

## Lloyd's Register Asia Presentation agenda

- Development of Arctic tanker fleet
- Selection of parent ship design for case study
- Case study findings: Ice belt extents: LU6 and PC5 Ice belt plating: PC5 and PC4 Ice belt framing: PC6 and PC6 Primary structure by direct calculations
- Ice class notional equivalents and case study equivalency
- Summary of case study

## Aker Arctic











Lloyd's Register Asia Comparison	n of ice bel	lt extents: bow and mid	l-body			
• Parent ship design requirement						
Ice strengthening to be dimensioned to RS ice class LU6 (Arc6)						
• Issue identified:						
Differences in ice strengthening extents between IACS PC and RS rules						
<ul> <li>Key study finding:</li> <li>Different approaches to define ice strengthening regions between</li> </ul>						
Parent ship design requirement (RS ice category rules)	Outcome from IACS PC Rule	Description of issue identified in case study	Background or study conclusion on reason for issue arising			
Requirement for ice strengthening to be dimensioned to RS ice class LU6 (Arc6)	Comparison of extent of bow and mid-body ice belt regions for RS ice category and IACS PC rules	There are differences in ice strengthening extents for PC rules c.f. RS rules for bow and mid-body regions: • Extent of bow region in PC rules is much larger than RS rule application • Extent of shoulder region is different in PC rules than RS rules with different distribution of areas • No separate bilge area in PC Rule mid-body region	Two rule sets use different approaches to define ice strengthening zones or regions.			
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Lloyd's Register Asia					
Compar1sor	n of framing	g: PC6 requirements			
• Parent sh	ip design requ	irement			
Transversely framed ice belt dimensioned to RS ice class LU6 (Arc6)					
• Issue identified:					
<ul><li>Parent ship design non-compliant with PC6 requirements</li><li>Key study finding:</li><li>Ice belt framing requirements based on different proportions in</li></ul>					
PC rule	Outcome from IACS PC Rule	Description of issue identified in case study	Background or study conclusion on		
(RS ice category rules) Requirement for ice strengthening to be dimensioned to RS ice class LU6 (Arc6) Requirement for transversely framed ice belt	application to Parent ship design Comparison of framing inice belt dimensioned to RS ice category LUG (Arc6) and IACS PC requirements	The parent design dimensioned to RS ice category LU6 complies with IACS PCG framing requirements except: Billing frames which fail PC-rule stability criteria Areas where of "over/lap" of Ice strengthening by PC rules when compared with RS rules Stern bottom frame which fail PC rule shear area requirements	reason for issue arising Parent ship design stiffeners tend to pass PC rule modulus and shear area criteria, but fail the PC rule stability check. Framing requirements for PC rules based on stiffener profiles of entirely different proportions to those of RS rules		
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Lloyd's Register Asia Comparison of framing: PC5 requirements						
• Parent ship design requirement						
Transversely framed ice belt dimensioned to RS ice class LU6 <i>(Arc6)</i>						
<ul> <li>Issue identified:</li> <li>Parent ship design non-compliant with PC5 requirements</li> <li>Key study finding:</li> </ul>						
Parent ship design requirement (RS ice category rules)	Outcome from IACS PC Rule application to Parent ship design	Description of issue identified in case study	Background or study conclusion on reason for issue arising			
Requirement for ice strengthening to be dimensioned to RS ice class LUB (Arc6) Requirement for transversely framed ice belt	Comparison of framing in ice belt dimensioned to RS ice category LUB (Arc6) and LCS PC requirements	The parent design dimensioned to RS ice category LUG compiles with IACS PCS framing requirements except: Lower ice beit and bilge area in mid-body where differing extents apply between PC and RS rules Ice beit and lower ice beit in bow and bow intermediate areas where differing exents apply between PC and RS rules Longitudinally framed bottom areas ( <i>except mid-body</i> ). Ice beit in stern due to higher loads from "stern os a bow" application	Parent ship design stiffeners tend to pass PC rule modulus and shear area criteria, but fail the PC rule stability check Framing requirements for PC rules are based on stiffener profiles of entirely different proportions to those used in Parent ship design compilant with RS ice category requirements			
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