6/15	According to this requirement, structural members welded to the strength deck or bottom plating is to be made of the same higher tensile steel of strength deck or bottom plating. The same requirement is applicable for non continuous longitudinal stiffeners welded on the web of a primary member contributing to the hull girder longitudinal strength. However, it is not clear which member should be applied to this requirement. Please confirm if our understanding of this requirement is correct as summarized in the attached Table.	Ch 3, Sec 6, [2.3.1] could be considered as the requirements in general. If the stress level due to hull girder bending, in longitudinal member not contributing to hull girder longitudinal strength, should be verified as to satisfy the requirement in Ch 5, Sec 1, [3.1.1], application of the requirements in Ch 3, Sec 6, [2.3.1] might be mitigated. As a matter of opening the door, the word "generally" should be added between "The same requirement" and "is applicable...".	Y
400	3/5.1	CI	Ballast Hold	2007/3/16	1) In CSR for BC, Ch 3, Sec 5, [1.2], there are already mentioned areas which are to comply with IMO PSPC. This means that IMO PSPC shall be applied to all dedicated seawater ballast tanks and void double skin spaces in bulk carriers. Therefore, we believe that the cating for the ballast hold spaces described in [1.4.1] is not related to PSPC, we would like to request the background for the interpretation. (2) Additionally, the ballast hold spaces are keeping in dry condition as other holds in sea-going condition. also, after cargo unloading, the tank bottom will be damaged due to unloading action. Therefore, we would like to recommend that the coating for tank bottom of all cargo hold spaces sahll not be painted as described in [1.3] (3) Furthermore,please clarify whether the partially floodable hold spaces are the ballast hold spaces or mornal cargo hold spaces in respect of coating issues.	(1) Ballast hold used in heavy weather condition and partially floodable holds used in harbour condition for loading/unloading operations are not considered as dedicated sea water ballast tanks and need not comply with IMO PSPC. (2) Regarding [1.4.1], an effective protective coating is not required to inner bottom in ballast hold by the CSR/Bulker. (3) The partially floodable holds used in harbour condition for loading/unloading operations are not to be considered as ballast hold spaces in respect of coating issues.	
403	3/6.10.4.2	CI	Bending Radius	2007/4/10	According to CSR-Bulker Ch.3 Sec.6 [10.4.2], the bending radius R is not less than 3.0 t but using net plate thickness. If the intention is to control cold forming, is it reasonable to use as-built thickness? For sake of clarity, the bending radius R should be defined as the "radius of inner plate surface" as illustrated in Figure 3.6.28.	The intention of this requirement is to control the cold forming. As described in IACS Rec. No.47, the minimum bending radius is 3 x t, where t is the gross thickness. The definition of "R" is defined as he "radius of inner plate surface". Threrefore, we will consider the editorial correction according to your suggestion.	

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414	3/6.1	CI	Cargo hold areas	2007/7/11	Ch.3Sec.6 [1] The requirements in section [6] are only applicable for the cargo hold area. Our opinion is that the subsections dealing with general principles, plating, stiffeners and primary supporting members should also apply to other structures, as we can not find any corresponding requirements in Ch.9. Please advise.	The requirements in Ch.3 Sec.6 are applicable to not only cargo hold area but also other areas, where the application is appropriate, including the areas related to Ch.9 in general, as defined in Ch.1 Sec.1 Table.1. Actually some subsections in Ch.3 Sec.6 specify the requirements to the structures outside of cargo hold area. However where the requirements in Ch.9 should contradict those in Ch.3 Sec.6 the former should govern.	
415	3/6.2.2.5	CI	Plating Thickness	2007/4/2	A change in plating thickness is not to exceed 50% of thicker plate thickness for load carrying direction." Please specify whether the requirement is based on gross or net thickness.	In this case, Plating thickness means the as-built thickness of plating. We will consider the Editorial Change.	
416 attc	3/6.10.5.1 & 3/6.5.2.1	CI	Depth of Stiffener	2007/5/14	Ch.3Sec.6 [10.5.1] and Ch.3Sec.6 [5.2.1]. The requirement "Depth of stiffener is to be more than 1/12 of stiffener length". Case 1: Typical web spacing is (3x800mm) = 2.4meter. A flat bar on longitudinal girder is then required to be 200mm. With a ship length of 200meters, utilizing the interpretation KC#328 in a typical pipe duct (tc=2), the required thickness is (3+0.015x200+2=) 8mm. That is minimum FB 200x8. Current comparable design is FB150x12. Case 2: Wash bulkhead in way of ER with a height of 4.5 m. Minimum height of supporting stiffeners is 375mm. Current comparable design is HP200x9. Q1: Please explain background of these requirements. Q2: With reference to Case1. The minimum required scantling is high and slender. Compared to current design the cross sectional area is smaller, (200x8 =)16cm2 vs. (150x12=) 18cm2. The slender profile will be more prone to tripping . It is also outside the slenderness requirement for ordinary stiffeners listed in Ch. 6 Sec. 2 [2.3.1]. We consider the original scantling to be a better choice. Please advise. Q3: With reference to Case 2. The dimensions required for the wash bulkhead stiffeners will be larger than for a comparable water tight bulkhead. This does not seem reasonable.	A1. The requirement of 5.2.1 has been based on the modified one of the current classification rules, taking into account the net scantling concept. This requirement is provided to ensure the appropriate scantling and rigidity of web stiffener for the purpose of avoiding the buckling of web plate of primary supporting member based on the experiences. Please refer to the attached documents for the background of the requirement of 5.2.1 of Ch 3 Sec 5. A2 and A3: Such stiffeners as described in the question are to be considered as ordinary stiffeners, with application of the full requirements of Ch 6, Sec 2.	Y

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417	Ch 3 Sec 6/ 10.5.1	CI	Bulkhead Stiffener	2007/5/14	The requirement "The net thickness of bulkhead stiffener is not to be less than the minimum thickness required for the considered bulkhead plate" . With reference to KC #328 approved 22/01/07 regarding web stiffeners on primary supporting members. Can the same interpretation be applied to [10.5.1]?	Yes, the same interpretation specified in KC 328 can be applied to [10.5.1]. This interpretation is the following one: It is agreed that the requirement asking that "the net thickness of bulkhead stiffener is not to be less than the minimum net thickness required for the considered bulkhead plate" seems quite severe. The interpretation is that "the net thickness of bulkhead stiffener is not to be less than the minimum net thickness defined in Ch 6, Sec 2, [2.2.1]", i.e. the minimum thickness of ordinary stiffeners (3 + 0.015 L2). We will consider the Rule Change according to our interpretation.	
422	3/5.1.2.2	CI	Measurements	2007/3/7	What is the interpretation of whether under CSR the ballast tanks and the double side skin spaves of bulk carriers is for length of 150m and upwards. CSR say".. For ships contracted the coating of internal spaces subject to the amended SOLAS regulations are to satisfy the requirements of the IMO performance standard". this would indicate that this is applicable to 150 L for both the ballast tanks and the double side skin spaces of bulk carrier; although the CSR for bulk carriers si for 90m and upwards	IMO PSPC is applicable for all ballast tanks of new ships of 500gt above and double side skin spaces of new bulk carriers of 150m above. CSR BC makes IMO PSPC effective for CSR bulk carriers contacted for construction on and after 8 Dec 06. Therefore, under CSR BC, IMO PSPC is applicable for all ballast tanks of bulk carriers of 90m above and double side skin space of bulk carriers of 150m above. If double side skin space is of ballast tank, PSPC is applicable for such space of bulk carriers of 90m above. If double side skin space is of void space, PSPC is applicable to such space of bulk carriers of 150m above.	

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424	3/6.10.4.2, 3/6.10.4.4 & 3/6.10.4.8	CI	definition of corrugation span “l”:	2007/3/9	[Q1] “Note” in IACS UR S18 Figure 2b indicates the following restrictions for the definition of corrugation span “l”: “For the definition of l, the internal end of the upper stool is not to be taken more than a distance from the deck at the centre line equal to: - 3 times the depth of corrugation, in general - 2 times the depth of corrugation, for rectangular stool “ Instead, neither CSR for BC Ch.3 Sec.6 /10.4.4 nor Figure 29 has such restrictions. If the intent of CSR is the same as IACS UR S18, such restrictions should be clearly indicated in the Rules. [Q2] On the other hand, CSR for BC Ch.3 Sec.6 /10.4.4 indicates “For the definition of lc, the height of the upper and lower stools may not be taken smaller than the values specified in [10.4.7] and [10.4.8]”. This is just the opposite from IACS UR S18. Presume that this sentence should read “For the definition of lc, the height of the upper and lower stools may not be taken GREATER than the values specified in [10.4.7] and [10.4.8]”. Please confirm. [Q3] If the restrictions in [Q1] are applicable to CSR, please further advise on the relation 'between the upper stool width at top and maximum 'effective depth for the calculation of corrugation span “lc”. CSR Ch.3 Sec.6/10.4.8 indicates “The stool top of non-rectangular stools is to have a width not less than twice the depth of corrugations”. In this connection, in case of a non-rectangular upper stool has a width at top of 1.5d and height of 3d, where d is the depth of corrugation, how to measure the corrugation span? There may be two options as follows. Which option (or any other else) is to be applied? Option 1: Treat this as a rectangular stool since the width at top is less than 2d, and take into account 2d for the calculation of “lc”. Option 2: Calculate “lc” by linear interpolation between rectangular stool and non-rectangular stool having a width at top of 2d. In case of this example, 2.5d is used for the calculation of “lc”. [Q4] CSR Ch.3 Sec.6 /10.4.2 indicates that the thickness of the middle part of corrugations is to be maintained for a distance from the deck (if no upper stool is fitted) or the bottom of the upper stool not greater than 0.3lc. In case “lc” is adjusted by [Q1], is “0.3lc” to be measured from the upper end of corrugation span “lc” or may be measured from the actual upper stool bottom? Please advise.	The intent of these requirement is the same as IACS UR S18. Namely,for the definition of lc, the lower end of the upper stool is not to be taken more than a distance from the deck at the center line equal to: - 3 times the depth of corrugation, for non-rectangular stool - 2 times the depth of corrugation, for rectangular stool. [A2]Same reply as in [A1]. [A3] Option 1 should be used for calculation "lc". [A4] "0.3lc" should be measured from the upper end of corrugation span "lc". **Also Included in Corrigenda 5**	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
426	3/5.1.2.1	CI	Double side Skin Space	2007/5/14	Ref. Ch. 3 Sec. 5 [1.2.1] "All dedicated seawater ballast tanks and void double side skin spaces are to have an efficient corrosion prevention system (..)" Please advice on below related questions. Q1:Could you please clarify "double side skin spaces". Is this only covering cargo hold area or entire ship? Q2: If a ship is arranged with double side in machinery space enclosing void spaces, should such spaces have corrosion prevention according to [1.2]? Q3: If you have a top wing tank that is a fuel oil tank the new Marpol require that you add a cofferdam toward the side skin, will this then be considered as a double side skin space in bulk carriers? Or when you have fuel oil tanks in the engine room that is, for the same reason fitted with a coffrdam towards the side, is this a double side space in bulk carriers?	A1. Chapter 1 Section 1 [1.1.1] of CSR for Bulk Carrier describe "With bulk carrier ……..and with single or double side skin construction cargo length area …..". Accordingly, the double side skin spaces specified in Ch 3 Sec 5 [1.2.1] are covering the cargo hold length spaces. A2. The double side spaces in machinery space is not necessary to apply to the requirement of [1.2] A3. Yes, such spaces arranged in cargo length area are considered as a double side skin spaces but such spaces arranged in spaces other than cargo length area are not considered as a double side skin spaces.	
429	3	Question	Port ballasting	2009/10/6	Currently CSR Bulk has no requirement/mention of port use ballasting of ordinary dry cargo holds which is a common practice of large bulk carriers typically Capesize. In our opinion, the following items (may not be exhaustive) should be clarified urgently: 1. In the past, acceptable filling height was determined for the given scantlings and based on design formula and criteria for ballast tanks. The same approach may be used in CSR for local plates and stiffeners, hold frames and all internal members, i.e., boundaries of topside and hopper tanks, inner bottom and bulkhead stools. 2. In an extreme case, the hold in question may have to be filled up to the hatchtop, then we definitely should check the strength of various members bounding the hold in question unless it is a dedicated heavy ballast hold. 3. How much dynamic load to be considered? 4. For corrugations and primary support members, scantlings have to be verified by a hold FEA with a separate "intact-harbour" load case because there is no formula for corrugation in intact condition vaide for ships above 150 meters. (Ref. Ch. 6 Sec. 2 [3.2.4]) 5. Any requirements against over filling, alarms, etc. if partial filling? 6. Should tank test be required? 7. What should be stated in the Loading Manual? 8. According to Chapter 3, Section 5 [1.4.1], all internal and external surace of hatch coamings and hatch covers, and all internal surfaces of ballast holds are to have an effictive protective coating. Is Chapter 3, Section 5 [1.4.1] applicable to port filled ballast holds?	We note your comments and requirements for the treatment of port use ballast hold will be included in the rules at a future revision.	
444	3/6.7.2.1	CI	Structural Design	2007/6/11	In Chapter 3, Section 6, [7.2.1] it is stated that "Where the double side space is void, the structural members bounding this space are to be structurally designed as a water ballast tank according to Ch.6. In such case the corresponding airpipe is considered as extending 0.76m above the freeboard deck at side" Does this requirement apply to both scontling and welding design?.	Yes, this requirement applies both to the scantling and welding designs.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
445	3/6.10.4.4	RCP	Span of corrugations	2007/7/11	In Chapter 3, Section 6, [10.4.4]- Span of corrugations", it is stated that "The span lc of the corrugations is to be taken as the distance shown in Fig 29. For the definition of lc, the height of the upper and lower stools may not be taken smaller that the values specified in [10.4.7] and [10.4.8]". On the basis of UR S18-fig 2b and its note, it seems that the word "smaller" could be replaced by "greater".	The intent of these requirement is the same as IACS UR S18. Namely,for the definition of lc, the lower end of the upper stool is not to be taken more than a distance from the deck at the center line equal to: - 3 times the depth of corrugation, for non-rectangular stool - 2 times the depth of corrugation, for rectangular stool. The draft Corrigenda for clarification of this requirement will be issued. **Also Included in Corrigenda 5**	
446	3/6.2.3.1	Question	Hull Girder Bending	2007/6/11	According to the answer of question #208 of IACS CSR KC,is the material of mild steel for the flat bar on the double bottom girders accepted?	It is accepted, provided that the stress level due to hull girder bending in such flat bar complies with the requirements in Chapter 5, section 1, [3.1.1]	
447	3/6.5.2.1	CI	Depth of Stiffener	2007/7/11	The last sentence "Depth of stiffener is to be more than 1/12 of stiffener length". What is the definition of "depth of stiffener"? Does it mean the web height + flange thickness if any?	Answer: In order to be in line woth the Chapter 6,section 2, [2.3] the depth of stiffener should be considered as only the height of its web.	
450 attc	3/6.10.4.7	CI	Net Thickness & Corrugation Flange	2007/5/14	Would you give me a clear interpretation for CSR BC Rule Ch.3 Sec. 6, 10.4.7. The quoted para. is as below. "The net thickness and material of the stool top plate are to be not less than those required for the bulkhead plating above. The thickness and material properties of the upper portion of vertical or sloping stool side plating within the depth equal to the corrugation flange width from the stool top are to be not less than the required flange plate thickness and material to meet the bulkhead stiffness requirement at the lower end of the corrugation." My interpretation is (t_S_TOP)net >= (t_BHD)net and (t_S_SIDE)gross >= (t_BHD)gross. (refer to the attached picture) It is because lower stool side plate has lower corrosion addition that transverse BHD plate. Do I interpret correctly?	First, all the requirement (coming from UR S18.4.1) should be given in net thickness. Secondly, the word "flange" in the text means "flange of the corrugation of the transverse bulkhead". Consequently, the text should be modified as: "The net thickness and material of the stool top plate are to be not less than those required for the bulkhead plating above. The net thickness and material properties of the upper portion of vertical or sloping stool side plating within the depth equal to the corrugation flange width from the stool top are to be not less than the required corrugation flange net plate thickness and material to meet the bulkhead stiffness requirement at the lower end of the corrugation."	Y
498 attc	3/6.5.7.4	Question	Primary Support Members	2007/8/2	A] Where opening is provided, as per the attachment, in primary supporting members such as double bottom girders, etc., should Ch.3, Sec.6, [5.7.4] be interpreted as follows regarding distances between the opening and slot openings for longitudinals ? 1) at the mid-part within 0.5 times of the span of the primary supporting members: l <= d1, d2, d3 and d4, 2) at the ends of the span, l<=0.25x(d1, d2, d3 and d4). [B] If Ch.3, Sec.6, [5.7.4] should not be applicable to the distances between the opening in primary supporting members and the slot openings, isn't there any restrictions to the distances ?	A): Your understanding is correct. You may see Fig.15 of Ch 3 Sec 6 that the example without collar plate in cut-outs is shown. B] According to the 1st sentence of 5.7.5, the reinforcement of such openings is required.	Y

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
502	Table 3.1.4	Question	Steel grade of lower bracket, of hold frames, of single side BCA/BCB bulk carriers	2007/8/2	Steel grade of lower bracket of hold frames of single side BCA/BCB bulk carriers. Reference is made to Chapter 3 Section 1 Table 4. The requirement is originating from SOLAS XII/6.5.3. Please advice if the requirement should be applied to lower bracket web and flange or web plate only.	This requirement is applied to web plate of lower bracket only. It is considered that this answer is an interpretation but there is no change of technical background and no scantling impact. Therefore, in order to clarify this matter, the corrigenda will be issued. **Also Included in Corrigenda 5**	
510 attc	3/6.7.2.1	Question	Upper and Double side Void Space	2007/8/3	In the attached document is a cross section of a DSS-BC shown, which has a void space in the area of the top wing tank to separate a FOT from the side shell. Is this upper part of the void spaces a double side void space according CH3, Sec6, 7.2.1, which has to be treated like a water ballast tank?	the area dashed in red in the attached document should be designed as a water ballast tank, as specified in the text of Ch 3 Sec 6 7.2.1.	Y
534 attc	3/6.6.1.3	CI	Position of the main propulsion machinery	2007/10/23	The position where the main propulsion machinery is seated is normally recessed from the main double bottom structure in engine room. And the baseline of this seating can be located at which the height from the baseline is less than required. Please refer to the sketch as an example (Moulded of this ship is 45m). In this circumstance, we would like to have your confirmation whether the above arrangement is acceptable or not for the SOLAS and CSR points of view. In addition, we would like to have your general interpretation on the above regulations such as the extent of exemption, necessity of bottom damage calculation, etc.	The minimum height for the double bottom is defined in CH9, Sec3, 2.1.2. The proposed arrangement with a reduced double bottom height in way of the main engine is acceptable provided the lateral extent is limited to the M/E breadth and by lateral tight girders for the CSR for bulk carriers view point and provided the Administration agrees for SOLAS view point. The rigidity of the engine seating and the surrounding bottom structure must be adequate to keep the deformations of the system due to the loads within the permissible limits, given by the engine manufactures. In special cases, proof of deformations and stresses may be required.	Y
540	3/6.6.5.2	Question	The bilge keel length	2007/10/19	The last sentence in the 1st paragraph of Ch.3 Sec.6 [6.5.2] reads:" The bilge keel with a length greater than 0.15L is to be made with the same grade of steel as the one of bilge strake." In this connection please confirm that the intermediate flat is not required to be made with the same grade of steel as the one of bilge strake regardless of the length of the intermediate flat.	The intermediate flat is also to be of the same steel grade as the bilge strake and the bilge keel in case of a bilge keel length > 0.15L.	
560	3/6.5.7.2	RCP	Lightenign holes in primary supporting members	2008/4/11	The first sentence of Ch 3, Sec 6, 5.7.2 states: "Where openings such as lightening holes are cut in primary supporting members, they are to be equidistant from the face plate and corners of cut-outs." Even though the above, the distance from the opening to the face plate of the primary supporting member is larger than the ones to the corners of the cuts-out as "a" indicated in Fig 15. At the same time, the location of the opening is restricted by the note, "h<=d/2", as indicated in Fig 15. We consider that this requirement is obviously impractical. Therefore, the word "the face plate and" should be deleted from the 1st sentence of 5.7.2. Furthermore, we would like to confirm the following: (a) this requirement is not applicable to the access hole; (b) "phi" in the figure means the width of the lightening hole, not the height of the hole; (c) even if the arrangement of holes in primary supporting member does not meet Ch 3, Sec 6, 5.7.2, it can be accepted based on the results of DSA.	We will consider a rule change with considering your comment. The answers to the items (a) to (c) in the question are as follows. (a) This requirement is not applicable to the access hole. (b) “phi” is the diameter of lightening hole, neither height nor width of openings. (c) As there are too many locations to be assessed, it is considered impracticable to determine the arrangement by FEA. Therefore, the arrangement of holes in primary supporting member meets this requirement as a principle. However, since it might be possible to determine the arrangement of hole in primary supporting member based on the results of FEA, it could be accepted based on the FEA at the discretion of the Classification Society.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
564	3/6.8.3.1	Question	Side Frames - General	2007/11/2	Reference is made to Ch. 3 Sec. 6 [8.3.1] Side frames – general This requirement is originating from UR S12.5. In CSR the formula states r= 0.3 x (..) while in UR S12.5 r = 0.4 x (..). Is this a typo? If not, what is the reason for the formula change.	We will consider the rule change in order to be in line with IACS UR S12. **Also Included In Corrigenda 5**	
590 attc	3/6.5.4.1	Question	Definition of Attached platins of primary members	2008/5/28	The main concern is on the definition of ATTACHED PLATINGS of primary members (girders/ webs etc). I have been using a LOGICAL spreadsheet to calculate the Effective width of attached plating for Primary members (as for secondary members the effective width is the normal frame spacing and is well defined).The spreadsheet I have been using for the same is attached for your reference. Based on the Latest ABS CSR 2006 requirement the definition says…" effective breadth of attached plating of primary supporting member to be considered in the actual net section modulus for the yielding check is to be taken as the mean spacing between adjacent primary members." This would mean that the primary would be stronger if the spacing of the primary is higher (in some cases). I have attached a case study on the Effective Width of plating considered based on IACS requirement and earlier Ship Rules. The summary is also attached in the same. I would request if you could arrange to clarify my little query on the same.	The definition of the effective breadth in CH3, Sec6, 5.4.1 is an antagonism to the definition, given in CH6, Sec4 Symbols. In this paragraph it is clearly stated that the effective breadth b_p is defined according CH3, Sec6, 4.3, which is b_p = min(s, 0.2l). The definition given in CH3, Sec6, 5.4.1 will be corrected accordingly.	Y
598	3/6.6.3.3	Question	Ordinary stiffener spacing	2008/1/10	According to CH3, Sec6, 6.3.3 a spacing of MIN (4.5m; 5x ordinary stiffener spacing) is required DB side girders in case of longitudinal framed double bottom. According to the GL rules and our experience, a spacing of maximum 2x ordinary stiffener spacing is appropriate in the strengthening forward area of a vessel. According CH9, Sec1, 5.4.1. the spacing "S" is not limited. is this limitation missing for the strengthening forward part?	In CSR of BC, the scantlings of girders and floors in the strengthened bottom forward are determined by the scantling formulae which in turn define the spans and spacing of the floors and girders. Therefore, by using the scantling formulae, there is no need to separately define the spacing of the girders and floors in the strengthened bottom forward.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
612	3/6.9.6.3 & Figure 3.6.25	Question	Extreme corners of end hatchways	2008/5/30	[Q1] C3S6[9.6.3] reads in its 3rd last paragraph: "For the extreme corners of end hatchways,…" Please clarify the location of "the extreme corners of end hatchways". [Q2] According to C3S6[9.6.3], for the extreme corners of end hatchways, the thickness of insert plates is to be 60% greater than the actual thickness of the adjacent deck plating. Is this requirement also applicable to hatch corners with the elliptical or parabolic profile? [Q3] For the dimension requirements of hatch corner inserts as specified in Fig.25 of C3S6[9.6.3], is this requirement also applicable to the corner inserts with the elliptical or parabolic profile? If yes, how to determine the value of "R" as indicated in Fig.25 for the elliptical or parabolic profile? [Q4] With regard to the question [Q3], since the required material class of hatch corner plating is Class III and that for adjacent deck plating is Class II, the insert plate may be required in some cases even if the corner profile is an elliptical or parabolic profile. In this case, are there any dimension requirements for such inserts? Are the requirements in Fig.25 of C3S6[9.6.3] applicable and if yes, how is the value of "R" shown in fig. 25 determined?	[A1] The extreme corners of end hatchways are: a) the fore end hatch corners of foremost hatch, and b) the aft end hatch corners of aftmost hatch. [A2] Please refer to 4th paragraph in Ch.3 Sec.6 [9.6.3] which reads:"For hatchways...insert plates are, in general, not required .....where the plating cut-out has an elliptical or parabolic profile and the half ....● twice the transverse dimension, in the fore and aft direction." According to this paragraph "60% greater" requirement needs not be applied if the afore-quoted condition of 4th paragraph is satisfied. In case the condition is not satisfied a strake or an insert plate containing the hatch corner needs to comply with the requirements of thickness in [9.6.3] including "60% greater" requirement. [A3] Dimension requirements of Fig.25 needs not be applied to the elliptical or parabolic profile which complies with the half axes and half lengths requirements of 4th paragraph of C3S6[9.6.3]. In case the foregoing 4th paragraph requirements are not satisfied a strake or an insert plate containing the hatch corner needs to comply with the dimension requirements of Fig.25. In such a case the starting points of d2 and d3 are to be taken from the radii's ends of the elliptical or parabolic profile. [A4] Please consider separately the steel grade from insert plate. In case a strake or an insert plate within 0.4L amidship includes the hatch corner, grade III or grade E/EH is to be applied. In case a strake or an insert plate does not contain the hatch corner and is not the stringer plate, grade II is to be applied. Dimension requirements for insert plate need not be applied to an elliptical or parabolic profile which complies with half axes and half length requirements of 4th paragraph of C3S6[9.6.3]. Fig.25 needs to be applied only when insert plate is required by [9.6.3].If elliptical or parabolic profile does not satisfy the requirements of half axes and half length requirements, a strake or an insert plate containing the hatch corner needs to comply with the dimension requirement of Fig.25. Then the steel grade of the strake or the insert plate within 0.4L amidship to be III or grade E/EH.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
614 attc	3/5.1.2.1	Question	Coating requirements of double-side skin spaces of bulk carriers	2008/5/6	Comment to the answer, A3 of KC#426 Since coating requirements of double-side skin spaces of bulk carriers in regulation 3/5.1.2.1 of CSR for Bulk Carriers are developed based on the former SOLAS regulation XII/6.3, definition of "double-side skin" should be in accordance with SOLAS regulation XII/1.4. ***quote*** Former SOLAS Regulation XII/6.3 (Resolution MSC.170(79)) Double-side skin spaces and dedicated seawater ballast tanks arranged in bulk carriers of 150 m in length and upwards constructed on or after 1 July 2006 shall be coated in accordance with the requirements of regulation II-1/3-2 and also based on the Performance standards for coatings* to be adopted by the Organization. SOLAS Regulation XII/1.4 (Resolution MSC.170(79)) Double-side skin means a configuration where each ship side is constructed by the side shell and a longitudinal bulkhead connecting the double bottom and the deck. Hopper side tanks and top-side tanks may, where fitted, be integral parts of the double-side skin configuration. ***unquote*** Accordingly, the said regulation 3/5.1.2.1 is only applicable to void spaces when located within cargo length area in bulk carriers of double-side skin construction. Therefore, the asked void spaces arranged as a part of top-side tank, when provided in bulk carriers of single-side skin construction, need not to be considered as a double-side skin space. The attached interpretation would be effective to the amended SOLAS regulation II-1/3-2 (resolution MSC.216(82)). Please clarify the above again.	We agree to your interpretation.	Y
617	3/1.2.3.9	CI	Welded attachments on hull plating	2008/5/30	Ch3, Sec1, 2.3.9 states as below; "Rolled products used for welded attachments on hull plating, such as gutter bars, are to be of the same grade as that used for the hull plating in way." Is it applicable to small members, such as coaming plates fitted around mooring winch on upper deck? Please clarify the applicability of this requirement.	This requirement applies to the longitudinal members attached to hull plating except internal members and which are considered in the longitudinal strength calculation such as gutter bars.	
630	3/6.9.2.3	CI	Cross deck beams	2008/6/19	Regarding Ch.3, Sec.6-9.2.3, the following question and suggestion are offered for reply. 1. The passage says, '…, beams are to be adequately supported by girders and extended up to the second longitudinal from the hatch side girders towards the bulwark'. Clarification of the beams is requested as to whether it means hatch end beam only or ordinary cross deck beams inclusive. A bulwark is not always arranged hence rewording such as 'deck side' is suggested. 2. In case that ordinary cross deck beams are inclusive, the paragraph does not seem to reflect practical design. It is therefore proposed that the extension of beams up to the second longitudinals…can be waived provided a direct strength analysis in compliance with the requirements in Ch.7 be found satisfactory.	A1: The continuity of structures and integration is the purpose of this section. Base on the original intention, it is considered that the beams means not only hatch end beams but also cross deck beams. We agree to editorial correction that bulwark is changed to deck side. A2: As mentioned by the questioner, this requirement does not seem to match the recent practice of design. We will consider the rule change proposal in order to match the practical design.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
638 attc	3/3.1.2.1 & Table 3.3.1	CI	Corrosion addition for ballast water tanks	2008/4/22	Regarding corrosion addition for ballast water tank within 3 m below the top of tank in Table 1 in Ch.3, Sec.3 of CSR BC Rule, our interpretation is that it should be applicable only to ballast tanks with weather deck as the tank top. This interpretation is in line with Table 3 of Technical Background on Corrosion addition and Note 1. of Table 6.3.1 of CSR for Double Hull Oil Tanker Rule. Please confirm if our interpretation is correct. According to Table 3 of the attached Technical Background, the corrosion value of 1.7 is shown for topside tank in WBT when the tank is subject to high temperature. The high temperature is expected for the members in ballast water tank with weather deck as the tank top. Therefore, a tank top of WBT which is not weather deck, e.g. the tank top of WBT(APT) below steering gear room, should be treated not as 'within 3 m below the top of tank' but as 'elsewhere' in Table 1 in Ch.3, Sec.3 of CSR BC Rule. In addition, if this interpretation is acceptable, an answer of KC ID 206 (corrosion addition of hopper side tank not connected to top side WBT) should be re-considered.	We examined the thickness measurement data regarding the position of structural members in bilge hopper within 3m below from the tank top. As the result, the corrosion diminution of structural members within 3m below from the tank top was not different from other than those. Therefore, we will consider the rule change proposal based on the results of the examination. Accordingly, we will modify the answer in KC ID 206	Y

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
646	Figure 3.6.2	RCP	Span length definition for ordinary stiffeners	2008/5/28	Reference is made to Chapter 3 Section 6 Figure 2 “Span length definition for ordinary stiffeners.” The span l of ordinary stiffeners is to be measured as shown in Figure 2, Ch.3 Sec.3 4.2.1. The fourth sketch of Figure 2 indicates that the span length on one side is to be related to the end bracket fitted on that side and on the other side related to the depth of the web stiffener fitted on the other side. There is no indication in the figure that the span reduction should be symmetrical, which implies that an unbalance moment will be set up at the support. There is, however, not found any requirement in the rules that may ascertain that the unbalance moment can be supported by the web stiffener or the girder. There is also not found any requirement formulation that ensures that the rotational stiffness of such a support is such that the unbalance moment will be generated. Proposal: Sketch 4 of Figure 2 in Ch.3 Sec.6 4.2.1 is amended to show that the span reduction on either side is not to be taken larger than the smaller of the span reduction by the bracket and the depth of the web stiffener. Refer also to CSR Tank Figure 4.2.2 b)	We will review your question and proposal in the course of harmonization process with CSR for Tanker.	
647 attc	3/6.5.2.1	RCP	Web Stiffeners on primary supporting members	2008/5/13	Applicable requirements to Web stiffeners on primary supporting members. Reference is made to KC 204/328/333/416/419 which all considers the requirements to web stiffeners on primary supporting members. We have looked into the above 5 KC items in order to gain a complete overview. To us it seem like the some of the KC is out of date and some are contradictory. Summary of our findings is enclosed in Excel spreadsheet. Based on the summary findings, we would like KC to clarify and update the rules on the following items: 1.Update if Ch.3Sec.6 with clear definition of web stiffeners with clear sketches showing the arrangement and table referring to applicable requirements. (KC also refer to buckling stiffeners.) 2.Update of Ch.3Sec.6 with clear definition of ordinary stiffeners with sketches and table referring to applicable requirements. 3.Ref. KC id416 where PT advice that Ch3Sec.6 5.2.1 is ..”to ensure the appropriate scantling and rigidity of web stiffeners for the purpose of avoiding the buckling of web plate(..)”. If the buckling stiffeners are calculated for buckling according to Ch.6 Sec.3 and minimum scantlings according to Ch.6 Sec.2, can the requirement of Ch.3 Sec. 6 5.2.1 be waived? If so, this should be clearly written in the rules. 4.Please delete/consolidate above 5 KC items in order to avoid future confusion.	The answers given to all KC items relevant to this subject (scantlings of web stiffeners - KC 204/328/333/416/419) are considered are being self-explanatory. However, the following is reminded: 1 - It is clearly mentioned in Ch 3, Sec 6, [5.2.1] that this requirement applies to stiffening arrangement of primary supporting members. No additional sketch or definition is needed. 2 - In addition, the answer to KC#419 states clearly that web stiffeners of primary supporting members are not to be considered as “ordinary stiffeners”. 3 - Then both the answers (b) in KC#204 and (2) in KC#333 states that only the following requirements are applicable to web stiffeners: - Ch 3, Sec 6, [5.2.1] for the net thickness of such stiffeners, which refers to the minimum net thickness of the primary members on which they are fitted, i.e. to Ch 6, Sec 4, [1.5.1],and - Ch 6, Sec 2, [4] for the net scantlings of web stiffeners of primary supporting members. In conclusion, we agree that all the KC items on this matter should be consolidated in a future corrigenda	Y
661	3/6.6.5.2	RCP	Net Thickness of the intermediate flat	2008/5/9	Ch3, Sect6,6.5.2 of the subject rules states "The net thickness of the intermediate flat is to be equal to that of the bilge strake. However, thickness may generally not be greater that 15mm." It is understood that the 15mm maximum should be the 'as-built' thickness, in keeping with previous rule sets. We propose the following corrigenda to clarify this: "The net thickness of the intermediate flat is to be equal to that of the bilge strake. However, the gross thickness need not be greater than 15mm."	Yes, the 15mm maxumum should be the "as-built' thickness. We will consider the editorial correction in order to clarify this.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
674	3/6.7.2.1	CI	DSS BC	2008/4/24	In case of a DSS BC which hopper and double side space forming a single sea water ballast tank, whereas the topside tank is a dry compartment, we have the following question: 1 - In relation to KC#510, should this topside tank be considered as a water ballast compartment for the purpose of net scantling and fatigue assessment? In case of yes: 2 - Should this topside tank be considered as a separated water ballast tank or continuous with the double side tank? 3 - Since it is for the purpose of NET scantling, does that mean that corrosion thickness tc should be considered as that of the actual dry compartment instead of the virtual water ballast compartment?	Answer or Interpretation: A1- The topside tank in this case (dry compartment from the water ballast tank in double side space) should be considered as a dry compartment since it is physicaly separated from the double side space. A2- Not relevant A3- It is considered as a dry compartment for corrosion addition tc as similar to the design principle specified in Ch 3 Sec 6 7.2.1.	
689	3/6.7.2.1	CI	Where the double side space is void	2008/5/28	Chapter 3 Section 6 Par 7.2.1 states as follows: "Where the double side space is void, the structural members bounding this space are to be structurally designed as a water ballast tank according to Ch 6. In such case the corresponding air pipe is considered as extending 0.76 m above the freeboard deck at side." Is therefore to be interpreted that in fatigue calculations, performed according to Chapter 8, these spaces are to be considered void? This is reasonable because such spaces are actually void in operating conditions. If confirmed, it could be useful to give explicit mention of this in Ch 3 Sec 6 Par 7.2.1.	Where the double side space is void, the requirement in Ch 3, Sec 6, [7.2.1] is clear enough as it requires only the application of Ch 6 as water ballast tank and doesn't require anything for fatigue. It is confirmed that these spaces are to be considered as void for the fatigue assessment.	
701	Table 3.3.1	Question	Corrosion addition on one side of structural members	2008/5/28	Ch3 Sec3, Table 1 regulates the corrosion addition on one side of structural members. Please advise which corrosiion addition in Table 1 should be applied to the inner side of hollow pillar.	A hollow pillar or the space behind a shedder or gusset plate is airtight closed. This means that oxygen will be dissipated in the first corrosion process and will be not replaced by new one. This is different from void spaces, where irregular inspections are carried out through man holes. Therefore, the corrosion addition for the inside of a hollow pillar and gusset or shedder plate is to be taken equal to 0.5mm as a void space.	
702 attc	3/6.4.5.2	Question	Ordinary stiffeners	2008/5/30	Ch3 Sec6, 4.5.2 regulates as follows; Where ordinary stiffeners are cut at primary supporting members, brackets are to be fitted to ensure structural continuity. In this case, the net section modulus and net sectional area of the brackets are to be not less than those of the ordinary stiffener. Please confirm the definition of “the net section modulus and net sectional area of the brackets” as follows. 1. The section of the bracket and the stiffener; 1-a. at the end of the stiffener. 1-b. at the mid-point of the free edge of the bracket. In case 1, is the snipped flange of the stiffener included in the calculations? 2. The section of the bracket; 2-a. normal to the free edge of the bracket. 2-b. at the end of the stiffener. 2-c. attached to the stiffener. 2-d. smaller of 2-b and 2-c. (Refer to the attached sketch)	When web and/or flange of stiffener is welded to primary supporting member (1-a) may be taken. For other cases (2-b) should be taken.	Y

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
711	3/1.2.3.3	CI	Steel grade of bedplates	2008/5/28	Technical Background document says that Ch.3, Sec.1-2.3.3 is derived from BV Rule Part B, Ch.4, Sec.1, Note 2 of Table 3. The requirement of Ch.3, Sec.1-2.3.3 is, however, different from the latest BV Rule, saying: 'The steel grade of bedplates of seats for propulsion and auxiliary engines inserted in the inner bottom is not to be less than A/AH for plate thickness lower than 40 mm. For plate thickness greater than 40 mm, different grades may be required by the Society on a case by case basis'. Hence the requirement of CSR BC Rule should be interpreted as same as the latest BV Rule. Please confirm...	The requirement in CSR is correct. Referring to Class I (Tab3),it means that A/AH is required for thicknesses up to 30 mm, then B/AH up to 40 mm and D/DH up to 50 mm. In BV Rules it was required A/AH up to 40 mm and requirement "on a case by case basis" above 40 mm. We think that the requirement in CSR-BC is more clear and more easily applicable.	
720	3/1.2.3.9	Question	Grades of steel	2009/6/2	What kind of plate member shall be considered here ? Is it also applied to small plate members such as oil spill coaming at mooring winches?	This requirement applies to the longitudinal members attached to the outside plating of the hull and which have lengths greater than 0.15L such as gutter bars. For example, an isolated oil spill coaming at mooring winches is not in the range of the application.	
756	3/6.5.2.4	RCP	Symbol missing in the 2nd Formula	2008/5/30	A symbol, b, is missing in the 2nd formula in Ch3 Sec6, 5.2.4. Ch3 Sec6, 5.2.4. requires the arm length of tripping brackets, where originates in 4.7.6, Section 3, Chapter, 4, Part B of the BV Rules. Please correct it.	This is a typo. we will consider the editorial correction.	
758 attc	3/6.6.1.3	CI	Minimum height of double bottom	2008/7/16	1st sentence of Ch 3 Sec 6 [6.1.3] requires the minimum height of double bottom. There are attached designs where the double bottom height varies according to the transverse locations. This is due to that bottom shell is not kept flat over the extent of inner bottom width. Please advise whether the foregoing requirement means: a) only double bottom height at centerline (h_CL) is to be kept to be not less than B/20 or 2m whichever is lesser, or b) B/20 or 2m whichever is the lesser is to be kept over the extent of inner bottom width including h_s.	The double bottom height h, measured vertically from the plane parallel with keel line to inner bottom, is not to be less than B/20 or 2 m whichever is the lesser. However, in no case is the value of h to be less than 760 mm.	Y
760	3/6.5.2.1	CI	web stiffners	2009/3/3	Applicability of minimum thickness requirement to web stiffeners: Regarding applicability of minimum thickness requirement to web stiffeners, the type of web stiffeners is referred at the end in the question in KC328, however, the answers in KC328 and KC647, relevant to KC328, are not clear to web stiffener type. The requirements of minimum thickness of web stiffener are as follows; -Ch3 Sec6, 5.2.1 : minimum net thickness of primary support members, referred to Ch6 Sec4, 1.5.1. -Ch6 Sec2, 2.2.1 : minimum net thickness of web of ordinary stiffeners The types of web stiffeners are as follows; - Flat bar type - Angle or T type Please clarify the applicability of the above two requirements to the two types of web stiffeners.	Ch 3 Sec 6 [5.2.1] is only applicable to web stiffener with flat bar type. The minimum net web thickness for web stiffener with angle or T type is to be not less that that for ordinary stiffener specified in Ch 6 Sec 2 [2.2.1].	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
761	3/6.5.6.2	CI	end bracket hight of primary support members	2009/6/26	Ch3 Sec6,5.6.2 requires that the end bracket height of primary support members should be not less than that of the primary supporting member. With reference to the interpretation of KC414, the requirements in Ch3 Sec6 are applicable not only cargo hold area but also other areas, where the application is appropriate. Please confirm whether the above requirement in Ch3 Sec6,5.6.2 is applicable to side transverse web in steering gear room. If applicable, providing large bracket according to the above requirement interrupts the arrangement of fittings in steering gear room.	The mandatory requirements for the scantlings of the end connection is given with the sentence "The scantlings of end brackets are to be such that the section modulus of the PSM with end brackets is not less than that of the PSM at mid-span". An editorial change will be made by introducing the word "generally" in the sentence in Ch3 Sec6,5.6.2, stating that "the height of end bracket is generally to be not less than that of the primary supporting member".	
762	3/6.6.3.1	CI	centre girder	2009/3/3	Ch3 Sec6, 6.3.1 requires tightness of center girders as follows: Where double bottom compartments are used for the carriage of fuel oil, fresh water or ballast water, the centre girder is to be watertight, except for the case such as narrow tanks at the end parts or when other watertight girders are provided within 0.25B from the centreline, etc. With reference to “etc” at the end, it seems that the CSR permit non-tight center girders under specific conditions. Please indicate the conditions in which non-tight center girders are permitted.	The word "etc." means the case of small watertight compartments that free surface effects thereof are considered very small, compared with the arrangement specified in this requirement.	
765	Text 3/6	Question	continuity of strength	2009/3/3	Please confirm that the requirements in Ch3 Sec6 are not required to be applied to areas other than cargo hold area, provided there is no cross reference to Ch3 Sec6 in the requirements to those areas specified in the relevant chapters, such as Ch9, etc	According to Ch 3 Sec 6 [1], the requirements of this section apply to the cargo hold area. For other areas, the requirements of Ch 9 Sec 1 to Ch 9 Sec 4 are to be applied. In fact some requirements are applicable in the whole ship, e.g. CH3, Sec6, 5.1.1 "Continuity of strength". We will make a rule change proposal in order to clarify the applicability of this chapter.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
769	Table 3.1.4	RCP	Application of material classes and grades	2008/10/15	With respect to CSR-BC, Ch.3, Sec.1, Table 4: Application of material classes and grades, it is proposed that the following parts in Special structural member category be editorially corrected. 1. The terms, 'ore carriers' and 'combination carriers' are inapproriate in view of the application set out in Ch.1, Sec.1, 1.1.2 where these ships are cleary ruled out. The text being a transcription from C5 in Table 1 as available in IACS URS6, Rev.5, this column should be more appropriated to CSR bulk carriers hence can only be changed to 'Strength deck plating at corners of cargo hatch openings (2)'. 2. The bottom of the category specifying 'End brackets and deck house transition of longitudinal cargo hatch coamings (5)' is most likely to be proper to container ships and not to bulk carriers. Should this be the case, please delete this column. If this should not be the case and applicable to CSR bulk carriers, clarification is requested as to whether the column refers to end brackets of discontinuous hatch side coamings having the length less than 0.15L. Otherwise, grade D/DH would be irrationally mandatory even for small bulk carriers.	1. We agree to your proposal. 2. Our understanding is that the bottom column of table 4 is applicable to bulk carrier having the longitudinal hatch coamings of length greater than 0.15L. This is in line with the third column from the bottom of the table. In order to clarify these items and to cover the revision of IACS UR S6 Rev. 5, we will consider the RCP.	
772	3/6.8.6.1	Question	brackets supporting longitudinal stiffeners	2008/10/15	According to Ch3 Sec6, 8.6.1 of Bulker CSR, brackets above the side frames in every frame space are fitted to ensure structural continuity. Consequently at least one side of the lowest longitudinal stiffeners on topside slant plates are normally supported by the brackets in every frame space. Please clarify how to take into account the effect of such brackets supporting longitudinal stiffeners with a view to determining the longiudinal stiffener span.	Span,"l", is the spacing of bracket or the distance between the transverse web in bilge hopper tank or topside tank, as applicable, and the adjacent bracket, when applying the formulas in Ch.6, Sec.2,[3.2.3], [3.2.5] or [3.2.7]. Please note that spacing, s, is to be a half longitudinal spacing between the adjacent longitudinal plus the half distance between the longitudinal and the connection of topside tank/bilge hopper tank sloping plate and side shell.	
773	Table 3.3.1	RCP	Corrosion addition in way of a WBT	2008/10/10	This issue relates to the application of Table.1 in Ch3 Sec3 with respect to the corrosion addition in way of a WBT (particulary, Top Side Tank) within 3m of the tank top. If only the part of face plate of an ordinary stiffener is located within 3m of the tank top while the web plate of the ordinary stiffener is located outside 3m from the tank top, which corrosion addition applies to such a stiffener? (1) Corrosion addition in way of a WBT within 3m of the tank top, or (2) Corrosion addition in way of a WBT oustside 3m from the tank top. Please clarify it.	According to the 2nd sentence from the bottom of Ch 3 Sec 3 [1.2.1], where a streuctural member are affected by more than one value of the corrosion addition, the scantling criteria are generally to be applied considering the severest value of corrosion addition applicable to the member. This is a general principle. Normally, the location of stiffener is judged from the coordinate at the conection of the attached plate. Therefore, for the case in question, corrosion addition in way of a WBT oustside 3m below the tank top. In order to clarify this, we will consider the RCP.	
777	Tanker 12/1.1.3 & Bulker 3/2.3.3	CI	as-built thickness	2009/5/19	The plans to be supplied onboard the ship are to include both the as-built and the renewal thickness. Does this mean all thicknesses on all drawings shall include as-built and renewal thickess ? Is it sufficient that renewal thickness are shown on main drawing or in a separate document?	The submitted structural drawings (Section 3, 2.2.2.1, (a) & (c) in CSR-Tankers and Ch 3 Sec 2, 3.3 in CSR-BC) is to show renewal thickness and as-built thickness. Any owner's extra thickness is also to be clearly indicated. For the plans to be supplied on board the ship, see Section 3/2.2.3 in CSR-Tankers. Alternatively, it is acceptable to present renewal thickness in a separate plan ("Renewal thickness plan") in which the as-built thickness may not be presented, and any owner's extra thickness is also to be clearly indicated. This plan is to be approved and supplied on board the ship.	
780	3/6.8.2.1	Question	air pipes	2009/3/3	The 2nd sentence in Ch.3 Sec.6 [8.2.1] reads: " If air pipes are passing through the cargo hold, they are to be protected by appropriate measures to avoid a mechanical damage." Please advise what the appropriate measures are.	Appropriate measures to avoid mechanical damages to air pipes passing through the cargo hold should be subjected to the Class Society.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
786	3/6.4.1.1	Question	bulb profile	2008/9/10	In CSR-BC, Ch 3 Sec 6, [4.1.1], the thickness tw of the web of the built-up section equivalent to a bulb profile is not defined. We assume that the thickness of the web is taken equal to the thickness t'w of the web of the bulb profile. Please confirm our interpretion.	Your interpretation is correct: in CSR-BC, Ch 3, Sec 6, [4.1.1] the thickness tw of the web of the built-up section equivalent to a bulb profile is to be taken equal to the original thickness t'w of the web of the bulb profile.	
787	3/1.2.3	Question	UR S6	2008/9/10	Considering Rev.5 (Sept 2007) of IACS UR S6, it seems necessary to update CSR-BC Ch 3, Sec 1, [2.3] to be in accordance with this revision.	We agree with your comment. The requirements in CSR-BC Ch 3, Sec 1, [2.3] will be updated to be in line with Rev.5 (sept2007) of IACS UR S6.	
794	3/1.2.3.3	CI	top plate of engine seats - material grade	2009/4/1	1.Reference is made to IACS KC ID: 711 regarding the material grade of the top plate of main engine seats inserted into inner bottom. 2.It is understood that a thicker top plate of main engine seats is required to suit securing the engine bolts on installation of a main engine, then, it is considered to be a very local strength item. 3.Consequently it is also understood that Grade A/AH is acceptable for the top plate of the engine seats located outside 0.6L amidships of any plate thickness and the requirement of Ch. 3, Sec.1, Para. 2.3.3 of the CSR BC is applicable to the top plate of the engine seats located inside 0.6L amidships. 4.For information, LR Rules accept A/AH for the top plate of the engine seats outside 0.6L amidships and few damage has been reported for it so far. Most of the classification societies' Rules are understood to be in line with this requirement. 5.A prompt confirmation on Para. 3 as above would be very much appreciated.	This question will be addressed within the harmonisation process of both CSR BC and CSR OT.	
808	3/6.6.4.2	RCP	alignment	2009/3/3	Ch3 Sec6, 6.4.2 requires that the net thickness and material of floors in way of lower stools should not be less than those of lower stool side plating. The requirement originates from the requirement of UR S18.4.1 (c)-"Alignment", which requires the net thickness and material of floors in way of corrugate bulkheads not to be less than those of corrugation flanges, in cases without lower stools. In cases without lower stools, the floor supports bulkhead corrugation and the necessities of equal net thickness and material of the floor are understandable from a structural viewpoint. In cases with lower stools, however, bulkhead corrugation is supported by such lower stools and the floor supports the stool side plating. Accordingly, any connections between lower stool side plating and floors are considered to be continuous enough by assuring equal thickness. Therefore, we would like to request a rule change stating that the material of floors will not be required in Ch3 Sec6, 6.4.2 in cases with lower stools.	This issues are included in RCP4 (Rule Change Notice 1, 2009) which has been reviewed according to PR32.	
817	3/6.5.2.2	Question	tripping brackets	2009/3/10	Ch3 Sec6, 5.2.2 generally requires tripping brackets welded to the face plates. In addition, the last sentence in Ch3 Sec6, 5.2.2 also requires that the face plates of the primary supporting members, which exceed 180 mm on either side, should be supported by tripping brackets. We are of the opinion that the tripping brackets shoud only support the face plate of PSM in case where such face plates exceed either side of the web. Please confirm the above.	Ch.3 Sec.6 [5.2.2] means that the side of the flange should be supported when the size of the side exceeds 180mm.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
827 attc	3/6.7.2.1	CI	void space	2009/3/3	Please refer to the attached sketch of a bulk carrier with double side skin construction. This bulk carrier has FOT and pipe trunk in the topside area. The pipe trunk is considered as void space. Ch3 Sec6, 7.2.1 requires as follows; Where the double side space is void, the structural members bounding this space are to be structurally designed as a water ballast tank according to Ch 6. In the bulk carrier, FOTs are arranged with cargo hold length and the pipe trunk is running through whole the cargo area length. According to our calculation based on the above, the dynamic pressure in the long pipe trunk is estimated about twice the large pressure in FOTs and excessive scantlings are required by the calculation based on the pipe trunk pressure. However, taking into account the technical background of Ch3 Sec6, 7.2.1 as quoted below, requiring the above-mentioned excessive scantling is irrational; If the double side skin part is to be used as a void space, and cargo of high density is to be carried in the cargo holds, then local loads are not presumed to act on the side structure of the cargo hold on the double skin side. Even in such cases, appropriate thickness exceeding the minimum thickness is considered necessary. As a conclusion, even if the double skin side part is a void space, it is treated as a ballast tank and assessment of local strength is specified. In this bulk carrier, the longitudinal bulkhead can be considered appropriately by the estimation of the pressure in FOT. Therefore, we are of the opinion that the longitudinal bulkhead between the pipe trunk and the FOT has an appropriate construction by calculating FOT internal pressure, therefore, the bulk carrier is in compliance with Ch3 Sec6, 7.2.1, without calculation of the pipe trunk internal pressure.	It was not the intention of the CSR to derive irrational dimensions for void bounding structures. We suggest to use the corresponding cargo hold length for l_H in the formula for inertial water ballast pressure. We will make a rule change proposal to eliminate this drawback.	Y
842	3/6.5	Question	curved face plates	2009/7/6	Ch.3 Sec.6 [5] In CSR Tanker rules 4/2.3.4 there is a correction formula for the effective flange area of curved primary supporting members. In CSR Bulk there is no such formula. Does this mean that curved flanges, e.g. in the top wing webs and bilge webs, are to be considered 100% effective?	There is no formula to evaluate the effectiveness of the curved part in the curved flange in CSR –BC. The formula to evaluate the effective breadth or effective area of curved flange is necessary in order to take into account the effect due to cross bending phenomenon. Therefore, this matter should be submitted to the Hull Panel to make a harmonized interpretation. Furthermore, the RCP will be considered in accordance with the harmonized interpretation.	
843	Text 3/6.2.2.5	Question	tapering	2009/6/25	Ch.3 Sec.6 [2.2.5] Change in plating thickness Main machinery seatings are typically more than double the thickness of the inner bottom. In case the seating is included in the double bottom strucure, is the requirement Ch.3 Sec.6 [2.2.5] to be complied with? If this is the case, insert plates will often be required in the inner bottom plating. In our opinion it is sufficient to use tapering in accordance with Ch.11 Sec.2 [2.2.2]. Please advise.	The meaning of "load" in "load carrying direction" in Ch. 3 Sec. 6 [2.2.5] is considered to be of a global type, such as hull girder loads. Where global loads are considered small or can be ignored, e.g. machinery seatings or reinforced openings in bulkhead, tapering according to Ch.11 Sec. 2 [2.2.2] is considered sufficient.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
844	3/6.10.3.4	Question	Stiffener brackets on plane bulkheads	2010/1/18	Ch.3 Sec.6 [10.3.4] The requirement for arm length a for stiffener brackets is very large for long stiffeners not subject to pressure. Example: Bulkhead in engine room between platform deck and upper deck. Length is 5.5 m. 9 mm plating is stiffened with HP140x8 stiffeners. The requirement to the arm length a then becomes 550 mm for the lower brackets and 440 mm for the upper brackets. The actual arm length a is 250 mm. In our opinion the bracket size should be decided based on the required section modulus for the stiffener, not the length. Please comment.	You are right. The bracket size should be decided based on the required section modulus for the stiffener, not the length. We will consider a rule change proposal in order to harmonize CSR for BC with CSR for OT.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
871 attc	3/6.10.4.7	Question	S 18	2009/5/13	See the attached comment/question forwarded by ABS re BC CSR Ch.3/6.10.4.7.	The requirement of Ch3/Sec6/[10.4.7] comes from S18, and is in line with SOLAS Ch. XII - SOLAS/CONF.4-Resolution of the Conference of Contracting Governments to the International Convention for Safety of Life at Sea, 1974- (November 1997) – Resolution3 –Recommendation on Compliance with SOLAS Regulation XII/5 – (Adopted on 27 November 1997). We should keep it as is.	Y
884	Text 3/2.3.3.1	question	net scantling approach	2009/6/24	From a viewpoint of net scantling approach, Ch3 Sec2, 3.3.1 requires that renewal thicknesses of structural members be indicated on the structural drawing. A renewal thickness is defined in Ch13 Sec2 as follows; t_renewal = t_as_built - t_C – t_voluntary_addition On the other hand, superstructures and deck houses required in Ch9 Sec4 are based on gross scantling as indicated in Ch3 Sec2, 2.1.1. Accordingly, it is considered that renewal thicknesses of superstructures and deck houses are not in line with the above definition and consequently follow that specified in each Class Rules. Therefore, we consider it unnecessary to indicate renewal thicknesses of superstructures and deck houses on the structural drawing. Please confirm the above.	Renewal of structures of superstructures and deck houses is to be left to discretion of each classification society. The same goes to all structures listed in Ch.3 Sec.2 [2.1.1].	
885	Table 3.3.1	Question	collision bulkhead & machinery space front bulkhead	2009/8/27	The question is on collision bulkhead and machinery space front bulkhead without upper stool and lower stool. Please confirm that only "Transverse bulkhead"-"Other parts" & "Upper parts" of "Structural member" category, in Ch.3 Sec.3 Table 1,are to be applied to the corrosion addition on cargo hold side of these bulkheads but that "Lower stool sloping plate, vertical plate and top plate" category needs not be applied.	The corrosion addition for lower stool plates intend to deal with the high level of corrosion that takes place within the lower stool space. As there is no lower stool, the corrosion addition to be considered here is the "Transverse bulkhead / other parts".	
920	3/6.10.4.5	Question	corrugated BHD	2009/7/16	In Ch.3 Sec.6 [10.4.5], it is stated that "In general, the first vertical corrugation connected to the boundary structures is to have a width not smaller than typical width of corrugation flange". Q1. We assume that "boundary structures" is side shell plate. Please advise correct interpretation of "boundary structure". Q2. We understand that the width of first vertical corrugation connected to side shell plate is more than typical width of corrugation flange. Please clarify the meaning of above paragraph whether our understading is correct or not.	A1: Boundary structure is the ship side structure. A2: The first corrugation is to be at least as width as a "typical" corrugation of the bulkhead. A larger width is not mandatory.	
926	Text 3/6.4.1.1	question	built-up stiffener	2009/6/24	Ch.3 Sec.6 [4.1.1] Bulb section, equivalent built-up stiffener. It is not clear if the text and Fig.1 are referring to net or gross dimensions of the bulb profile and the equivalent built-up profile. Please clarify if t'w, tw, h'w, bf and tf are net or gross dimensions	t'w, tw, h'w, bf and tf used in Ch.3 Sec.6 [4.1.1] are net dimensions. A corrigenda will be prepared to clarify it.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
931	Table 3.3.1	Question	corrosion addition	2009/7/24	Please clarify the corrosion addition for bilge tank/drainage store tank.	This question has to be considered within the scope of the harmonisation. The position expressed by ABS hereafter will be submitted to the relevant harmonisation team. ABS proposal: Bilge and drainage store tanks would generally contain a combination of oil and water. However, in the extreme case they may contain salt water only. Considering stiffeners of FOT the two sided corrosion addition (without t-reserve) is 1.4mm -> 1.5mm and in the case of a Ballast Tank the two sided corrosion addition would be 2.4mm -> 2.5mm. It is believed that a two sided corrosion addition of 2.0mm to 2.5mm would be appropriate. Considering the amount of the structure to which this would be applied, and "fitting" of this category of tank into the existing categories of compartments it is recommended that these be treated as Ballast Tanks.	
933 attc	3/5.1.3.4	CI	cargo hold painting spec	2009/7/16	We, from HHIC-Phil had a discussion regarding the Painting Specification of our Bulk Carrier which will be constructed in our yard by next year. The Painting Specification was prepared in accordance with the CSR and PSPC Rules together with the paint maker's recommendation and building specification. Regarding this matter we encountered a problem on the interpretation of the CSR for Bulk Carriers on the Transverse bulkhead Areas to be coated. If we apply the CSR strictly, the painting demarcation line of the transverse bulkhead will vary according to the position of the frame end brackets. We would like to request an interpretation of the Common Structural Rules (CSR) regarding the cargo hold painting demarcation line for Single Side Bulk Carrier. Please see the attachment to give us some clarification on the painted areas and no-painting areas of the cargo hold corrugated transverse bulkhead and the likes. Thank You very much in advance. Your kind attention and prompt reply would be much appreciated.	your interpretation is correct.	Y
944 attc	Table 3.1.4	Question	categories of structural members	2009/9/1	Ch.3 Sec.1 Table 4 defines the category of structural member, regarding which, Q1: Is the deck plate strake (Deck Plate 2 in the attachment) in way of hatch side girder to be regarded as of "PRIMARY" category? Q2: The design is provided with longitudinal watertight bulkhead separating the topside space into two compartments. Is the deck plate strake (Deck Plate 1 in the attachment) above longitudinal bulkhead to be regarded as of "PRIMARY" category? Please advise.	Q1: Yes, your understanding is correct and "Deck Plate 2" is regarded as "PRIMARY" category, except that "Deck Plate 2" is to be regarded as of "SPECIAL" category when the strake contains the strength deck plating at the corners of cargo hatch openings. Q2: In the Table 4 "Deck plate at longitudinal bulkhead" is categorized as "SPECIAL". However UR S6 (Rev.4), which is the basis of Table 4, adds the Note [2] to "Deck plate at longitudinal bulkhead" as follows:"Excluding deck plating in way of inner-skin bulkhead of double hull ships". This exception may be applied similarly to the longitudinal bulkhead in the topside space in the attachment. Accordingly "Deck Plate 1" may be regarded as of "PRIMARY" category.	Y

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
945	3/6.9.5.4	RCP	protection of hatches	2009/7/30	We noticed that paragraph 9.5.4 of Ch3, Sec6 is not in line with IACS UI SC208. The requirement stated in the CSR-BC QUOTE 9.5.4 Wire rope grooving in way of cargo holds openings is to be prevented by fitting suitable protection such as halfround bar on the hatch side girders (i.e. upper portion of top side tank plates)/hatch end beams in cargo hold or upper portion of hatch coamings. UNQUOTE leads to the wrong assumption that exclusive protection of hatch girder OR hatch coaming is sufficient.	The correction of this paragraph to be in line with IACS UI SC208 is already included in the RCP2-6". It will be changed as follows: " For ships with holds designed for loading / discharging by grabs and having the additional class notation GRAB[X], wire rope grooving in way of cargo holds openings is to be prevented by fitting suitable protection such as half-round bar on the hatch side girders (i.e. upper portion of top side tank plates)/hatch end beams in cargo hold and upper portion of hatch coamings."	
949	3/5.1.3.4	CI	coating of transverse bulkhead areas	2009/9/3	It is specified in CSR Background Document that the requirements of 1.3.3 and 1.3.4 are in accordance with UR Z 9. According to 1.3.4, some area of transverse bulkhead (below horizontal level located at distance of 300 mm below the frame end bracket for single side bulk carriers or below the hopper tank upper end for double side bulk carriers) may not be coated. But according to UR Z 9, all area of tranverse bulkhead including stool are to be coated. Please clarify the coating area. Quote: UR Z 9 ~ and all internal surfaces of the cargo holds, excluding the flat tank top areas and the hopper tanks sloping plating approximately 300 mm below the side shell frame and brackets, are to have an efficient protective coating ~ Unquote Quote: CSR Bulk Carriers Ch3 Sec 5 1.3.4 The areas of transverse bulkheads to be coated are all the areas located above an horizontal level located at a distance of 300 mm below the frame end bracket for single side bulk carriers or below the hopper tank upper end for double side bulk carriers. Unquote	The coating of transverse bulkhead is to be considered as per Ch.3 Sec.5 [1.3.4] as the requirement of UR Z9 should be applicable to the stool plating, sloped or not.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
950	3/6.10.4.9	CI	welding requirements	2009/9/4	This requirement comes from of UR S 18 like as 10.4.7 and 10.4.8. But I think that the requirement specified below quotations is different from UR S 18. According to UR S 18, full or deep penetration welding can be used for connection between plating of supporting floor and inner bottom. But in Ch 3 Sec.6 10.4.9, only full penetration welding can be used for it. On the other hand, not only full penetration but deep penetration is accepted in the requirement of Ch 11, Sec 2, 2.4.4. Please clarify which type of welding is right. Quote: UR S 18. 4. 1 (c) Alignment At bottom, if no stool is fitted, the corrugation flanges are to be in line with the supporting floors. Corrugated bulkhead plating is to be connected to the inner bottom plating by full penetration welds. The plating of supporting floors is to be connected to the inner bottom by either full penetration or deep penetration welds. Unquote Quote: CSR Bulk Carriers Ch3 Sec 6 10.4.9 At bottom, if no lower stool is fitted, the corrugation flanges are to be in line with the supporting floors or girders. The weld of corrugations and floors or girders to the inner bottom plating are to be full penetration ones. Unquote	You are right: both full and deep penetration welding can be used for connection between plating of supporting floor and inner bottom. The sentence, “The weld of corrugations and floors or girders to the inner bottom plating are to be full penetration ones”, in Ch3 Sec6 10.4.9 will be revised as: Corrugated bulkhead plating is to be connected to the inner bottom plating by full penetration welds. The plating of supporting floors or girders is to be connected to the inner bottom by either full penetration or deep penetration welds.	
952	3/1.2.3.1	RCP	Grades of steel	2009/7/21	Correction of wrong reference number. The last sentence of Ch.3 Sec.1 [2.3.1] states; "For strength members not mentioned in Tab 3, grade A/AH may be used." Please correct the reference "Tab 3" into "Tab 4".	You are right. The strength members are considered in Table 4, not in Table 3. We will prepare corrigenda to correct it as following: For strength members not mentioned in Tab 4, grade A/AH may be used.	
954	3/6.4.4	CI	Ordinary stiffeners - shear section	2009/9/10	For the yielding check of shear sectional area Ash of ordinary stiffeners as required in Ch 6, Sec 2, [3] of CSR-BC, the actual shear sectional area of the ordinary stiffener needs to be calculated. However, it is not stated in CSR-BC (Ch 3, Sec 6, [4.4]) how to calculate the actual shear sectional area of such stiffener, and in particular if the net thicknesses of attached plate and flange, if any, are to be included in this calculation. In CSR-OT (Ref Section 4, 2.4.2.2), thicknesses of attached plate and flange, if any, are included in the determination of the "effective shear depth dshr" used for the yielding check of the shear sectional area. Our interpretation is that both CSRs should have the same approach, i.e. the one of CSR-OT.	It is agreed that the way to calculate the actual shear sectional area of ordinary stiffener should be defined in CSR-BC Ch 3, Sec 6, [4.4]. It is also agreed that both CSRs should have the same approach, i.e. the one of CSR-OT. It means that the thicknesses of attached plate and flange, if any, are to be considered for the calculation of the actual shear sectional area of an ordinary stiffener.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
961	Table 3.3.1	Question	Normal ballast draught	2009/9/3	Definition of "normal ballast draught" According to Ch.3, Sec.3, Table1 Note (7), "Outer side shell between normal ballast draught and scantling draught is to be increased by 0.5mm". We understand that the definition of "normal ballast draught" is same as that in Ch.6, Sec.1 [2.2.1], which has been interpreted as the minimum design lowest ballast waterline amidships in KC ID409. Please confirm the above.	Your interpretation is correct.	
978	Table 3.3.1	Interpretati on	Corrosion addition for lower stool	2010/3/30	Ch3 Sec3 Table 1, Corrosion addition for lower stool Reference is made to KC 243. The corrosion addition for hopper plating is smaller than for the lower stool plating. Our understanding is that the reason for this difference is that the hopper plating is cooled down by the ballast water inside in ballast conditions. The lower stool is normally void, so the lower stool plating will not experience the same cooling effect. Based on the above, it seems reasonable to apply tc=3.7 mm instead of tc=5.2 mm to the lower stool plating if the stool is arranged as ballast water tank. Please confirm our interpretation.	We agree with your interpretation.	
1004	3/6.4.1.1	Question	bulb sections	2009/12/16	In CSR BC, a bulb section may be taken as equivalent to an angle section, which is defined in Ch.3 Sec.6 [4.1.1]. From our experience, for some kinds of bulb sections, the section properties of bulb sections are comparable to those of equivalent angle sections; for others, they are not. For example: the inertial moment about the horizontal neutral axis of a bulb 200x10 1. Equivalent to an angle section, I=1019cm4. 2.Direct method. For Holland Profile, I=1017cm4. For Russian Profile, I=1083cm4. In CSR OT RCN2, the descriptive method, calculating the section properties of a bulb section, is deleted, and a direct method should be adopted. The two set of rules should be harmonized.	Your comment is noted. Ch.3, Sec.6, [4.1.1] will be modified. The following paragraph will be included in [4.1.1]: The sections properties of bulb profiles should be determined by direct calculations. Otherwise... [4.1.1 as it is now].	
1030	3/5.1.4.1	RCP	Protective coating in ballast holds	2010/4/14	Regarding the protective coating in ballast holds, the paragraph of 3/5.1.4 should be deleted in order to be in line with IACS UR Z9. CSR for Bulk Carriers January 2006 Background Document Chapter 3 says that "This regulation (3/5.1.4.1 Protection of ballast hold spaces) is in accordance with IACS UR Z9." And Z9 stipulates the same requirement of protective coating in both ballast holds and other cargo holds, which is equivalent to 3/5.1.3 of CSR BC Rules. However, 3/5.1.4 requires that all internal surfaces of ballast holds are to have an effective protective coating (It is noted that IACS KC 400 exempts inner bottoms in ballast holds.), and are beyond the requirement of Z9. Therefore, 3/5.1.4 should be deleted so that 3/5.1.3 can cover both ballast holds and other cargo holds..	This KC is same as KC400, that is, Ch.3 Sec.5 [1.3] should have be modified to include dry cargo holds which may carry water ballast and [1.4] should be deleted. A corrigenda will be considered.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attach ment
1046	3/6.6.52	Question	Steel grade requirement of Bilge Keel	2010/8/4	CSR-B Ch.3, Sec.6, 6.5.2 Bilge keel The following requirement is to prevent cracks propagated to bilge strakes from these occurred in bilge keels due to longitudinal bending moments. "The bilge keel and intermediate flat are to be made of steel with the same yield stress as the one of the bilge strake." For bilge strakes, even when the use of HT steel is not required by Ch.5, Sec.1, 4.5 for longitudinal strength consideration, HT steel may be used for convenience of design. However, in light of the above, we consider that this requirement may be dispensed with if bilge keels are not located in the HT zones specified Ch.5, Sec.1, 4.5.	Since a large number of comments from shipowners have been received about bilge keel and prevention of damage to its ends, it was decided that the material of the bilge keel should have the same strength as the bilge strake. Similar to long hatch side coamings of 0.15L specified in the IACS UR S6, if the length of the bilge keel is greater than 0.15L, the material of the bilge keel is required to be the same as that of the bilge strake. The material requirement for the bilge keel is also found in Ch3/Sec6/[2.3.1]. The intermediate flat is to be made of steel with the same yield stress as the one of the bilge strake in order to ensure continuity of material.	
1065	3/2.3.3.1	Interpretation	Indication of gross and renewal thickness in the structural drawings	2010/11/15	Refer to Chapter 3/ Section 2. Quoted 3.3 Available information on structural drawings 3.3.1 The structural drawings are to indicate for each structural element the gross scantling and the renewal thickness as specified in Ch 13, Sec 2.2". Unquoted Our understanding of this paragraph could only be interpreted that all structural drawings submitted to the IACS class are to indicate for each structural member the Gross and RENEWAL THICKNESS. We would appreciate if our understanding is correct.	As you mention, Chapter 3 Section 2 3.3.1 states that for each structural member, gross scantling and renewal thickness should be indicated. However, for clarification of extension and alternative methods we refer to KC777, KC948 and KC1058. A common position will be issued by the harmonization project.	
1077 attc	Bulker 3/6.5.7	Question	Depth of cut-outs	2010/11/10	Harmonisation request for depth of cut-outs and naming of cut-outs/slots? (Original request: Please refer to attachment)	Your comment is noted. We will retain your comment for consideration during the harmonisation of the two CSR Rules.	Y

KC#333

Requirements for web stiffeners attached primary supporting members

	Chapter 6		Capter 3	Capter 6
	Section 2		Section 6	Section 4
Type	2.2	2.3	5.2	1.5
Water tight	Apply	Apply	**Apply or N. A. ?**	
Non tight	N. A	N. A	Apply	

Rule			Title
Chapter 6	Scetion 2	2.2	Minimum net thickness of webs of ordinary stiffeners
		2.3	Net Dimensions of ordinary stiffeners
Chapter 3	Section 6	5.2	Stiffening arrangement
Chapter 6	Section 4	1.5	Minimum net thickness of webs of primary supporting members

KC#398

Ch 3, Sec 6, 2.3.1 – Connections with higher tensile steel

According to this requirement, structural members welded to the strength deck or bottom plating is to be made of the same higher tensile steel of strength deck or bottom plating. The same requirement is applicable for non continuous longitudinal stiffeners welded on the web of a primary member contributing to the hull girder longitudinal strength.

However, it is not clear which member should be applied to this requirement.

Please confirm if our understanding of this requirement is correct as summarized in the table below.

<Summary of connections with higher tensile steel>

Item		Application
1. Longitudinal members not contributing to the hull girder longitudinal strength		
(a) Longitudinal hatch coamings (length < 0.15L)	Web plate	X
	Top plate	??
(b) End bracket	Web plate	??
	Face plate, if any	??
(c) Gutter bar, strengthening of deck opening, bilge keel	Web plate	X
	Face plate, if any	??
2. Members contributing to the hull girder longitudinal strength		
(a) Longitudinal hatch coamings (length ≥ 0.15L)	Web plate	NA
	Top plate	NA
(b) Stringers and girders	Web plate	NA
3. Members welded on the web of a primary member		
(a) Non continuous longitudinal stiffeners welded on the web of a primary member **not contributing** hull girder longitudinal strength	Web plate	NA
	Face plate, if any	NA
(b) Non continuous longitudinal stiffeners welded on the web of a primary member **contributing** hull girder longitudinal strength	Web plate	X
	Face plate, if any	??

Notes:

X : applicable

NA : not applicable

?? : unclear

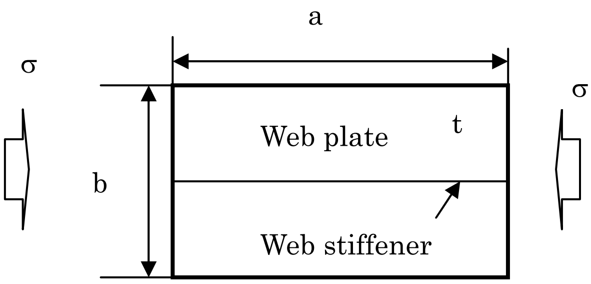
KC#416

Technical Background of Ch 3 Sec 6 [5.2.1] of CSR for Bulker

The web stiffener of the primary supporting member (PSM) is provided to prevent the buckling failure of the web plate of PSM.

Even if the buckling failure occurs in the web plate of PSM, the web stiffener has to withstand the buckling loads. For that reason, the stiffness of the web stiffener is always larger than that of the web plate of PSM.

Now, the ratio of the stiffness of the web stiffener to that of the web plate of PSM sets to C and the web stiffener is assumed to be of flat bar with thickness “t” and depth “h”



The stiffness of the web plate of PSM: $Et^3 / 12(1-\nu^2)$

The stiffness of the web stiffener: $Eth^3/3$

The critical value “C” can be obtained by the following formula;

$$C = \frac{Eth^3/3}{Et^3/12(1-\nu^2)b} = 3.64\frac{t}{b}\left(\frac{h}{t}\right)^3$$

The critical value C varies depending on the aspect ratio of web plate. Here, the critical value C is taken to 20, based on the actual designs. Then, we can get the following formula.

$$\frac{h}{b} = 1.77\left(\frac{t}{h}\right)^{2/3}$$

The ratio of thickness and height of flat bar varies to 135 to 80 which are obtained from the current design, then, $\frac{h}{b} = 0.067 \; to \; 0.095 \cong \frac{1}{15} \; to \; \frac{1}{10}$ can be obtained.

The value “1/12” is the average value of $\frac{h}{b}$ above.

Considering the actual design, it was found that this relationship between web stiffener height and panel length can apply to web stiffeners with flat bar fitted to all PSM.

Then, to simplify this relationship, the web stiffener length l has been used instead of b.

As a conclusion, CSR has been adopted the last sentence of the requirement of Ch 3 Sec 6 5.1.2 that the depth of web stiffener is to be more than 1/12 of stiffener length.

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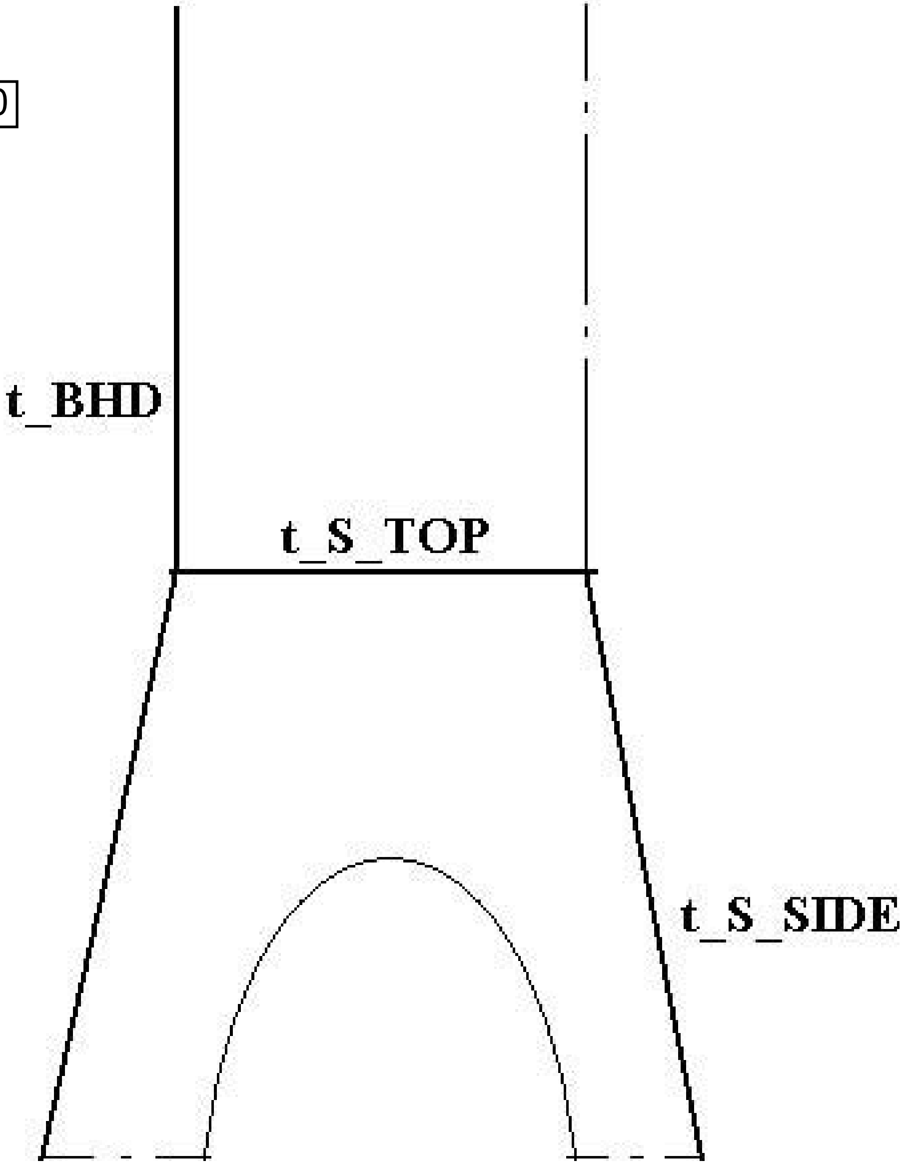
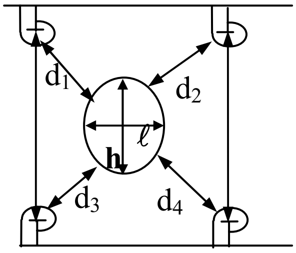
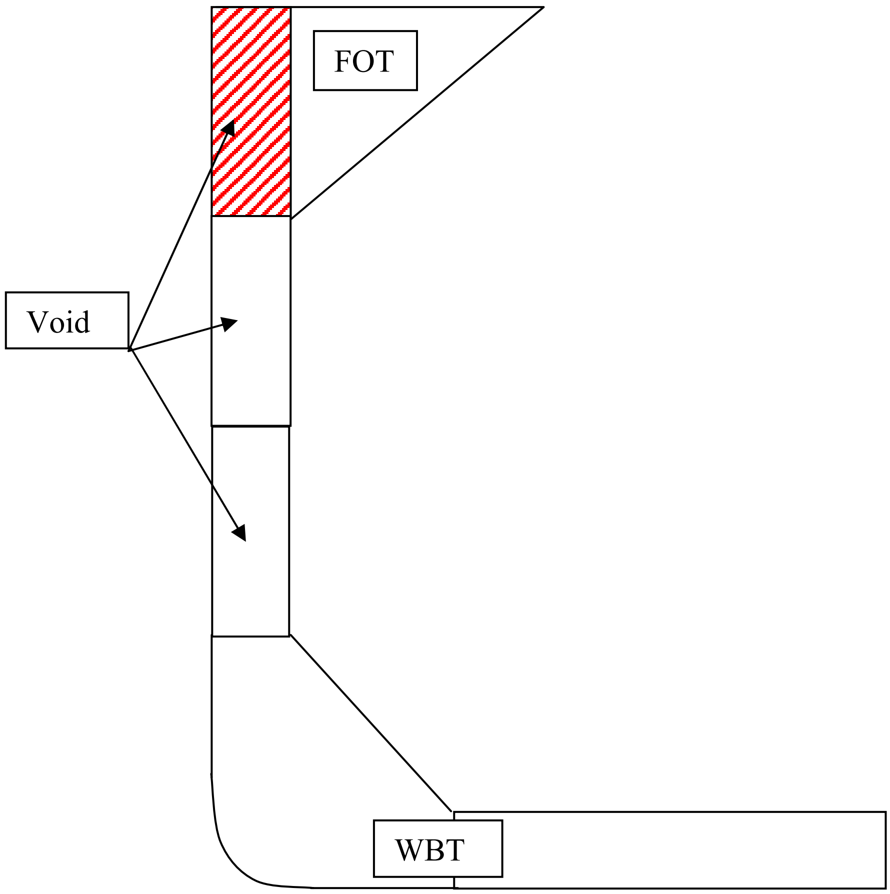
KC#450



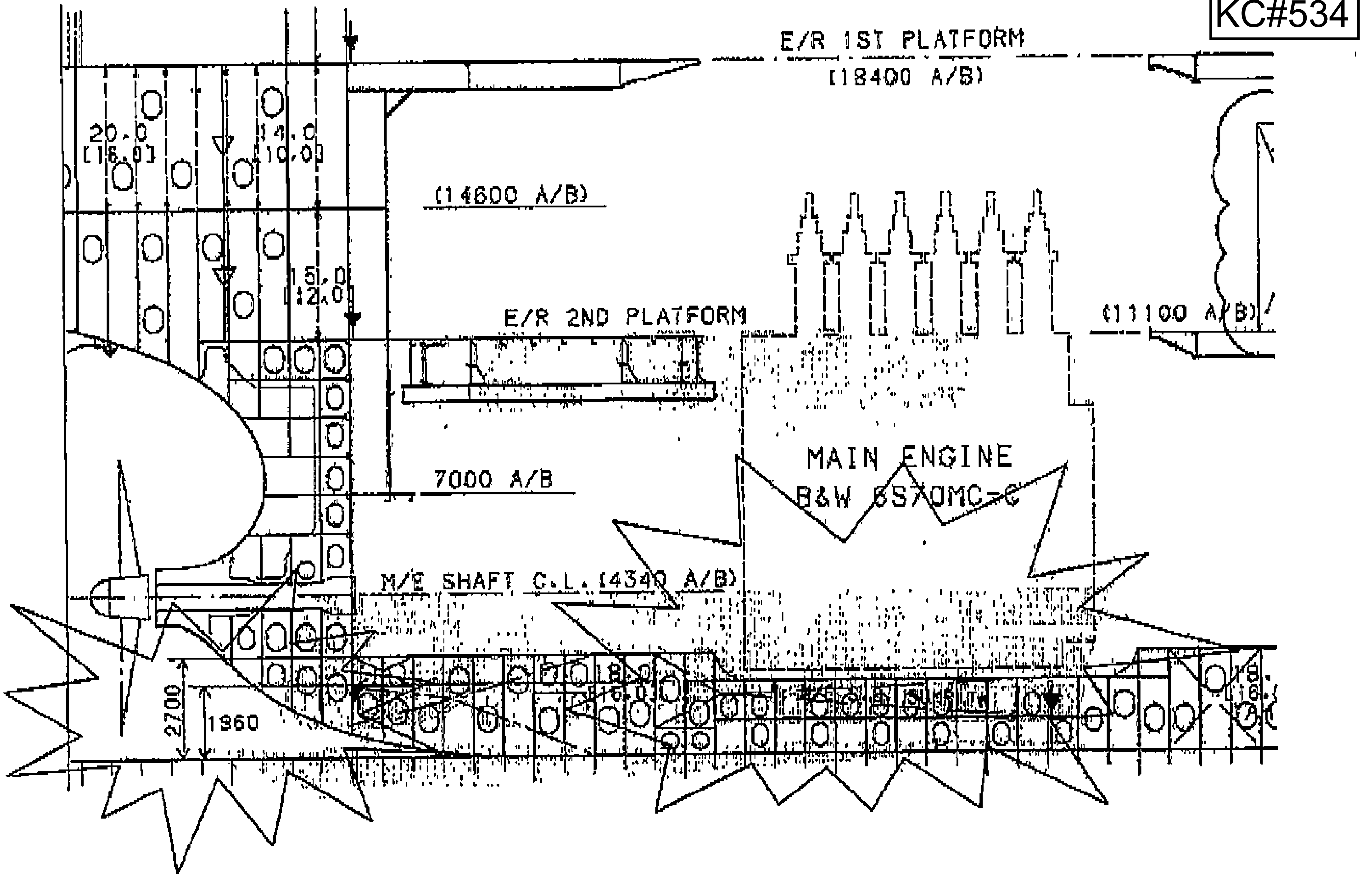
KC#498



KC#510



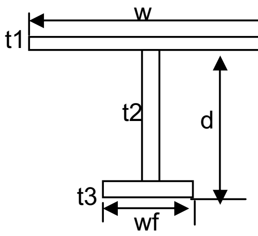
KC#534


E/R 1ST PLATFORM
(18400 A/B)
20.0
[16.0]
14.0
[10.0]
(14600 A/B)
15.0
[12.0]
E/R 2ND PLATFORM
(11100 A/B)
MAIN ENGINE
B&W 6S70MC-C
7000 A/B
M/E SHAFT C.L. (4340 A/B)
2700
1960

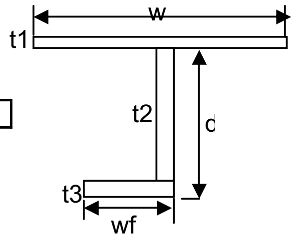
KC#590

SECTION MODULUS CALCULATION (IRS, Part 3 ,Chapter 3, Section 4)

Project:- aaaaa



<<PRIMARY>>



<<Double Sided Flange,D>> ***<<Single Sided Flange,S>>***

For Bracket Design (LR) CLICK>>

For Corossion allowance to SM CLICK>>>

NOTE:Openings in primary WEB to be REINFORCED ALONG EDGE OF OPENING if the Opening depth>d/4 (or) 300mm (AND) Opening length>web depth,d (OR) Opening length >60% Secondary spacing

	INPUTS					
Flange (S,D for Single,Double sided flange)	S	**<<<Provide Tripping Brackets>>>**				
Type number of equally spaced load point on member	0	**<<<Web Stiffening Required>>>**				
Input 0 for stiffener/ secondary; 1 for girder/ primary	1	**Web Stiff FB (Reqd.)=**		**56 X 10**		
Thickness of attached Plating (t1) mm	10			**d/t2 STATUS**		
Depth of Web (d)mm	560	d/t2=	56.00	***Check d/t2***		***Max.55***
Thickness of Web (t2)mm	10			**wf/t3 STATUS**		
Width of flange (wf)mm	150	wf/t3,D=	15.00	***Wf/t3 OK***		***N/A***
Thickness of flange (t3),mm	10	wf/t3,S=	15.00	***Wf/t3 OK***		***Max. 15***
Span of member (mm)	4410	C1Value=	0.77			0.77
Spacing of member (mm)	1830	C2Value=	0.46			0.46
Effective Width of attached plating (w)mm	838.99	C Value=	0.46			

		A (sqmm)	L(mm)	AL	ALL	Iown
Width atached pltg (mm)	838.992273	8389.92	565	4740306	2678273082	69916.02
Thk. Attached pltg (mm)	10					
Depth of web (mm)	550	5500.00	285	1567500	446737500	138645833.33
Thk. Of web (mm)	10					
Width of flange (mm)	150	1500.00	5	7500	37500	12500.00
Thk. Of flange (mm)	10					
Area Total		15389.92		6315306	3125048082	138728249.36

Height Of N/A from BaseLine (mm)		410.35	Ymin=	159.6467
Height Of N/A from TopLine (mm)		159.65	Ymax=	410.3533
MOI about BaseLine (mm^4)		3263776331.76		
MOI about Neutral Axis (mm^4)		672269221.34		
Zmax (mm^3)=I NA/Ymin		***4210982***	***mm^3***	
Zmin (mm^3)=I NA/Ymax		***1638269***	***mm^3***	
Max.Shear Area (Web)		***5700***	***mm^2***	
Total sectional area (Web+Fl.)		***15390***	***mm^2***	

Note Kg/m below is EXCLUDING ATTACHED PLTG		
55.74	***Kg/m (Stiffener OR Primary ONLY)***	
67226.92	***cm^4***	***I N/A***
4210.98	***cm^3***	
1638.27	***cm^3***	***Z min.***
57.00	***cm^2***	***A shear***
153.90	***cm^2***	***A total***

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

SUB: CSR assumption on the Effective Width of attached plating for the Primary Members & Section Modulus values for Primary.

Please refer to ABS CSR 2006 for Bulk Carriers Part 5B, Chapter 3, Section 6, 5.4.1 Effective Breadth of Primary Supporting member quotes *" effective breadth of the attached plating of a primary supporting member to be considered in the actual net section modulus for the yielding check is to be taken as the mean spacing between adjacent primary supporting members"*.

The ABS Steel Vessels 2007 (also other Ship Rules) Part 3 Chapter 1 Section 2 13.3 stipulates *"...effective width of plating not exceeding one half of the sum of spacing on each side of the member (OR) 33% of the unsupported span of the member whichever is LESS."*

The Effective width of attached plating for a primary seems to be over estimated in the ABS CSR for the bulk carriers. In some cases this assumption leads to higher differences; especially when the span of the primary < than the primary spacing.

As an example assuming a T section primary 900x10/ 150x15 spaced at 3000mm (say 600mm x 5 Spaces) and spanning 2000mm would result in different section modulus values. Attached plating say 12 mm thick.

A) Based on ABS CSR 2006 ;
Effective width of attached plating : 3000mm (= primary spacing)
Corresponding Section Modulus: **4420 cm^3**

B) Based on ABS Steel Vessels 2007
Effective width of attached plating : Minimum of (0.33x2000=660mm (or) 3000mm)=660mm
Corresponding Section Modulus: **3920 cm^3 (88 % of CSR Section Modulus)**

C) Based on IRS Steel Vessels (With Effective width correction)
Effective width of attached plating : 437mm
Corresponding Section Modulus: **3722 cm^3 (84 % of CSR Section Modulus)**

D) Based on LRS Steel Vessels 2003 Part 3 Chapter 3 Section 9
Effective width of attached plating : 687mm
Corresponding Section Modulus: **4009 cm^3 (90 % of CSR Section Modulus)**

The above difference in the SECTION MODULUS of PRIMARY MEMBERS seems to be significant in some cases and would require your advice.

Please arrange to clarify on the above and advice on the EFFECTIVE WIDTH OF ATTACHED PLATING TO BE CONSIDERED FOR PRIMARY MEMBERS.

(The respective calculations A, B, C & D are attached for your reference)

(A) ABS CSR 2006 Section Modulus Calculation (Effective width of attached plating 3000mm= Primary Spacing)

	INPUTS					
Flange (S,D for Single,Double sided flange)	D					
Type number of equally spaced load point on member	0	<<<Web Stiffening Required>>>				
Input 0 for stiffener/ secondary; 1 for girder/ primary	0	Web Stiff FB (Reqd.)=		90 X 10		
Thickness of attached Plating (t1) mm	12			d/t2 STATUS		
Depth of Web (d)mm	900	d/t2=	90.00	Check d/t2		Max.55
Thickness of Web (t2)mm	10			wf/t3 STATUS		
Width of flange (wf)mm	150	wf/t3,D=	10.00	Wf/t3 OK		Max. 30
Thickness of flange (t3),mm	15	wf/t3,S=	10.00	Wf/t3 OK		N/A
Span of member (mm)	2000	C1Value=	0.25			0.25
Spacing of member (mm)	3000	C2Value=	0.15			0.15
Effective Width of attached plating (w)mm	3000.00	C Value=	0.15			

		A (sqmm)	L(mm)	AL	ALL	Iown
Width atached pltg (mm)	3000	36000.00	906	32616000	29550096000	432000.00
Thk. Attached pltg (mm)	12					
Depth of web (mm)	900	8850.00	457.5	4048875	1852360313	607500000.00
Thk. Of web (mm)	10					
Width of flange (mm)	150	2250.00	7.5	16875	126562.5	42187.50
Thk. Of flange (mm)	15					
	Area Total	47100.00		36681750	31402582875	607974187.50

Height Of N/A from BaseLine (mm)		778.81	Ymin=	133.1943			
Height Of N/A from TopLine (mm)		133.19	Ymax=	778.8057			
MOI about BaseLine (mm^4)		32010557062.50					
MOI about Neutral Axis (mm^4)		3442599884.95		344259.99	cm^4		I N/A
Zmax (mm^3)=I NA/Ymin		25846457	mm^3	25846.46	cm^3		
Zmin (mm^3)=I NA/Ymax		4420358	mm^3	4420.36	cm^3		Z min.
Max.Shear Area (Web)		9120	mm^2	91.20	cm^2		A shear
Total sectional area (Web+Fl.)		47100	mm^2	471.00	cm^2		A total
Stiffener (or) Primary ONLY (Web+Fl.) Wt/m		87.14	kg/m	87.14	Kg/m		Wt/m

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

(B) ABS Steel Vessels 2007 Section Modulus Calculation (Effective width of attached plating =Minimum of 1 Primary Spacing OR 33% of Span=.33x2000=660mm)

	INPUTS					
Flange (S,D for Single,Double sided flange)	D					
Type number of equally spaced load point on member	0	<<<Web Stiffening Required>>>				
Input 0 for stiffener/ secondary; 1 for girder/ primary	0	Web Stiff FB (Reqd.)=		90 X 10		
Thickness of attached Plating (t1) mm	12			d/t2 STATUS		
Depth of Web (d)mm	900	d/t2=	90.00	Check d/t2		Max.55
Thickness of Web (t2)mm	10			wf/t3 STATUS		
Width of flange (wf)mm	150	wf/t3,D=	10.00	Wf/t3 OK		Max. 30
Thickness of flange (t3),mm	15	wf/t3,S=	10.00	Wf/t3 OK		N/A
Span of member (mm)	2000	C1Value=	0.86			0.86
Spacing of member (mm)	660	C2Value=	0.55			0.55
Effective Width of attached plating (w)mm	660.00	C Value=	0.55			

		A (sqmm)	L(mm)	AL	ALL	Iown
Width atached pltg (mm)	660	7920.00	906	7175520	6501021120	95040.00
Thk. Attached pltg (mm)	12					
Depth of web (mm)	900	8850.00	457.5	4048875	1852360313	607500000.00
Thk. Of web (mm)	10					
Width of flange (mm)	150	2250.00	7.5	16875	126562.5	42187.50
Thk. Of flange (mm)	15					
	Area Total	19020.00		11241270	8353507995	607637227.50

Height Of N/A from BaseLine (mm)		591.02	Ymin=	320.9763			
Height Of N/A from TopLine (mm)		320.98	Ymax=	591.0237			
MOI about BaseLine (mm^4)		8961145222.50					
MOI about Neutral Axis (mm^4)		2317288691.85		231728.87	cm^4		I N/A
Zmax (mm^3)=I NA/Ymin		7219500	mm^3	7219.50	cm^3		
Zmin (mm^3)=I NA/Ymax		3920805	mm^3	3920.81	cm^3		Z min.
Max.Shear Area (Web)		9120	mm^2	91.20	cm^2		A shear
Total sectional area (Web+Fl.)		19020	mm^2	190.20	cm^2		A total
Stiffener (or) Primary ONLY (Web+Fl.) Wt/m		87.14	kg/m	87.14	Kg/m		Wt/m

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

(C) IRS Steel Vessels (Effective Width of attached plating of primary= 437mm only)

	INPUTS					
Flange (S,D for Single,Double sided flange)	D	<<<Provide Tripping Brackets>>>				
Type number of equally spaced load point on member	0	<<<Web Stiffening Required>>>				
Input 0 for stiffener/ secondary; 1 for girder/ primary	1	Web Stiff FB (Reqd.)=		90 X 10		
Thickness of attached Plating (t1) mm	12			d/t2 STATUS		
Depth of Web (d)mm	900	d/t2=	90.00	Check d/t2		Max.55
Thickness of Web (t2)mm	10			wf/t3 STATUS		
Width of flange (wf)mm	150	wf/t3,D=	10.00	Wf/t3 OK		Max. 30
Thickness of flange (t3),mm	15	wf/t3,S=	10.00	Wf/t3 OK		N/A
Span of member (mm)	2000	C1Value=	0.25			0.25
Spacing of member (mm)	3000	C2Value=	0.15			0.15
Effective Width of attached plating (w)mm	436.89	C Value=	0.15			

		A (sqmm)	L(mm)	AL	ALL	Iown
Width atached pltg (mm)	436.88503	5242.62	906	4749814	4303331505	62911.44
Thk. Attached pltg (mm)	12					
Depth of web (mm)	900	8850.00	457.5	4048875	1852360313	607500000.00
Thk. Of web (mm)	10					
Width of flange (mm)	150	2250.00	7.5	16875	126562.5	42187.50
Thk. Of flange (mm)	15					
Area Total		16342.62		8815564	6155818380	607605098.94

Height Of N/A from BaseLine (mm)		539.42	Ymin=	372.5783			
Height Of N/A from TopLine (mm)		372.58	Ymax=	539.4217			
MOI about BaseLine (mm^4)		6763423478.62					
MOI about Neutral Axis (mm^4)		2008116957.94		200811.70	cm^4		I N/A
Zmax (mm^3)=I NA/Ymin		**5389785**	***mm^3***	5389.79	cm^3		
Zmin (mm^3)=I NA/Ymax		**3722722**	***mm^3***	3722.72	cm^3		Z min.
Max.Shear Area (Web)		**9120**	***mm^2***	91.20	cm^2		A shear
Total sectional area (Web+Fl.)		**16343**	***mm^2***	163.43	cm^2		A total
Stiffener (or) Primary ONLY (Web+Fl.) Wt/m		**87.14**	***kg/m***	87.14	Kg/m		Wt/m

For Clarifications Contact: G.Jayasankar (jayasankar007@yahoo.com)

(D) LRS Steel Vessels 2003 Part 3 Chapter 3 Section 9 (Effective width of attached plating = 687mm)

SECTION MODULUS CALCULATION : LLOYD REGISTER RULES

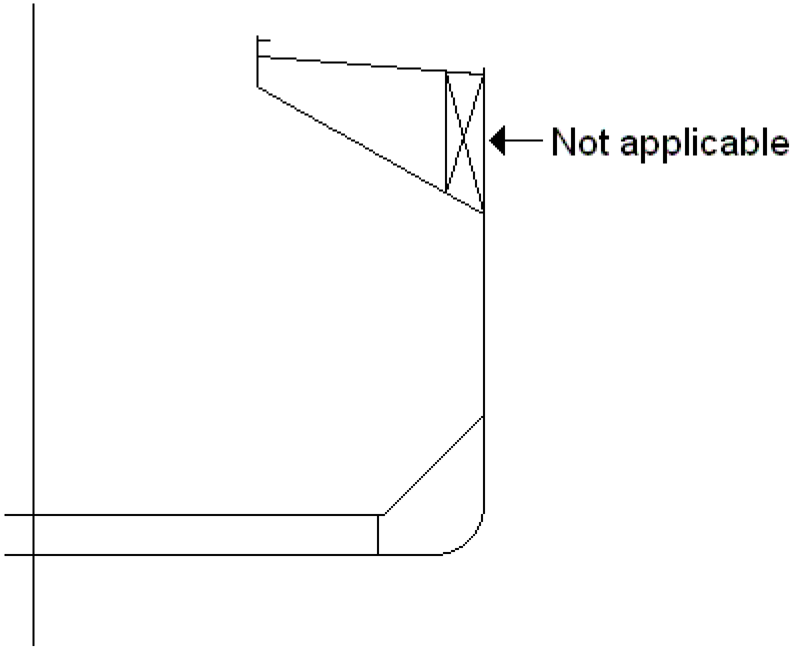
(Refer LRS 2003 Part 3 Chapter 3 Section 3)

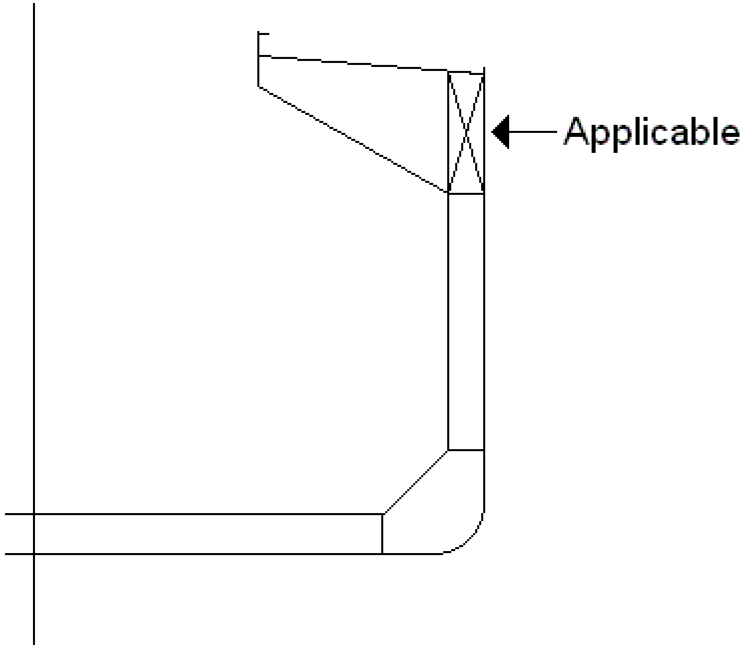
	INPUTS		*If in doubt ask.....Jay*	
Primary (OR) Secondary	Primary		l/b (1)	0.67
b(m)=	3	(Half of sum of spacing between adjacent stiffeners)	l/b (2)	0.67
l (m)=	2	(Length of supporting member)	f=	0.23
a(cm^2)=	22.5	(Face plate area in cm^2)		
dw(mm) Clear Inside Depth=	900	(Web depth in mm)		
tw (mm)=	10	(Web plate thickness in mm)		
tp (mm)=	12	(Thickness of attached plating in mm)		

40x tp (mm)=	480	
A (cm^2)=	82.42	**<< Effective Area of Attached Plating considered in 6800mm X 12mm**
Z1=	2025.0	
Z2=	1350.00	
Z3=	1.47	

EFFECTIVE WIDTH OF ATTACHED PLATING CONSIDERED IN SM CALC. (mm)=	**Eff. W (m**	**686.83**
AVAILABLE SECTION MODULUS (PLATE WITH ATTACHED STIFFENER) cm^3=	**Z (cm^3)**	**4009.84**

KC#614





Technical Background on Corrosion Addition

Oct 28, 2004
Rev. Apr. 8 2005
JBP

Introduction

The IACS Unified Requirements for strength criteria of structures such as double bottom and bulkheads of single side skin bulk carriers have adopted the "Net Scantling Approach" in which the gross scantling is obtained by adding the net scantling obtained from the structural strength requirement to the thickness diminution due to corrosion. In using the net scantling approach, the following terminology is used.

Net thickness: the thickness required solely based on the structural strength aspect which is the minimum scantling that must be kept throughout the service life of the ship

Wastage allowance: the value of thickness diminution due to corrosion expected during the service life of the ship obtained by statistical analysis based on the thickness measurement data of ships and the steel renewal criteria which ensure that the net thickness is kept throughout the service life of the ship.

Corrosion additions: the value is obtained from Wastage allowance by adding to the thickness diminution predicted till the next thickness measurement.

In order to introduce this Net Scantling Approach to the hull structural rules, at first, we have to have an accurate grasp of the real thickness diminution. For this, corrosion process from occurrence through propagation were investigated on extensive thickness measurement data, and a corrosion process model was developed based on probabilistic theory thus estimating the thickness diminution of structural members. Based on this, a guideline on corrosion addition for bulk carriers and tankers was developed and was submitted to the IACS Working party on strength (WP/S). The philosophy of Net scantling approach and the corrosion addition values are adapted in the draft IACS Common structural rules for bulk carriers and tankers. This paper describes on how to determine the corrosion addition, how to apply the corrosion addition and how to treat the wastage allowance.

1. Corrosion addition

1.1 Determination of corrosion addition

The corrosion addition was determined by the following procedure (details can be found in the technical paper published in ClassNK Technical Bulletin, Vol.21, 2003, pp 55-71).

(1) Gather about 600,000 thickness measurement data sampled from single hull tankers and single side skin bulk carriers of age 5 to 27 years.

(2) Select the thickness measurement data of single hull tankers complying with MARPOL 73/78 Convention and with no coating of structural members in cargo oil tanks and of bulk carriers with coated structural members in cargo holds required by the existing IACS UR.

(3) Develop a corrosion propagation model to simulate the realistic corrosion phenomenon based on probabilistic theory and identify the necessary parameters for each structural member using the thickness measurement data.

(4) Estimate the corrosion diminution at the cumulative probability of 95% for 20 years using the corrosion propagation model.

(5) Sort out the corrosive environment to which each structural member is exposed and calculate the amount of corrosion of each corrosive environment using the estimated corrosion diminution of each structural member.

(6) Corrosion addition is determined based on the environment to which each structural member is exposed.

However, the average scrapping age of ships is about 25 years, and the design life of ships is proposed as 25 years by the submission paper on "Goal Based Standard" MSC/78/6/2 of IMO. Therefore the estimation period of corrosion diminution is changed to 25 years from 20 years. Moreover, in the real corrosion phenomena, scatter of thickness diminution depends on the maintenance condition of the individual ship rather than the thickness measurement of each structural member as shown in Figure 1.

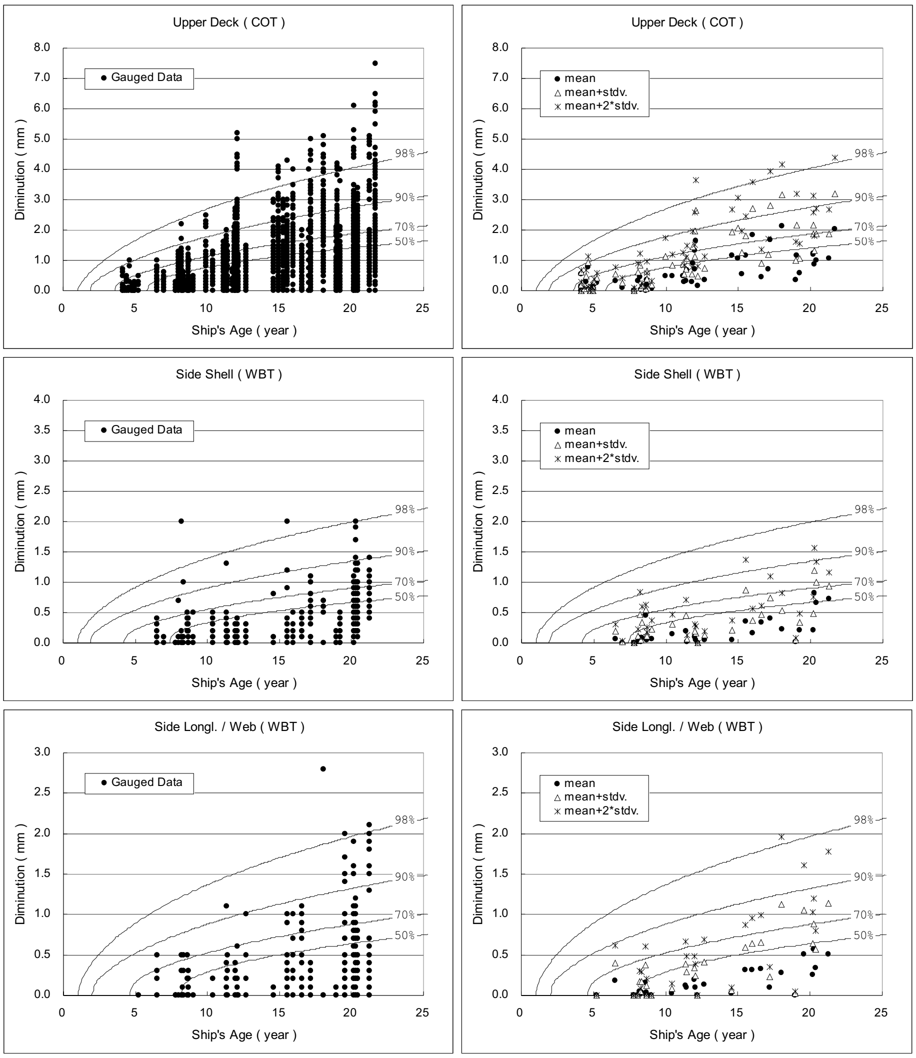


Figure 1 Statistical analysis of thickness measurement data of structural members of tankers

The conclusions drawn from the figure are:

(1) The mean value of thickness diminution of upper deck plating that is exposed to severe corrosive environment exceeds the estimated value at the cumulative probability of 70% in seven ships among 75 ships. And the "mean + 2 times standard deviation" value exceeds the estimated value at the cumulative probability of 98% in only 5 ships.

(2) The "mean + 2 times standard deviations" value of side shell plating and structural members in ballast water tanks the environment of which is less corrosive than upper deck exceeds the estimated value at the cumulative probability of 98% in none and 1 ship, respectively.

(3) The individual mean value of thickness measurement for most of the ships is lower than the estimated value at the cumulative probability of 50%.

(4) The thickness measurement data of structural members other than upper deck plating, side shell plating and internals of ballast water tank also have similar tendencies as in item (2).

These conclusions show that, except for a small number of ships with poor maintenance, steel renewal is not required if structural members have sufficient corrosion additions according to the estimated corrosion value at the cumulative probability of 90% for 25 years. Therefore the corrosion additions are determined based on the estimated corrosion at the cumulative probability of 90% for 25 years.

Tables 1 and 2 show the estimated corrosion at the cumulative probability of 90% for 25 years for structural members of tankers and bulk carriers respectively.

Table 1 The estimated corrosion for structural members of tankers Unit mm

Structural Member	COT	WBT
Upper Deck Plate	2.93	2.19
Side Shell Plate	1.90	1.79
Bottom Plate	4.05	3.15
Longl. Bhd. Plate	1.92	2.00
Trans. Bhd. Plate	2.35	2.34
Deck Longl.	1.94	1.81
Deck Trans. Web / Face	2.07 / 2.36	1.90 / 2.73
Horizontal Girder Web / Face	2.03 / 2.89	1.90 / 2.77
Cross Tie Web / Face	1.84 / 1.90	1.69 / 1.81
L. Bhd. Longl. Web / Face	1.85 / 1.87	1.68 / 1.71
L. Bhd. Trans. Web / Face	2.50 / 1.93	1.48 / 1.94
Side Longl. Web / Face	1.85 / 1.87	1.68 / 1.71
Side Trans. Web / Face	1.99 / 2.01	2.36 / 2.00
Bottom Trans. Web / Face	2.41 / 1.94	1.38 / 1.74
Bottom Longl. Web / Face	1.88 / 1.90	1.73 / 1.74

Table 2 The estimated corrosion for structural members of bulk carriers Unit mm

Structural Member	Position	Cargo Hold		Ballast Hold	
		DW<50,000	50,000≤DW	DW<50,000	50,000≤DW
Bhd. Plate	Lower	1.98	4.35	2.06*	3.28
	Middle	1.98	4.17	2.06*	4.62
	Upper	1.82	4.40	1.92*	3.14
Hold Frame	Lower	2.42	3.99	2.42*	2.93
	Middle	2.42	3.80	2.42*	2.85
	Upper	1.92	3.49	3.62*	3.45
Lower Stool		2.09	5.50	3.68*	5.53
		DW<50000		50000≤DW	
Upper Deck Plate		3.82		3.66	
Hatch Coaming		1.71		2.79	
Bottom Plate		*		1.92	
Side Shell Plate		*		2.91	
Inner Bottom Plate		3.29		4.86	
Sloped Plate in TST		1.78		2.95	
Sloped Plate in BHT		2.06		3.83	
Floor		*		2.27	
Girder		*		2.34	
Longl. in DBT & BHT		*		2.17	
Longl. in TST		*		3.12	
Trans. Ring in BHT		*		2.39	
Trans. Ring in TST		*		3.40	

*: indicates that the estimated value is unreliable or estimation is not possible due to the lack of thickness measurement data or the data is taken from ships of similar age.

Further to the above considerations, corrosion addition of structural members in fuel oil tanks, fresh water tanks and their boundaries are also evaluated so that corrosion addition can be specified for all structural members of the ship. The results are summarized below:

1.1.1 Keel plate and bottom shell plating

In the current class rules, the keel plate is required to have a thickness 1.0 or 2.0 mm above the adjacent bottom plating thickness. This was provided based on the assumption that the keel plate corrodes faster as it is difficult to paint the keel block due to docking blocks in the dry dock. However, this effect could not be observed from the corrosion analysis mentioned above, though the thickness measurement data of keel plate is also included in the bottom plating. Gathering 684 thickness measurement data for bottom plating and 103 data for keel plate of general cargo ships and bulk carriers of age of 14 to 24 years, statistical values like the maximum diminution value, average diminution value, etc are investigated. Figure 2 shows the result of the investigation which clearly indicates that thickness diminution of keel plate is not different from that of bottom plating.

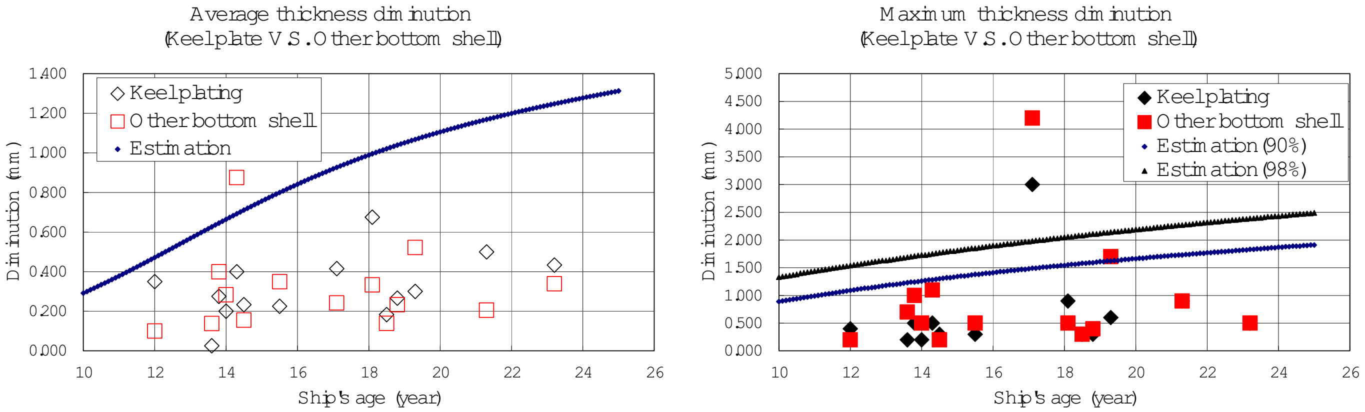


Figure 2 Thickness diminution of keel plate and bottom plating

1.1.2 Thickness diminution of structural members in fuel oil tanks (FOTs) and their boundaries

Structural members in FOTs are generally examined visually for corrosion at periodical surveys, and thickness measurement is dispensed with if the condition is found satisfactory. Therefore, thickness measurement data of structural members in FOTs or lubricated oil tanks are very limited. About 320 thickness measurement data of three general cargo ships of age 12 to 20 years were collected from among the massive thickness measurement data. The maximum diminution was 0.6mm at about 20 years and the average diminution was 0.3mm. A simple extrapolation to 25 years gives the maximum diminution of 1.0mm. From this result, the value for corrosive environment in such oil tanks is considered to be 0.5mm for one side which is the same for void space as given in Table 3.

On the other hand, the boundaries of FOTs, especially the boundary plate between FOT with heated fuel oil and water ballast tank (WBT), have heavier corrosion than those within the tanks. In order to confirm this inference from the thickness measurement data, about 360 thickness measurement data from ten ships of age 12 to 20 years are sampled. A maximum value of 2.7mm, an average value of 1.0mm and a 90-percentile value of 2.4mm at about 20 years are obtained from the statistical analysis of the data. The sampled data are of the boundaries between FOT and WBT within double bottom. This result is shown in Figure 3.

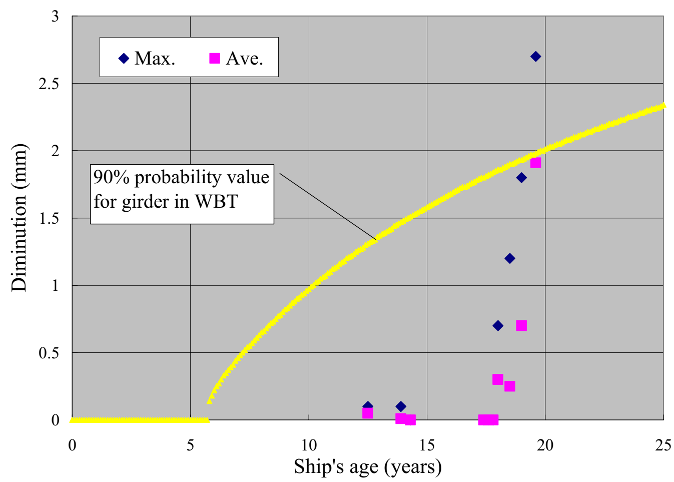


Figure 3 The thickness diminution of boundaries of FOT loaded with heated oil

An extrapolation to 25 years using this result gives the 90-percentile value of 2.9mm. The value of corrosion addition on one side in WBT is given as 1.2mm from Table 3 and 0.5mm in FOT from the result mentioned above. Therefore, the corrosion value of 1.2mm due to heated fuel oil effect is obtained by reducing 1.2mm for WBT and 0.5mm for FOT from 2.9. This effect is limited to the boundaries between FOTs and WBTs and does not appear in other boundaries such as bottom plate that is always cooled down by seawater.

1.1.3 Fresh water tanks (FWTs)

Similar to FOTs, thickness measurement of structural members in fresh water tanks is also seldom carried out, and therefore the thickness measurement data of structural members in FWT is very limited. From the sampling of 22 thickness measurement data of three ships of age 12 to 18 years, the maximum diminution was found to be 0.4mm, and the average was 0.1mm at about 18 years. Therefore, the value of corrosive environment in FWTs is considered to be 0.5mm.

1.1.4 Lower bracket of hold frame

Thickness measurement data of hold frames is classed into 3 categories; upper part, middle part and lower part. Thickness measurement data of the lower part and upper part of hold frame include the data of both webplate and faceplate of frames and their bracket. However, lower brackets of ships of deadweight 50,000 tons and above are considered to be more corroded than lower part of hold frame because stress on the lower bracket is higher than that on the webplate and faceplate of lower part of hold frame. This effect is considered as the additional corrosion effect for lower brackets.

1.1.5 Classification of bulk carriers

Corrosion phenomenon of structural members in cargo holds of bulk carriers strongly depends on the kind of loaded cargo. The kind of cargo is closely related to the deadweight of the ship; ships of deadweight 50,000 tons and above mainly load iron ore and/or coal, and ships of deadweight under 50,000 tons mainly load cargo other than iron ore and coal. However, since the kind of loaded cargo is more related to the ship's length than ship's deadweight, the bulk carriers are classed into 2 categories corresponding to their length; ships of length 200 m and above, and ships under 200m in length.

On the other hand, IACS Unified Requirements S25 (UR/S25) regarding harmonized notations and design loading condition has been adopted in 2002. In this UR, bulk carriers having length of 150m or above are classed into 3 categories with notation BC-A, BC-B and BC-C. Corresponding to this classification of bulk carriers, the draft guideline for corrosion addition of bulk carriers and tankers submitted to IACS WP/S specifies that bulk carriers classed into BC-A and BC-B ships mainly carry iron ore and/or coal, and BC-C ships and ships of length under 150m mainly carry cargo other than iron ore and coal.

Further, ballast hold for all bulk carriers is used both as ballast hold and cargo hold. Since thickness diminution of structural members in ballast hold is smaller than that of cargo hold, corrosion addition of structural members in cargo hold is applied to that in the ballast hold.

Based on these results, the corrosion value of each corrosion environment for double hull tankers and bulk carriers is given in Table 3. The corrosion addition is obtained by summing up the values given in Table 3 corresponding to the environment on the two sides of the structural member plus reserved corrosion margin (0.5mm). This corrosion addition value is corresponding to the value obtained by mean + 2 times standard deviations at 25 years.

In this case, rounding operation to the nearest 0.5mm could not be accepted. This is because the corrosion value is derived based on the corrosive environment corresponding to actual corrosion phenomenon, and rounding off of this figure may result in too large or small value. Therefore, the corrosion addition should be expressed in 0.1 mm increments without rounding off.

Table 3 The corrosion value for different corrosive environments (the values are given for one side of the structural member)

Corrosive environment			Corrosion value (mm)	Applicable structural member
Main environment		Additional factor		
In COT			1.1	Structural member other than those mentioned below
		High temperature	1.1 + 0.5	Deck plating
		High stress	1.1 + 0.3	Faceplates of girders and transverses
		Pitting effect	1.1 + 1.6	Inner bottom plating
In WBT	Topside tank	High temperature	1.7	Structural member other than those mentioned below
		High stress	1.7 + 0.3	Faceplates of girders and transverses
	Other than above		1.2	Structural member other than that mentioned below
		High stress	1.2 + 0.3	Faceplates of girders and transverses
In cargo hold of BC-A and BC-B ships	Upper part	Members not between cargo holds	1.8	Hold frame and inner side skin plating
		Boundary between cargo holds	2.0	Transverse bulkhead
	Middle and lower parts	Members not between cargo holds	1.8 + 0.2	Hold frame and inner side skin plating
		Lower bracket	1.8 + 0.2 + 0.3	Lower bracket
		Boundary between cargo holds	2.0 + 0.2	Transverse bulkhead
		Horizontal member	1.8 + 0.2 + 1.7	Inner bottom plate, sloping plate of bilge hopper tank
		Slant plate of lower stool	2.0 + 0.2 + 2.2	Slant plate of lower stool
In cargo hold of BC-C ships or ships of length below 150m	Upper part	Members not between cargo holds	1.0	Hold frame and inner side skin plating
		Boundary between cargo holds	1.0	Transverse bulkhead
	Middle part and lower part	Members not between cargo holds	1.0 + 0.2	Hold frame and inner side skin plating
		Boundary between cargo holds	1.0 + 0.2	Transverse bulkhead
		Horizontal member	1.0 + 0.2 + 1.2	Inner bottom plate, sloping plate of bilge hopper tank
		Slant plate of lower stool	1.0 + 0.2 + 1.0	Slant plate of lower stool
Atmosphere		Horizontal	1.7	Exposed upper deck plating
		Vertical	1.0	Side shell plating and hatch coaming
Sea water			1.0	Side shell and bottom shell plating
FOT			0.5	Internal members in FOT
		Boundary between FOT and WBT	1.7	Tight girders and floors between FOT and WBT
Void spaces, FWT			0.5	Internals in such spaces

1.2 Application of corrosion addition

1.2.1 Corrosion addition for local strength members

Corrosion addition is applied to the local strength member according to the definition of net scantling approach. That is, the necessary minimum scantling of a structural member $t_{gross\_required}$ is given by adding the necessary scantling from the strength point of view t_{Net} and corrosion addition t_{CA}. This is obvious from the basic assumption of local strength assessment.

Generally, the necessary scantling from the strength point of view t_{Net} given by the scantling formula is expressed in increments of 0.1mm by rounding off the two decimal places to the nearest single digit. Also the corrosion addition t_{CA} is expressed in increments of 0.1mm as mentioned above. Therefore, the necessary minimum scantling of a structural member $t_{gross\_required}$ is also expressed in increments of 0.1mm.

Though current classification rules for hull structure do not allow the actual scantling to be less than that obtained from the rule formula, conventionally classification societies may accept a smaller scantling expressed in increments of 0.5mm obtained by rounding off to the nearest 0.5 mm that may correspond to the nominal thickness of rolled steels which comes in increments of 0.5mm. This is possible because $t_{gross\_required}$ is considered to have sufficient safety margin including corrosion, and hence the safety margin compensates for the reduction in scantling due to rounding down in the current rules. However, in the net scantling approach, such a rounding down will result in the reduction in values of t_{Net} or t_{CA} which is not appropriate. As the solution, the following 3 approaches may be adapted in the new structural rules.

(1) $t_{gross\_required}$ is expressed in intervals of 0.1mm and rounding down is not accepted.

(2) $t_{gross\_required}$ is rounded up to the nearest higher 0.5mm unit

(3) Both t_{Net} and t_{CA} are rounded up to the nearest 0.5mm unit

Since the approach specified in above (1) is in terms of 0.1mm unit, it will require a great deal to order, produce, and control rolled steels and it will be likely that the problem of minus tolerance of thickness of rolled steels is brought to the scantling requirements. On the other hand, the approach (2) or (3) is not likely to have the above problem. Furthermore, the approach (3) results in scantlings 0.25mm greater than that specified in (2). The designers and some owners may not welcome the approach (3) because of the weight increase due to the addition of 0.25mm on an average, but some owners may welcome this due to the merit of increased wastage allowance. Since the proposed corrosion addition is sufficient to minimize the steel renewal of structural members for a ship which is properly maintained, approach (2) is considered to be an optimal one.

1.2.2 Corrosion addition for global strength members

The strength assessment of major load carrying structural members such as transverse girders is carried out considering the mutual interaction of such members covering a wide extent of the structure rather than using simplified scantling formula such as for a local strength member. Generally, finite element analysis (FEA) is widely used for the strength assessment of such structures. In FEA, a wide extent of the structure is modeled in order to consider the mutual interaction of primary supporting members and the structural response of the whole structure when the loads act on them is obtained. In this case, when the thickness diminution of one structural component is uniformly reached its corrosion addition value, it is most unlikely that the rest of the structure also has reached its corrosion addition value from the viewpoint of probabilistic theory. Normally, corroded areas and less corroded areas are scattered in the structure at random. The structural response in the corroded condition mentioned above is considered equivalent to that in uniformly corroded condition with average diminution. In this case, it is necessary to consider the average corrosion value of all the structural members, but it is a complicated task to prepare the average corrosion value of each structural member that has a different corrosion addition value. The average corrosion value is nearly equal to half the corrosion addition of each structural member. Therefore, half the corrosion addition value is applied to the structural strength analysis of primary supporting members in using the FEA. Hence the actual structural model for FEA is prepared by reducing half the corrosion addition value from the original scantling in the drawings, and strength assessment is carried out. Hull girder strength assessment and ultimate strength assessment for hull girder when a ship is regarded as a simple girder are also carried out in the same manner.

When assessing the buckling strength of panel elements of shell plating and web plate of primary supporting members, the stress acting on the panel element estimated from the result of the FEA is used.

However, critical buckling stress of the panel element is calculated using the scantling obtained by reducing the full corrosion addition from the original scantling because the panel element is regarded as a local strength member.

1.2.3 Corrosion addition for fatigue strength assessment

Fatigue strength of structural members can be assessed by the cumulative damage estimated against the cyclic loads encountered by the ship during her design life. The scantling of the structural member varies from no thickness diminution at the initial stage to thickness diminution equal to the corrosion addition at the end of the design life. However, it is not practical and is very difficult to consider the diminution of the scantling which varies over time in fatigue strength assessment. Therefore fatigue assessment considering the corrosion effect is generally used instead of considering the actual scantling diminution. In this case, it is necessary to consider many coefficients of corrosion effect for every corrosive environment because the corrosion effect depends on the environment to which structural members are exposed. Thus this method is also seemed to be impractical. Assuming that the thickness diminution is zero prior to service and thickness diminution reaches full corrosion addition at the ship’s design life, the average diminution can be half the corrosion addition through the ship’s design life. Therefore, half the corrosion addition can be applied for fatigue strength assessment.

2 Wastage allowance in the current rules and the net scantling approach

2.1 Wastage allowance for the local strength member

The current classification rules give scantlings that are necessary to prevent structural damage mainly based on extensive experience, but it is not clear what is the actual scantling that is sufficient enough. Further the lower acceptable level of structural strength due to corrosion is also not clear. Surveys of the ships in service have been carried out by experienced surveyors using specified wastage allowance set as a percentage of original thickness based on experience. For that reason, the chances of causing serious problems due to corrosion are very limited.

For example, in the case where the thickness diminution limit of the upper deck plate is 20% of the original thickness at the midship region and the thickness of the whole upper plate is worn out about 20% of the original thickness, the section modulus of the transverse section also reaches 80% of the original. And this case is never accepted from the viewpoint on longitudinal strength of hull girder in the current rules. Therefore wastage allowance criteria for the transverse section modulus are defined in the current classification rules to ensure sufficient hull girder strength. The more critical criteria among the two wastage allowance criteria mentioned above are applied in actual survey of ships in service. For the example case mentioned above, wastage allowance is 10% diminution of the original thickness. The wastage allowance criteria from a similar point of view are also applied to the bottom plates which contribute to the longitudinal strength of hull girder. In case of inner bottom plating, since it is close to the neutral axis of transverse section, the wastage allowance is set as about 20% of the original thickness. Considering the example of a Cape size bulk carrier with deck plating 38mm, inner bottom plating 25mm, and bottom plating 20mm, the wastage allowance and proposed corrosion addition mentioned above is given in Table 4.

Table 4 Current Wastage allowance and proposed corrosion addition

	Original thickness t	Wastage allowance from the viewpoint of local strength	Wastage allowance from the viewpoint of longitudinal strength	Proposed wastage allowance	Proposed corrosion addition
Upper deck plating	38mm	8.6mm (20% *t + 1mm)	3.8mm	3.5mm	3.9mm
Inner bottom plating	25mm	6.0mm (20% *t + 1mm)	5.0mm	5.0mm	5.4mm
Bottom plating	20mm	5.0mm (20% *t + 1mm)	2.0mm	2.5mm	2.7mm

In can be concluded that the proposed wastage allowance is approximately equal to the current actual wastage allowance criteria applied in actual survey. Therefore, the proposed wastage allowance and corrosion addition provide a sufficient value considering the actual wastage allowance in the new structural rule based on the net scantling approach

2.2 Wastage allowance for the global strength member

As mentioned before, the global strength of structural members is assessed using scantlings obtained by reducing half the corrosion addition from the original scantling. The result of hull girder strength assessment considering this approach is given in Figure 4 which shows that the transverse section modulus considering half the corrosion addition is nearly equal to 90% of the original value, which can be the wastage limit from the viewpoint of longitudinal strength. Thus the strength assessment of global structural members considering half the corrosion addition implies the strength assessment of structural members whose scantlings reach their wastage limit. In this case, since some structural members are assumed to reach the wastage limit from the viewpoint of local strength, the wastage limit of structural members is dealt with in the same manner as the local strength member. However, the actual wastage limit from the viewpoint of longitudinal strength is judged based on the actual thickness measurement data. Therefore, the treatment of the wastage allowance of global structural members mentioned above depends on accurate thickness measurement.

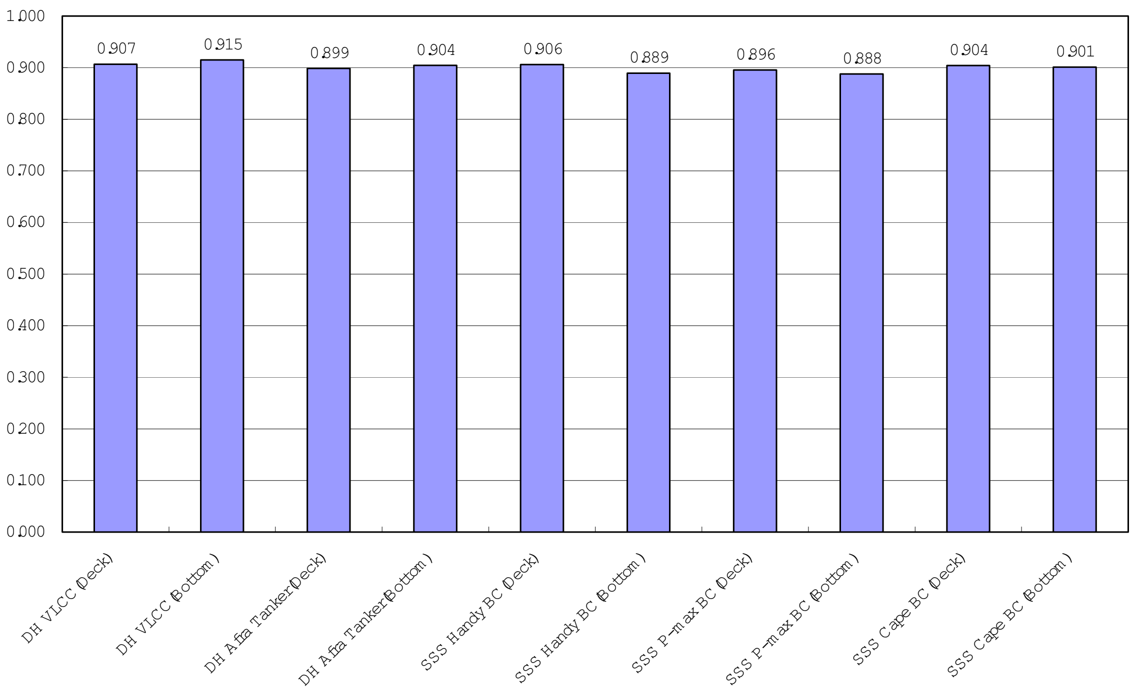


Figure 4 Transverse section modulus considering half the corrosion addition

In using FEA for the strength assessment of global structures such as structures within the cargo hold region, half the corrosion addition is taken as the average thickness diminution. Full corrosion addition is considered for buckling strength assessment. Therefore, the wastage allowance of structural members whose scantling is determined by FEA is also the same as the wastage allowance for local strength member.

3 Conclusions

The conventional method based on the corrosion rate obtained by dividing the thickness diminution by the elapsed years cannot explain the actual corrosion phenomenon of structural members. However the corrosion progress process model newly developed based on the probabilistic theory can explain the actual corrosion phenomenon. This is because the probabilistic parameters of the corrosion process model are identified by using more than half a million thickness measurement data sampled considering coated ballast tanks and cargo holds, uncoated cargo oil tanks, and maintenance condition of individual ships.

The conclusions of this study can be summarized as follows:

(1) The estimation period of corrosion diminution is 25 years which is the average age of scrapped ships.

(2) The estimated corrosion at the cumulative probability of 90% gives a sufficient level because the

thickness diminution of most of the structural members of ships that are properly maintained does not exceed the estimated corrosion values during their life.

(3) Based on the estimated corrosion, the wastage allowance is defined which minimizes the steel renewal of structural members during the ship's design life as given the following formula.

$t_{wastage\_allowance} = roundup_{0.5}(t_{CA} + t_{c2})$

This wastage allowance is close to the actual current criteria on wastage allowance applied in the survey of ships in service.

(4) The wastage allowance is defined for each side of the structural member as the corrosive environment to which each side is exposed may be different. The total corrosion addition t_{CA} is obtained by adding the corrosion addition value of one side t_{C1} and that of the other side t_{C2} plus 0.5mm taken as $t_{reserve}$, which are expressed in increments of 0.1mm. Where $t_{reserve}$ (=0.5mm) is the thickness in reserve to account for anticipated maximum thickness diminution t hat may occur during the assumed inspection intervals of 2.5 years after the thickness measurement. Then corrosion addition value is nearly equal to the estimated corrosion diminution taking into account the 2 standard deviation at 25 years.

(5) The scantling of a structural member consists of two necessary minimum components as follows: One is t_{Net} which is the net scantling required from the structural strength viewpoint that should be kept throughout the design life of the ship. The other is the corrosion addition t_{CA} which corresponds to the estimated thickness diminution during the design life of the ship plus $t_{reserve}$. The estimation of rational corrosion addition makes the introduction of the net scantling approach to the new structural rules.

(6) The required scantling of local structural members $t_{gross\_offered}$ is obtained by the following formula.

$t_{gross\_required} = roundup_{0.5}(t_{Net} + t_{CA})$

It is preferable that $t_{gross\_required}$ is rounded up to the nearest higher 0.5mm.

(7) Transverse section modulus considering half the corrosion addition is about 90% of the original value which corresponds to the wastage allowance from the viewpoint of hull girder longitudinal strength. Wastage allowance for global structural members can be obtained using the same formulation as for local structural members.

(8) Global strength members such as those contributing to the hull girder strength can be assessed by FEA considering half the corrosion addition.

(9) Fatigue strength of structural details can be assessed considering half the corrosion addition as a mean thickness diminution during the design life of ships.

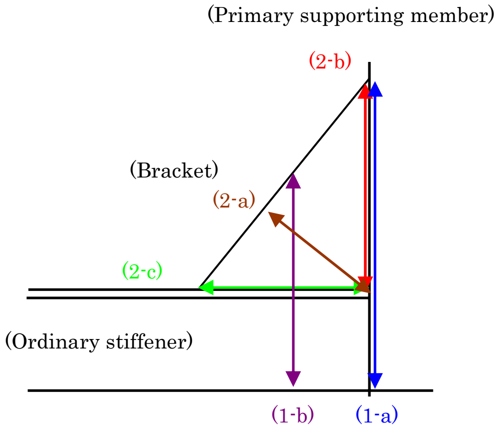
KC#647

Summary of KC items on web stiffeners for primary supporting members.

		Chapter 3	Chapter 6				
		Section 6	Section 2			Section 3	
KC	Type	5.2.1	4.1.1	4.1.2	4.1.3	4	Comment
204	Longitudianl buckling stiffeners on typical DB girder	Minimum thick primary supp	N.A.	Apply	N.A.	Apply	It is confirmed that Ch. 6 Sec.2.1/2.2/2.3 is applicable only to ordinary stiffeners. Which seem contradictory to the answer in item b)
328	Minimum thickness of web stiffeners	Change min thick req. to Ch.6Sec.2					
333	Web stiffeners on Watertight Primary Supporting Members	Minimum thick primary supp	Apply	N.A.	N.A.		
333	Web stiffeners on Non-Watertight Primary Supporting Members	Minimum thick primary supp	Apply	Apply	Apply		
416	Longitudianl buckling stiffeners on typical DB girder	Stiffener is refferring to the same stiffener as per 204 with the minimum thickness as outlined in KC328. Conclusion from PT is that this is an ordinary stiffener.					PT state that the requirement of Ch.3 Sec.6 5.2.1 is a buckling requirement based on experience
419	General definition of web stiffener	Confirms that web stiffener is different from ordinary stiffener					

Rule			Title
Chapter 3	Section 6	5.2.1	Requirements to web stiffeners of primary supporting members
Chapter 6	Section 2	4.1.1	Net sectional area of web stiffener at the web stiifener mid-height
		4.1.2	Net section modulus of web stiffeners of non-watertight pimary supporting members
		4.1.3	Permissible stress at ends of web stiffeners of primary supporting members in water
	Section 3	4	Buckling of partial and total panels

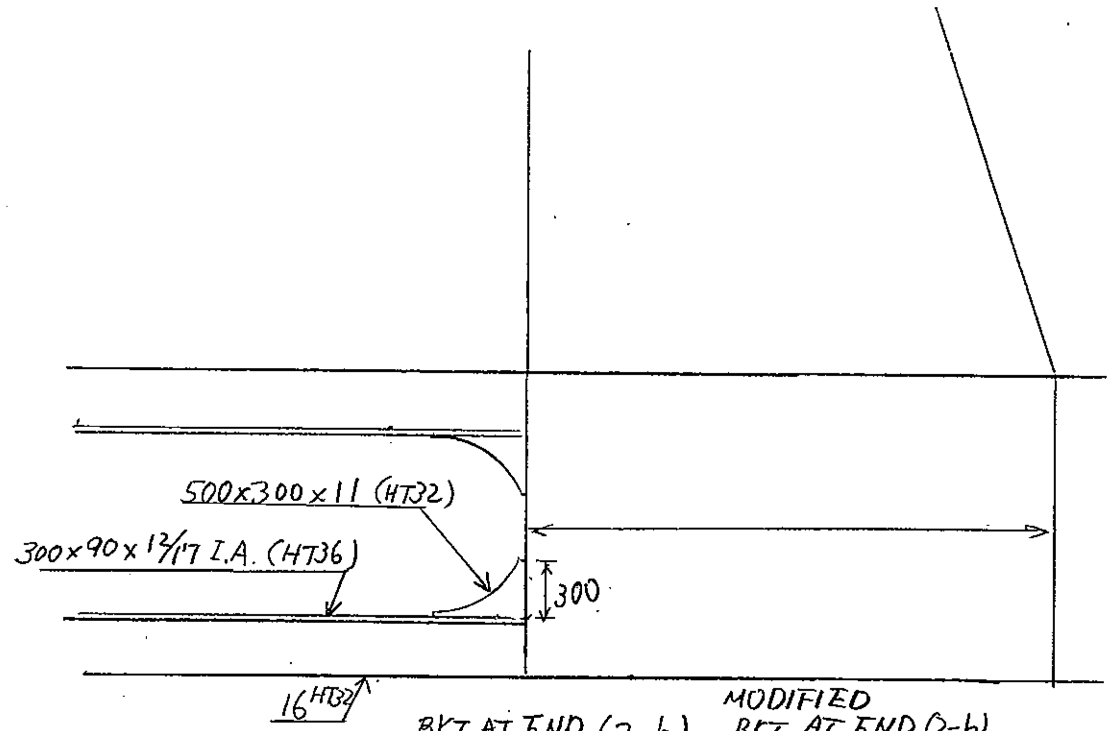
KC#702



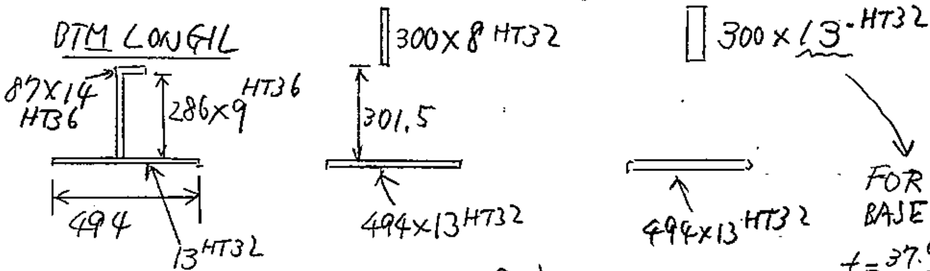
1. The section of the bracket and the stiffener;
   1-a. at the end of the stiffener.
   1-b. at the mid-point of the free edge of the bracket.

In case 1, is the snipped flange of the stiffener included in the calculations?

2. The section of the bracket;
   2-a. normal to the free edge of the bracket.
   2-b. at the end of the stiffener.
   2-c. attached to the stiffener.
   2-d. smaller of 2-b and 2-c.



BTM LONGIL	BKT AT END (2-b)	MODIFIED BKT AT END (2-b)



FOR HT36 BASE,

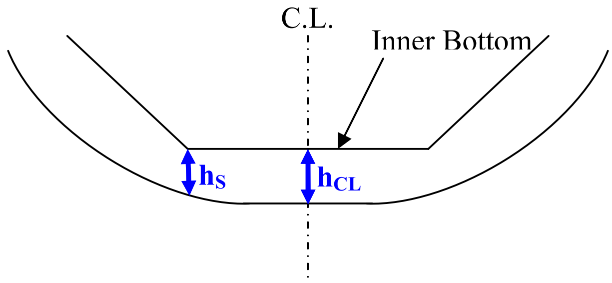
$t = \frac{37.92 \times 100}{300} \times \frac{0.78}{0.72} = 13.7 \rightarrow 14mm$

(K = 0.72)	(K=0.78)	
SM = 555 cm³ (HT36)	SM = 795 cm³ (HT32)	
	$SM' = 795 \times \frac{0.72}{0.78} = 733 cm^3$	
Astiff = 37.92 cm² (HT36)	ABKT = 24 cm² (HT32)	ABKT = 39 cm² (HT32)

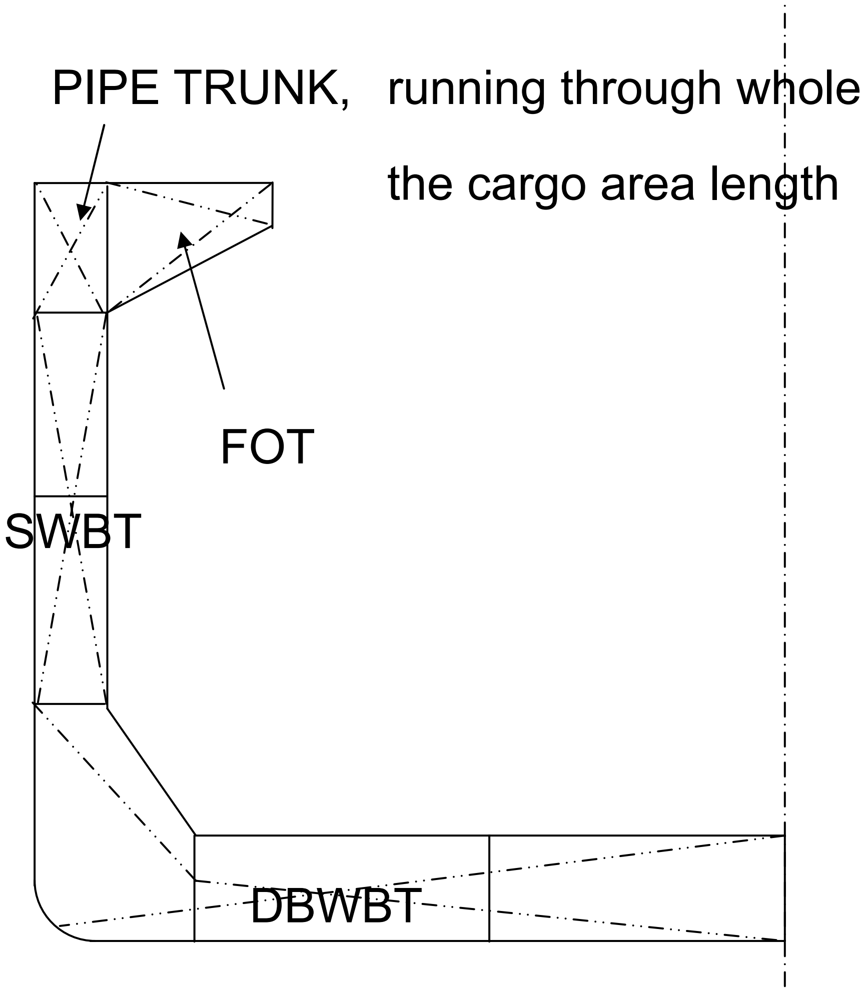
→ BRACKET SIZE TO BE INCREASED TO 300 × 16 HT32 FROM 300 × 11 HT32.

→ IF MATERIAL FACTOR SHOULD BE CONSIDERED, TO BE INCREASED TO 300 × 17 HT32.

KC#758



KC#827



PIPE TRUNK, running through whole
the cargo area length
FOT
SWBT
DBWBT

KC#871

Comment/question, 31st July 2008

Chapter 3 Section 6 "Structural Arrangement Principles"

Re: 10.4.7 – Lower Stool – Rule includes, the inadequately discussed changes proposed in "Corrigenda 5" as quoted below by ignoring our previous comments:

Quote:

Where corrugations are cut at the lower stool, corrugated bulkhead plating is to be connected to the stool top plate by full penetration welds. The stool side plating is to be connected to the stool top late and the inner bottom by either full penetration or deep penetration welds. The supporting floors are to be connected to inner bottom by either full penetration or deep penetration weld.

Unquote

Versus the following text as submitted by IACS UR S18 (1998) to IMO for the inception of SOLAS Ch. XII.

Quote:

Where corrugations are cut at the lower stool, corrugations and stool side plating are generally to be connected to the stool top plate by full penetration welds. The plating of lower stool and supporting floors is generally to be connected to the inner bottom by full penetration welds.

IACS should really consider very closely their submittals to IMO for the development of SOLAS Ch. XII and assure their similarities and consistency. Unless IACS wishes to resubmit the bulkhead welding requirements to IMO with proposed changes for approval by all IMO Administrations, such changes should be avoided.

Until such time we hereby request IACS to replace the text as per the original CSR wording that is in agreement with IACS UR S18 originally submitted to IMO.

KC#933

◇ Common Structure Rule for Bulk Carrier (Chapter 3, Section5 / Page25~6)

1.3 Protection of cargo hold spaces

1.3.1 Coating

It is the responsibility of the shipbuilder and of the owner to choose coatings suitable for the intended cargoes, in particular for the compatibility with the cargo.

1.3.2 Application

All internal and external surfaces of hatch coamings and hatch covers, and all internal surfaces of cargo holds (side and transverse bulkheads), excluding the inner bottom area and part of the hopper tank sloping plate and lower stool sloping plate, are to have an efficient protective coating, of an epoxy type or equivalent, applied in accordance with the manufacturer's recommendation.

The side and transverse bulkhead areas to be coated are specified in [1.3.3] and [1.3.4] respectively.

1.3.3 Side areas to be coated

The areas to be coated are the internal surfaces:

- the inner side plating
- the internal surfaces of the topside tank sloping plates
- the internal surfaces of the hopper tank sloping plates for a distance of 300 mm below the frame end bracket for single side bulk carriers or below the hopper tank upper end for double side bulk carriers.

These areas are shown in Fig 1.

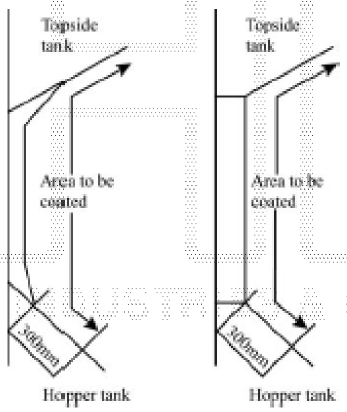


Figure 1: Side areas to be coated

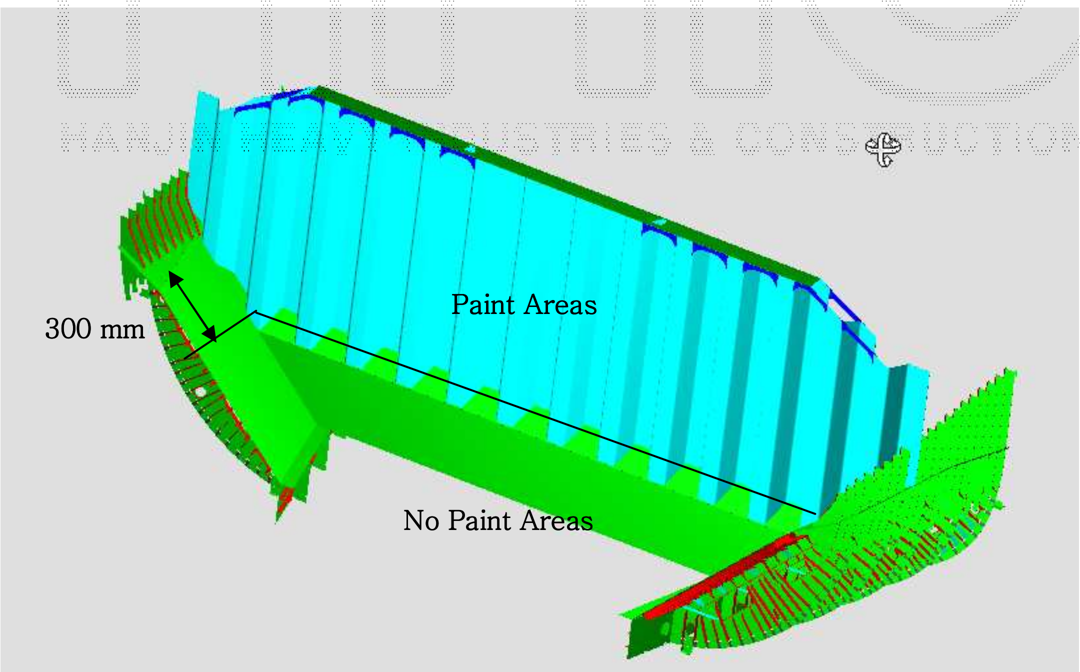
1.3.4 Transverse bulkhead areas to be coated

The areas of transverse bulkheads to be coated are all the areas located above an horizontal level located at a distance of 300 mm below the frame end bracket for single side bulk carriers or below the hopper tank upper end for double side bulk carriers.

[Our design concept]

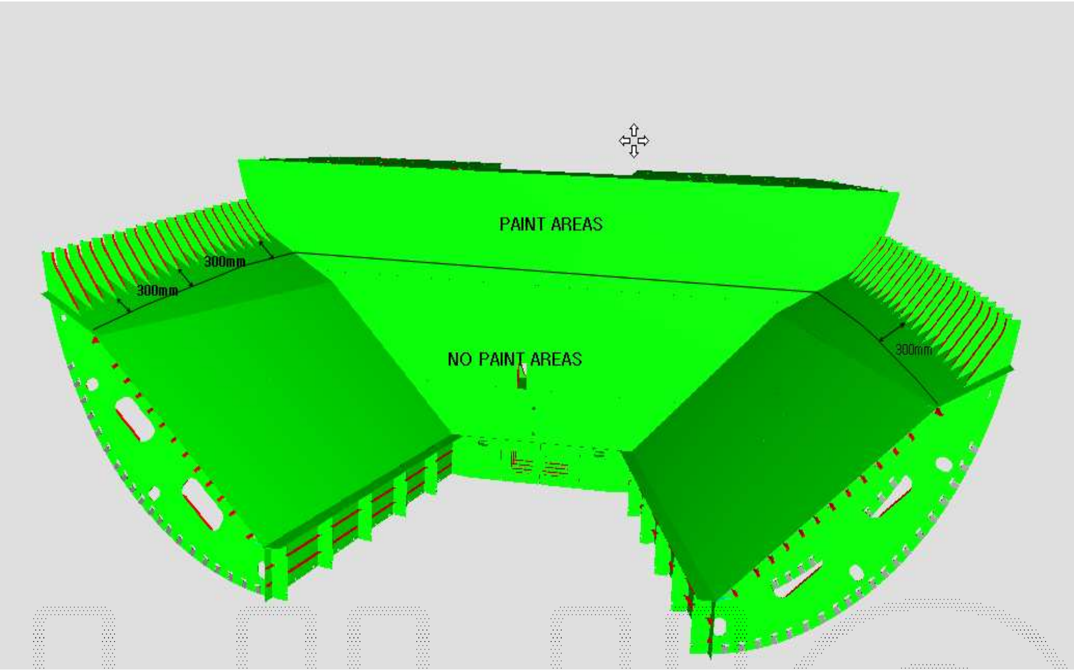
1) In case of side areas, the areas to be coated are “the inner side plating, the internal surfaces for the topside tank sloping plates” to “the hopper tank sloping plates for a distance of 300mm below the frame end bracket” according to 1.3.3. (Please refer to detail samples as follows)
2) In case of transverse bulkhead areas, the areas to be coated are above an horizontal level located at a distance of 300mm below the frame end bracket for single side bulk carrier according to 1.3.4. (Please refer to detail samples as follows)

Sample1)



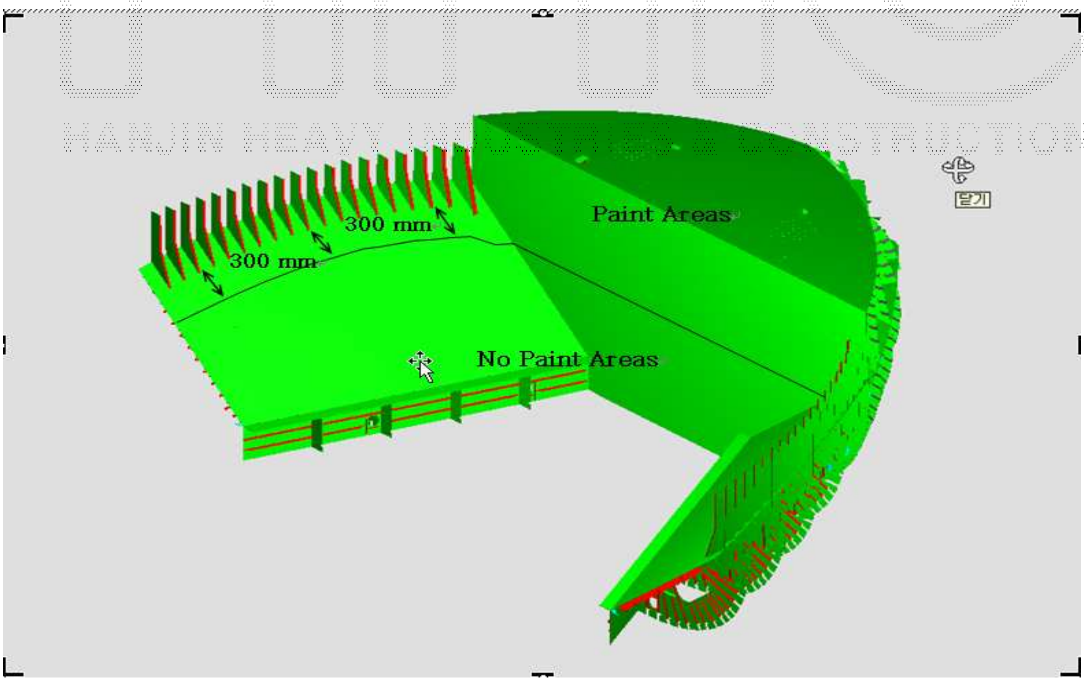
[No.9 C/H Front side]

Sample2)



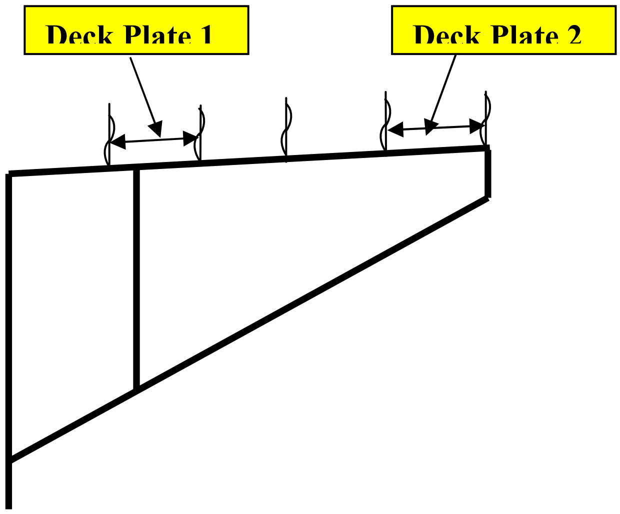
[No.9 C/H After side]

Sample3)



[No.1 C/H Front side]

KC#944



KC#1077

Dear sir,

Chapter 3, Section 6 Common Structural Rules for Bulk Carriers

5.7 Cut-outs and holes
5.7.1
Cut-outs for the passage of ordinary stiffeners are to be as small as possible and well rounded with smooth edges.
The depth of cut-outs is to be not greater than 50% of the depth of the primary supporting member.

Section 8 Common Structural Rules For Oil Tankers

SECTION 8.2/PAGE 24

2.6.1.7 Webs of the primary support members are to have a depth of not less than given by the requirements of 2.6.4.1, 2.6.6.1 and 2.6.7.1, as applicable. Lesser depths may be accepted where equivalent stiffness is demonstrated. See 3/5.3.3.4. Primary support members that have open slots for stiffeners are to have a depth not less than 2.5 times the depth of the slots.
SECTION 8.3/PAGE 5
3.3.3.5 The web depth of primary support members is not to be less than 14% of the bending span and is to be at least 2.5 times as deep as the slots for stiffeners if the slots are not closed.
SECTION 8.4/PAGE 5
4.3.4.4 The web depth is to be not less than 2.5 times the web depth of the adjacent frames if the slots are not closed.
SECTION 8.5/PAGE 7
5.3.3.5 The web depth of primary support members is not to be less than 14% of the bending span and is to be at least 2.5 times as deep as the slots for stiffeners if the slots are not closed.

For tankers, D>=2.5d, then d<=40%D. It could be described as " The depth of cut-outs is to be not greater than 40% of the depth of the primary supporting member."

I suggested the requirement in two rules to be harmonized as well as the names 'cut-out' and 'slot'.