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

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attachment
347	Appendix A.2.3	Question	Formulae for critical Stressess & Buckling of transversely stiffened plate panels.	2007/8/22	11) In Appendix A, [2.3], there are editorial errors in the formulae for critical stresses in the following requirements: [2.3.4] - Beam column buckling [2.3.5] - Torsional buckling of stiffeners [2.3.7] - Web local buckling of flat bar stiffeners The correction should be to delete the coefficient in the brackets in formulae giving critical stresses. Please confirm? 2) In Appendix A, [2.3.8] - Buckling of transversely stiffened plate panels, the coefficient is missing in the first line of the formula giving the critical stress, between yd and the first bracket. Please confirm?	1) It is right, the critical stresses used in [2.3.4], [2.3.5] and [2.3.7] are respectively: - In [2.3.4], for σE1 > σyd*ε/2, σC1 is equal to σyd*(1 - (σyd*ε)/(4*σE1)) - In [2.3.5], for σE2 > σyd*ε/2, σC2 is equal to σyd*(1 - (σyd*ε)/(4*σE2)) - In [2.3.7], for σE4 > σyd*ε/2, σC4 is equal to σyd*(1 - (σyd*ε)/(4*σE4)) 2) It is right, the critical stress σCR5 in [2.3.8], in the first line of the formula is equal to: σyd*Φ*(s/(1000*lstf) *(2.25/βp - 1.25/βp^2) + 0.1*(1-s/(1000*lstf))*(1+1/β p^2)^2)	
427	A/2.2.2.4	CI	Transversely Stiffened Plates	2007/6/11	App A/2.2.2.4 When calculating the contribution of transversely stiffened plates in the HG ultimate strength, hard corners of 20 tgrs extend at both ends of the plate. On the other hand, for the load shortening portion of the stress-strain curve, the full plate breadth (to intersections of other plates) are considered. This approach is fine. However in the last sentence of the note, the full area of the plate is to be taken ie the breadth between the intersecting plate. In such a case the sections corresponding to the 20tgrs at both ends are considered 2 times, one time in elastic perfectly plastic (area correspoding to 2*20tgrs) and a 2nd time if the full area of the plate is used. I suggest the note be changed and interpretation be made, indicating that the full area of the plate is to be taken ie the breadth between the intersecting plate for the load shortering portion of the stress-strain curve but only the area of the transverse plate between the 20 tgrs limits be considered in order to count one time the total area of this transverse plate.	We agree with the comment. The Note in A/2.2.2.4 is to be understood as follow: For transversely stiffened plate, the effective breadth of plate for the load shortening portion of the stress-strain curve is to be taken as the full plate breadth (lstf used in 2.3.8.1), i.e. to the intersection of other plates – not from the end of the hard corner if any. The area on which the value of sigCR5 defined in 2.3.8.1 applies is to be taken as the breadth between the hard corners, i.e. excluding the end of the hard corner if any.	

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attachment
449	A /2.1.1.1	Question	Hull Girder Stress Modulus	2007/5/1	Sigma_yd is defined as specified minimum yield stress of material that is used to determine the hull girder section modulus. When material of deck plate and deck longitudinal are different or higher than the design yield stress for longitudinal strength, which yield stress should be used? Please clarify. Case-1: Deck plate is of HT36 and deck longitudinal is of HT40. The hull girder section modulus is determined for HT36. Yield stress for HT36 should be used? Case-2: Deck plate is of HT36 and deck longitudinal is of HT40. But the hull girder section modulus is determined for HT32. Yield stress for HT32 should be used?	Where the material properties of deck plate and deck longitudinals are different, in general, the lower material property is used for the determination of the hull girder section modulus on tankers. Therefore, the wording "that is used to determine the hull girder section modulus" in the definition of sigma-yd in Appendix A/2.1.1.1 was put with the intention to use the lower material property of deck plate and deck longitudinals. Consequently, for both Case-1 and Case-2, HT36 should be used. Please note that Case-2 is very unusual case on tankers and, therefore, the current rule wording does not fit. We intend to update the definition to make this clear.	
499 attc	App A/2.2.2.3 & 2.2.2.4	CI	Hull Girder Ultimate Strength	2008/10/9	The CSR for Oil Tankers and for Bulk Carriers need to have the same definition of hard corners in the Hull Girder Ultimate Strength. The attachment is a proposal for a common interpretation in this respect. The differences between the Rules in force are: CSR for Oil Tanker:The area on which the value of the buckling stress of transversely stiffened panels applies is to be taken as the breadth between the hard corners, i.e. excluding the end of the hard corner if any. Refer to KC CSR for Bulk Carriers: The definition is too vague and needs improvement through this CI.	The hard corners in the hull girder ultimate strength is defined as shown in the figure of the attached file "Fig._KC499.pdf".	Y
519 attc	App A 2.3	CI	Calculation procedures for ultimate strength	2008/1/7	With regard to calculation procedure for ultimate strength by incremental-iterative approach, please be clarified three questions as follows. Q1. Shortening curve for a stiffened plate element where material of plate and stiffener are different. Q2. Shortening curve for an element where thickness of plate are different. The element can be stiffener or plate. Q3. Shortening curve for an element where material and thickness of attached plate are different. (Attachment included)	A1) Where materials of plate and stiffener are different, two calculations are carried out: 1) for the stiffener: by adding to the stiffener an attached plating of the same material as the one of the stiffener, then determine the shortening curve and the stress σ to be applied to the stiffener. 2) for the attached plating: by adding a stiffener made of the same material as the one of the attached plating, then determine the shortening curve and the stress σ to be applied to the attached plating. (A2):An average thickness by the area of each considered plate is used for the considered element. (A3): An average thickness and yield strength by the area of each considered plate is used for the considered element.	Y
520 attc	App A /2.2.2.2	CI	Plates stiffeners	2007/10/23	For plates stiffened by not longitudinally continued stiffeners such as girders in double bottom, how to divide the plate to calculation elements. Should the stiffeners be neglected and considered as plate elements? (Attachment included)	If the stiffener is not continuous it does not participate to the hull girder ultimate strength and thus it is not to be taken into account. But it divides the plate into elementary plate panels which are calculated independently.	Y

KCID No.	Ref.	Type	Topic	Date completed	Question/CI	Answer	Attachment
521 attc	App A/2.2.3.	CI	Length of Stiffeners	2007/10/23	For stiffeners where one side of web are supported by bracket which space less than the space of primary supporting members, which is length of this element, space of brackets or supporting members? (Attachment included)	The length of the stiffener is taken as the space of primary supporting members as it cannot be considered that a bracket on one side of the stiffener's web is enough to reduce this length.	Y
1060	A/2.3.7.1	Question	Web local buckling of flat bar	2010/8/12	There seems to be an error in Equation 2.3.7.1 of Appendix A, CSR for Tankers. We feel the expressions "A s-net50sigmaC4" and "A s-net50" are being incorrectly multipied by "10^-2". We propose the following modification: The correct form of the equation should multiply "10^-2 " by "st net50sigmaCP" and "st net50" instead of by "A s-net50sigmaC4" and "A s-net50". Please clarify.	We can confirm that there is an editorial typo. Your proposed modification is agreed with, and the Rules will be amended at the first opportunity.	

KC#499

1. DEFINITION OF HARD CORNERS

1.1. Structural members

The following structural areas are to be defined as hard corners:

(a) the plating area adjacent to intersecting plates

(b) the plating area adjacent to knuckles in the plating with an angle greater than 30 degrees.

(c) plating comprising rounded gunwales.

1.2. Size and extend

The size and modelling of hard corner elements is to be as follows:

(a) it is to be assumed that the hard corner extends up to s/2 from the plate intersection for longitudinally stiffened plate, where s is the stiffener spacing;

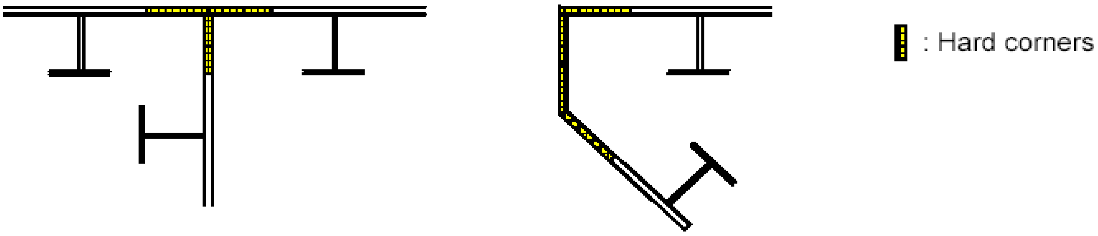

Figure 1 : Different definitions of hard corners in longitudinal framing

(b) it is to be assumed that the hard corner extends up to $20t_{gross}$ from the plate intersection for transversely stiffened plates, where t_{gross} is the gross plate thickness.

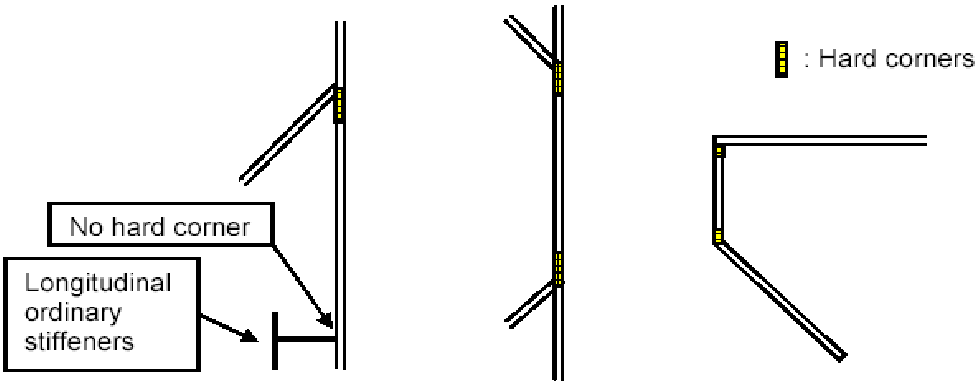

Figure 2 : Different definitions of hard corners in transverse framing

Nota: For transversely stiffened plate, the effective breadth of plate for the load shortening portion of the stress-strain curve is to be taken as the full plate breadth, i.e. to the intersection of other plates – not from the end of the hard corner if any.
The area on which the value of the buckling stress of transversely stiffened panels applies is to be taken as the breadth between the hard corners, i.e. excluding the end of the hard corner if any.

2. MODE OF FAILURE OF HARD CORNERS

Hard corners are sturdier elements composing the hull girder transverse section, which collapse mainly according to an elasto-plastic mode of failure. The relevant load-end shortening curve σ-ε is to be obtained according to the following formula, valid for both positive (shortening) and negative (lengthening) strains:

$$\sigma = \phi R_{eH}$$

where:

- ϕ : edge function: $\phi = -1 \quad for \quad \varepsilon < -1$; $\phi = \varepsilon \quad for \quad -1 < \varepsilon < 1$; $\phi = 1 \quad for \quad \varepsilon > 1$
- ε : Relative strain: $\varepsilon = \varepsilon_E / \varepsilon_Y$

  ε_E : Element strain

  ε_Y : Strain inducing yield stress in the element: $\varepsilon_Y = R_{eH} / E$

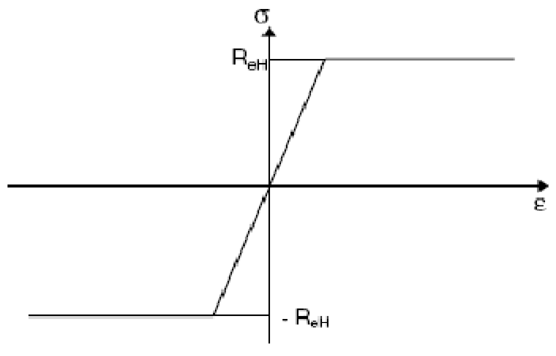

Figure 3 : Load-end shortening curve σ- ε for elasto-plastic collapse

3. RULES REFERENCES

Common Structural Rules for Oil Tankers, edition October 2006

Appendix A, [2.2.2.3], [2.2.2.4], [2.3.2.1] and [2.3.3.1].

Common Structural Rules for Bulk Carriers, edition January 2006

Chapter 5, Appendix 1, [2.1.2], [2.2.2], [2.2.3] and [1.3.3].

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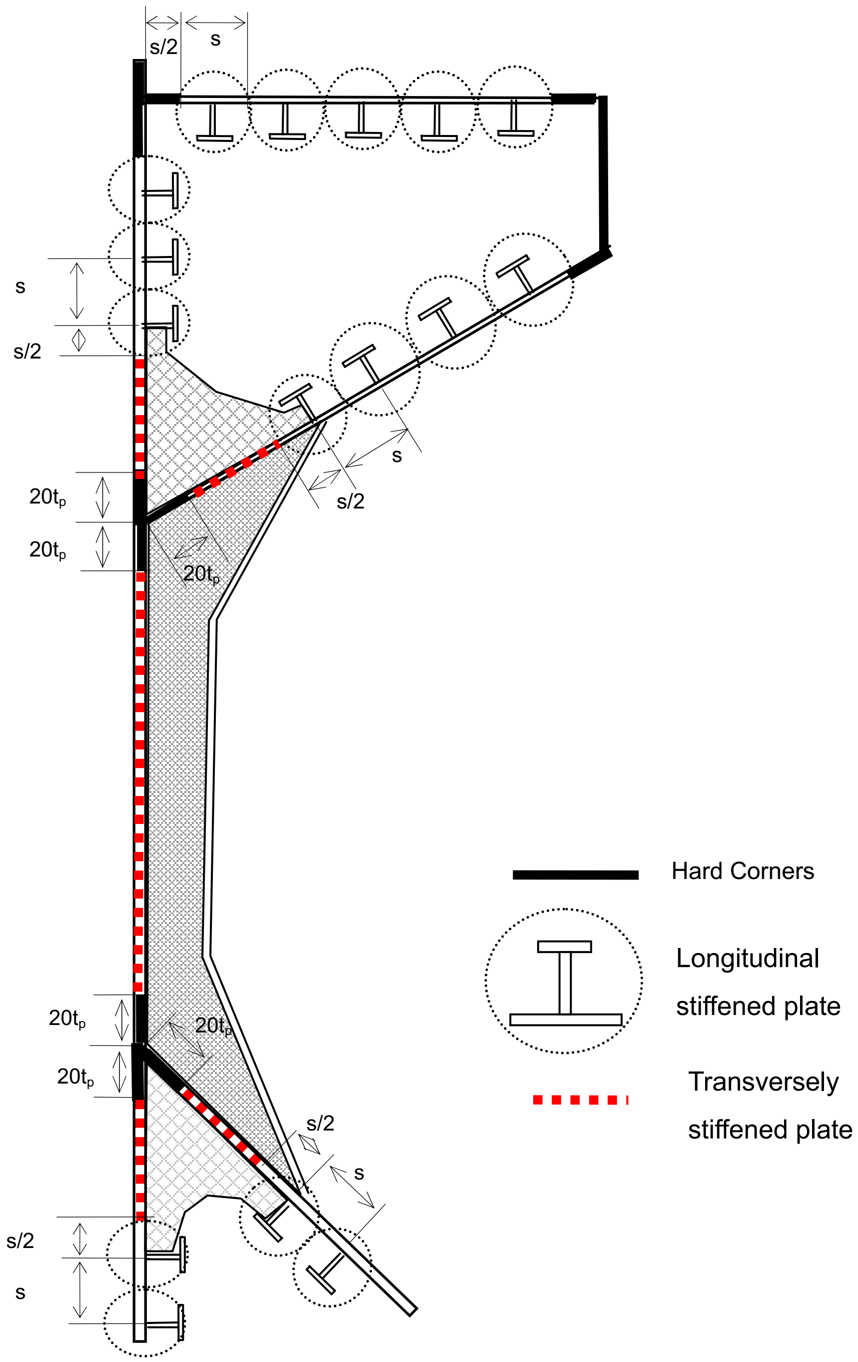
Question Id. 427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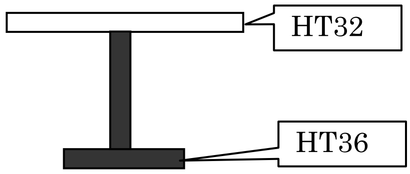
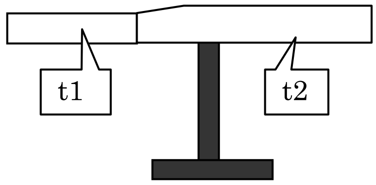
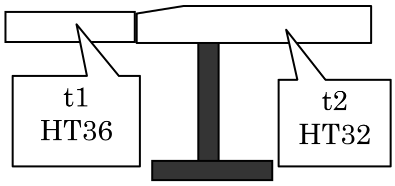
Hard Corners
Longitudinal stiffened plate
Transversely stiffened plate

KC#519

Question for ULS

Rule Ref.: Bulker CSR Ch5 Appendix 1, Tanker CSR Appendix A 2.3

Interpretation requested to calculation procedure for ultimate strength by incremental-iterative approach.

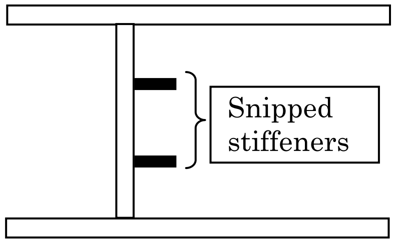
ID	Questions	Figures
Q1	Shortening curve for a stiffened plate element where material of plate and stiffener are different.	
Q2	Shortening curve for an element where thickness of plate are different. The element can be stiffener or plate.	
Q3	Shortening curve for an element where material and thickness of attached plate are different	

KC#520

Question for ULS

Rule Ref.: Bulker CSR Ch5 Appendix 1, Tanker CSR Appendix A 2.3

Interpretation requested to calculation procedure for ultimate strength by incremental-iterative approach.

ID	Questions	Figures
Q1	For plates stiffened by not longitudinally continued stiffeners such as girders in double bottom, how to divide the plate to calculation elements. Should the stiffeners be neglected and considered as plate elements?	

KC#521

Question for ULS

Rule Ref.: Bulker CSR Ch5 Appendix 1, Tanker CSR Appendix A 2.3

Interpretation requested to calculation procedure for ultimate strength by incremental-iterative approach.

ID	Questions	Figures
Q1	For stiffeners where one side of web are supported by bracket which space less than the space of primary supporting members, which is length of this element, space of brackets or supporting members?