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

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attachment
55	Table 9.2.1	Question	Yield utilization factor	2006/5/5	1.According to "JTP Background Document", the yield utilization factor for structures at tank boundaries is set to a value less than that for internal structures in tanks to account for the stress induced by the lateral pressure loads. So, it is understood that a tank boundary plate, for a certain loading condition, may be regarded as an internal structure if it is not subjected to lateral pressure load in the relevant loading condition. Please describe the above in the Note. 2.Thank you for your understanding. Our comment is based on "JTP Background Document" and we agree to JTP's philosophy of rule development, consistency and transparency. We also do not wish to put any "operational restrictions" nor increase load cases. We would like you to study on the additional FEM load cases as you had done last year. 3. In addition, please confirm that the increased yield utilization factor can be applied to tight girders between ballast tanks. Otherwise, your detailed explanation would be appreciated.	1. We understand the concept of your comment. We further understand that the request is to increase the allowable stresses for the cargo tank longitudinal bulkheads, tight floors, girders and webs for the loading conditions where no net pressure is applied to the member in the FE loading conditions and retain the current lower allowable stresses for loading conditions where these structures are subject to liquid pressure from one side. It is noted that the scantlings in many of the areas mentioned are mainly dominated by the buckling requirements and that your requested change will only affect scantlings which are determined by yield requirements and hence will have limited effect. The longitudinal bulkhead in way of transverse bulkheads is the principal area where the required thickness will be affected especially in FEM cases with all cargo tanks empty or full across. In the final version of the Rules, the only FE load cases that are used to check the 100% hull girder shear load situation are the fully loaded across and the fully empty across tank conditions. If the allowable stress is increased, then the following might also need to be considered: (1)The intended criteria are designed to cover conditions where not all the tanks are empty or full across. It is necessary to ensure that these conditions are still covered in the Rules given that even the shear force of a slightly different loading condition may not reach the maximum assigned value but the shear stress could be higher on one longitudinal bulkhead if the loading is not symmetrical transversely. (2)The shear force and stress in the harbour condition where one tank is full and the adjacent tank is not full (e.g. half full) or one tank is empty and the adjacent tank is not empty (e.g. half full).Therefore, whilst we know that in the design Rule FE loading conditions some tank boundaries will not be subject to tank pressures or the tanks on each side of certain tank boundaries will be simultaneously loaded, this may not always be the case in service. We do not wish to put any "operational restrictions" on simultaneous loading. While we understand that we have taken an "engineering approach" to envelope certain conditions in order to account for operational considerations, if we were to add additional considerations such as your suggestion we would very likely have to add additional FEM load cases in order to more accurately reflect the wide range of possible load scenarios. We will therefore keep the Rules as they are currently, but we will retain your comment for future consideration while working on future Rule updates. (Continues to the next page.)	

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55	Table 9.2.1	Question	Yield utilization factor	2006/5/5	(See previous page.)	(Continues from the previous page.) 2. The following Rule clarification to Table 9.2.1 has been made in Corrigenda 1 published in April 2006 that the yield utilisation factor for longitudinal bulkheads between cargo tanks may be taken the same as non-tight structural members for FE load cases where either both sides of the bulkhead are empty or loaded. 3. There are no load cases in the CSR with single sided pressure for tight girders between ballast tanks and hence increasing the allowable yield utilisation factor to 1.0 for such structural members can only be done if additional load cases with single sided pressure are added. We have however performed additional studies on the tight floors/stringers/girders between ballast tanks and find that the present Rule text is somewhat conservative. The Rule Change Proposal in this connection is now under review by IACS.	
64	9/ Table 9.1.1	Question	partial safety factor	2006/5/5	The partial safety factor, 1.3 for GammaW looks too big. This factor should be decreased, unless it can be supported by detailed explanation together with damage experience.	The ultimate hull girder strength assessment is an assessment of the hull girder ultimate strength when subjected to an extreme load. The reference formula for the wave bending moment is taken as the existing IACS URS11 formula. This formula is however based on an assumption of equal probability for all headings. This is reasonable for standard responses but will not be correct for the hull girder ultimate strength assessment. If a ship encounters the 25 year maximum storm it is more likely to go up against the waves and hence have a higher weighting on the head sea than the equal probability assumption. This alone gives a 10%; increase on the moment. Additional safety margins are also included in the hull girder ultimate check due to consequence of failure and lack of redundancy. Further details on the requirements are given in the background document.	
159 attc	9/3.3	Question	Required Structural Details to fatigue check	2007/11/8	(1) Are the following structural details only required to fatigue check and are the following method for fatigue check applied to each structural detail? (a) longitudinal stiffener end connection (b) scallops in way of block joints on the strength deck (c) welded knuckle between inner bottom and hopper plate (2) We have no fatigue damage of scallops in way of block joints on the strength deck. If the fatigue damage of such part were recorded, we would like to know the damage details such as sketch of damage, number of damage, the longitudinal location including on-deck or under deck, type of longitudinals, elapsed time after service, ship's size.	(1) Yes, your understanding is correct. With regard to item (b), as indicated in Appendix C/1.6.1.1, unless the specification in Section 8/1.5.1.3 for class F2 is satisfied, the scallops in way of block joint on strength deck is to comply with Figure C.1.12, then fatigue check is not required. Only for option II in Fig C.1.12, alternative scallop geometry may be accepted subject to demonstration of satisfactory fatigue check. Please see Appendix C/1.6.1 and Notes to Fig.C.1.12. (2) Fatigue cracks are recorded for half circular scallops in way of block joints in the main for oil tankers trading in harsh environment. The typical crack location is at location A defined in the below figure. The stress concentration factor at this location obtained by FE analysis reads 2.4 for half circular scallops and the fatigue strength becomes critical in case butt welds are located in the bay of the scallop. By elongated scallops as defined by Figure C.1.12 (II) the stress concentration is reduced to about 1.3. More details on ship type, number of damages and elapsed time are however not available.	Y

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252 attc	Table 9.2.2	Question	cross tie buckling	2006/12/1	An anomaly has been found in utilization factor for cross tie buckling of table 9.2.2(direct calculation) and Sec 8 2.6.8 (rule calculation) that the utilization factor for direct calculation is lower than that for rule calculation. The utilization factor for direct calculation should be at least same as that for rule calculation as more precise estimation is made by FEM. The anomaly should be corrected as a corrigenda.	We note and agree with your comments. We intend to modify the utilisation factors for FE in Table 9.2.2 at the next occasion of the Rule change.	Y
407	9/2.2.5.5	Question	Corrugated bulkhead requirements	2007/2/20	The section in reference requests to apply a permissible stress which is reduced by 10% if no stool is arranged underneath a corrugated bulkhead. Comparing with already existing designs this leads to increased plate thickness. We would like to know the techical background for this requirement.	For ships with a moulded depth less than 16m, omission of lower stool is allowed in accordance with Sec.8/2.5.7.9. This paragraph was introduced in the rules just before the final CSR was published (in Oct.05 after the 3rd CSR draft) reflecting the industry comments. Since the prescriptive requirements for corrugation web shear, flange buckling and section modulus requirements as given in Sec. 8/2.5.7.3, 8/2.5.7.5 and 8/2.5.7.6 were calibrated with corrugated bulkheads having lower stool, those requirements are not applicable for the corrugated bulkheads without lower stool. An additional factor of safety in FE Analysis (10% reduction in the stress and buckling acceptance utilisation factors) was introduced in the absence of applicable prescriptive requirements for those bulkheads. Also, service experience indicates that corrugated bulkhead designs without a lower stool are more critical (e.g. prone to local fracture) than those fitted with a lower bulkhead stool due to higher stress level and alignment problems with the supporting structure in the double bottom. Having said the above, however, we see a need for future development/re-calibration of the prescriptive requirements for those without lower stool in association with possible adjustment of utilization factors in FE Analysis.	

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423	Text 9/3.2.3.1	Question	Fatigue Strength	2007/6/19	If a design fatigue life of more than 25 years (e.g. 30 years, 35 years etc.) is specifically requested on CSR tanker, how the criteria are to be modified to calculate the requirements meeting the requested fatigue life? Note: This question is only for fatigue strength, and is not for scantling and strength (FE) assessments.	We would like to point out that the following comments relate to an increased target fatigue life which is not the same as an increased expected service life. Specifying target fatigue life above 25 years is a way to optionally increase the safety margin for the fatigue damage calculation. The input values for the number of cycles (NL), the design life (U), in formula in C/1.4.1.4 may be adjusted to correspond with an increased target fatigue life as requested. Or, the acceptance criteria, DM <=1, can be adjusted as DM <= 25/(design fatigue life). It should be noted that the same corrosive environment correction factor (fSN) of 1.06 is to be used regardless of the optional increased target fatigue life. The corrosive environment correction factor of 1.06 is based on a corrosion protection period of 20 out of 25 years or 20% of the service life uncoated. This means no additional input or change of the factor is required when performing fatigue calculations with an extended target fatigue life compared to the default 25 years.	
467	Table 9.2.3	Question	Element Adjacent to Weld	2007/6/12	Rule Ref. : CSR for Tankers Sec.9, Table 9.2.3 Please clarify whether it is adjacent to weld or not, the element in contact at a point. e.g) a free-edged element of bracket toe next to snipped flange	Element in contact with welding at a point is to be treated as "element adjacent to weld" in the application of Table 9.2.3.	
539	Table 9.2.1 & Rule Change Notice 1/ Corrigenda 1	Question	Centreline bulkhead in case of Load Case B6	2007/9/11	For the centerline bulkhead in case of Load Case B6 in Appendix B, the yield utilisation factor is taken as 1.0 for non-tight structural members in accordance with Rule Clarification of Corrigenda 1. Is this interpretation also applicable to water-tight bottom girder under centerline bulkhead at the same load case? According to Rule Change Notice 1, tight girders are now in the same category as centerline longitudinal cargo tank bulkheads.	In order to obtain max shear force on the longitudinal bulkhead the cargo tanks need to be full abreast, and in this condition (B6-head-sea) there is marginal net pressure on the longitudinal bulkhead between cargo tanks. We may therefore disregard the in plane stresses on the bulkhead due to lateral pressure for this particular condition and apply the criteria for non-tight structure. The same does not apply to watertight girder in double bottom under the centre line bulkhead because the size of the tanks may allow for a combination of high hull girder shear force and lateral pressure on the centre line girder.	

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778	9/2.2	Question	FE analysis	2008/8/29	When carrying out FE analysis, we think that longitudinal PMAs connected to horizontal girders on transverse bulkheads should be modelled with shell elements taking into account their structural continuity. Please confirm whether such PMAs are to be modelled with shell elements. In addition, please also confirm that if PMAs are modelled with shell elements, whether they are to be verified by advanced buckling as specified in Appendix D	Longitudinal PMAs connected to horizontal girders on transverse bulkheads should be modelled with shell elements. Advanced buckling as specified in Appendix D is not required. See also Corrigenda 1, July 08.	
924	9/2.3.1.1	CI	over deck longitudinal stiffening	2009/10/23	Regarding over deck longitudinal stiffening. Rule reference Section 9/2.3.1.1(e) requires fine mesh analysis for typical conventional arrangement: "(e)end brackets and attached web stiffeners of typical longitudinal stiffeners of double bottom and deck, and adjoining vertical stiffener of transverse bulkhead.". Does the same requirement apply to over deck longitudinal stiffening?	We can confirm that over deck longitudinals are to be investigated by local fine mesh structural analysis.	
973	Bulker 5/App.1 , Tanker 9/1.1.1.2	Question	Hull girder ultimate strength	2010/10/12	With respect to hull girder ultimate strength 1. The scantling requirements by hull girder ultimate strength are to be applied within 0.4L amidships in 9/1.1.1.2 of CSR OT. For CSR BC, It is noted that the normal stresses are to be checked within L, please clarify whether the scantling requirements by hull girder ultimate strength are to be applied within L in CSR BC or not. 2. Our understanding is that the modifications to CH5/Appendix 1 in bulker rcn1 to July 08 are also applicable to CSR OT, please confirm.	1. This issue will be submitted to the Harmonisation teams. 2. We confirm the modifications to CH5/Appendix 1 in CSR/Bulk Carrier RCN1 to July 08 are also applicable to CSR OT. The Rules will be amended to incorporate those modifications.	

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1014	Table 9.2.1 & KC ID 539	Question	Yield utilisation factor for non-tight structural members	2010/2/12	With reference to KC ID 539: Please reconsider the answer of KC ID 539 for the following reason. According to the Rule Clarification of Corrigenda 1, the yield utilisation factor for longitudinal bulkheads between cargo tanks may be taken as for non-tight structural members for FE load cases where either both sides of the bulkhead are empty or both sides are loaded. However, in KC ID 539, this interpretation is not applicable to watertight bottom girders under centreline bulkheads because the size of the tanks may allow for a combination of high hull girder shear force and lateral pressure on such centreline girders. We consider that it is possible to be taken as a utilization factor for non-tight structural members because the lateral pressure acting on watertight bottom girders is low in cases where both sides of the watertight bottom girder are empty or both sides are loaded.	There are no load cases in the CSR with single sided pressure for tight girders between ballast tanks and hence increasing the allowable yield utilisation factor to 1.0 for such structural members can only be done if additional load cases with single sided pressure are added. We will therefore keep the Rules as they are currently.	
1097	Text 9/2.3.1, App.B/3.1, Sec.9/3.3, App.C/2	Question	Fine mesh analysis on hopper knuckle connection	2011/10/5	Upper hopper knuckle connections are required to be evaluated by fine mesh analysis according to Section 9/2.3.1 and Appendix B/3.1. While lower hopper knuckle connections are required to be by very fine mesh fatigue analysis according to Section9/3.3 and Appendix C/2. We consider that structural assessment of upper hopper knuckle connections similar to lower hopper knuckle connections is possible to be carried out by very fine mesh fatigue analysis that is more advanced calculation than fine mesh analysis. Is it acceptable that very fine mesh fatigue analysis for structural assessment of upper hopper knuckle is carried out?	There is currently no procedure (in CSR OT) to carry out a fatigue assessment of the upper hopper knuckle and individual class requirements should be followed.	

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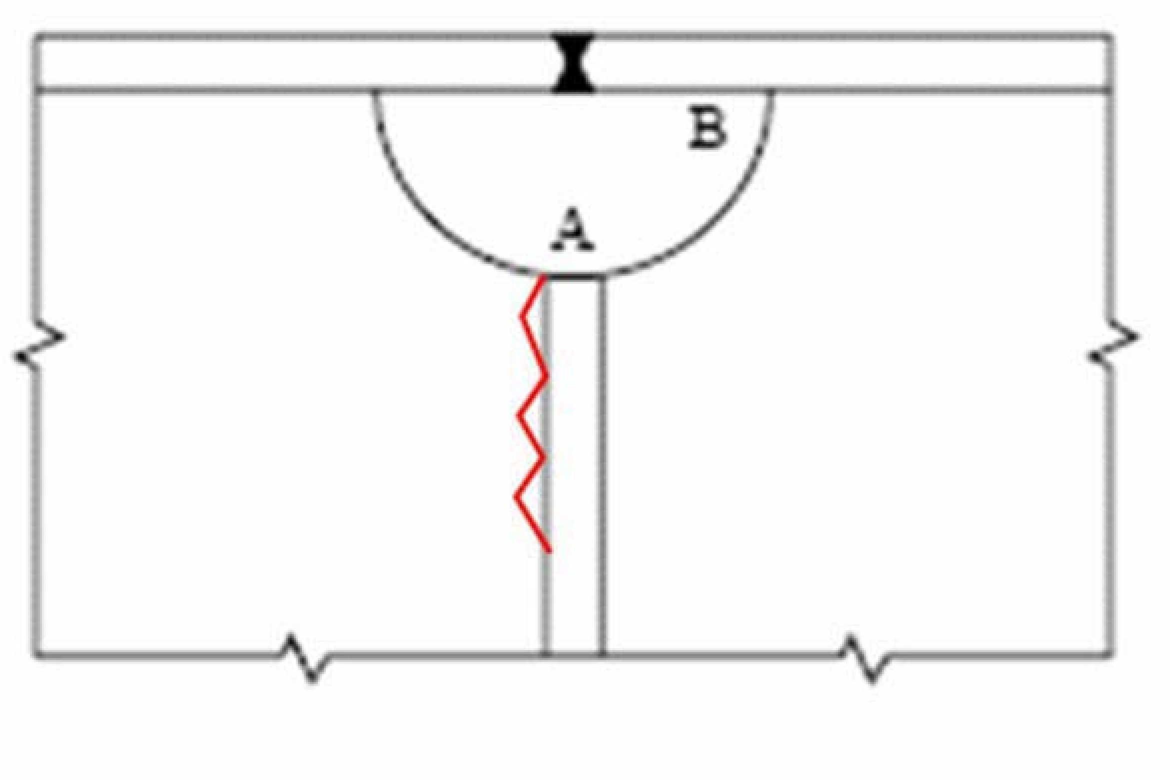

KC#252

Sec.		Rule	Comment	Note
9	2.2.5	Design Verification Table 9.2.2 Pillar buckling of cross tie structure $\eta \leqq 0.5$ (S+D)$\leqq$ $\eta \leqq 0.4$ (S)	The maximum permissible utilization factors against buckling of cross tie structure prescribed in Table 9.2.2 of Sec. 9 differ from those in Sec.8 2.6.8 Cross Ties. In Sec.8 2.6.8 $\eta \leqq 0.6$ (AC2) $\eta \leqq 0.5$ (AC1) Working stresses in cross tie structures, which are derived from FE analysis, are to be used according to the requirements in sec.9. Thus the accuracy of the working stresses is higher than that of Sec.8. The utilization factors in Sec.9 therefore should be at least the same as those in Sec.8. We would like to ask you to revise the discrepancy as soon as	