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To relevant departments of CCS Headquarters, Shanghai Rules & Research Institute, Plan approval centers, branches, CCS surveyors, relevant shipyards, marine product manufacturers, designers and shipping companies

Notice on revision of Chapter A4 Additional Requirements for Hull Structure of Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, 2009

In recent years, with the wide use of high strength stainless steel material in the construction of chemical tankers, the existing provisions for the material factor of high strength stainless steel and the corrosion addition of stainless steel material in the current CCS Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk cannot meet the need of development. Therefore, the requirements for stainless steel of the Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk are revised by the Society.

The revision will be implemented to ships contracted to construction on or after the date on which this Circular is issued. The revision may also be implemented to ships contracted to construction before the date on which this Circular is issued.

This Circular is published on CCS website www.ccs.org.cn and is to be forwarded by CCS branches to relevant shipyards, marine product manufacturers, designers and shipping companies in relevance to their business area.

Hereby notify the above.

Annex: Chapter A4 Additional Requirements for Hull Structure of Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, 2009

Please contact Technology Management Dept. of the Headquarters in case of any unclarity during the implementation of this Circular.

Annex

Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, 2009

Chapter A4 Additional Requirements for Hull Structure

The existing paragraph A4.2.1 is replaced by the following:

"A4.2.1 Where stainless steel is incorporated in continuous longitudinal material in the vicinity of deck or bottom, the minimum midship section modulus W_1 is not to be less than the value obtained from the following formula:

$$W_1 = W \cdot K$$

where: W ——minimum midship section modulus, in cm^3, obtained according to 2.2.5.1 of Chapter 2 of PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;

K ——material factor according to Section 5, Chapter 1 of PART TWO of CCS Rules for Classification of Sea-Going Steel Ships. For stainless steel, it is to be taken according to A4.2.1.1 and A4.2.1.2."

A new paragraph A4.2.1.1 is added as follows:

"A4.2.1.1 In calculation of longitudinal strength, for duplex stainless steel material, the value of K is not to be less than 0.72; for austenitic stainless steel, K is taken as:

$$K = \frac{235}{R_{eH}}$$

where: R_{eH} ——yield stress of stainless steel, in N/mm^2."

A new paragraph A4.2.1.2 is added as follows:

"A4.2.1.2 In calculation of local strength, for stainless steel, the value of K is not to be less than $235/R_{eH}$, in addition to complying with the following requirements:

(1) For duplex stainless steel material, the value of K is not to be less than the value obtained from the following formula:

$$K = \frac{235}{-65\ln(T) + 200 + R_{eH}}$$

(2) For austenitic stainless steel material not containing nitrogen, the value of K is not to be less than the value obtained from the following formula:

$$K = \frac{235}{-40\ln(T) + 127 + R_{eH}}$$

(3) For austenitic stainless steel material containing nitrogen, the value of K is not to be less than the value obtained from the following formula:

$$K = \frac{235}{-48\ln(T) + 142 + R_{eH}}$$

where: T——cargo temperature, in ℃.”

The existing paragraph A4.8.4.1 is replaced by the following:
“A4.8.4.1 The thickness t of the deck plating which forms part of the boundary structure of integral cargo tanks is not to be less than the value obtained from the following formula:

$$t = t_0 + t_c \quad \text{mm}$$

where t_0 is to be taken as the value obtained from the following formulae, whichever is the greatest:

$$t = 40s\sqrt{P_v - 0.02} \quad \text{mm}$$

$$t = 2.8s\sqrt{\rho h} \quad \text{mm}$$

$$t = 4.5s \quad \text{mm}$$

$$t = 6.5 + \frac{L}{40}$$

mm, but not less than 7.5mm

where: t_c——corrosion addition, in mm, to be taken as 2.5 mm;

s——spacing of deck longitudinals, in m;

P_v——design pressure of tank top, in MPa gauge, to be taken as not less than 0.02;

ρ——the maximum cargo density, in t/m^3, to be taken as not less than 1.025;

h——vertical distance from top of the overflow to deck, in m;

L——length of ship, in m.”

The existing paragraph A4.8.4.2 is replaced by the following:
“A4.8.4.2 Where the deck plating which forms part of the boundary structure of integral cargo tanks is of stainless steel, the plating thickness is to be calculated according to A4.8.4.1 of this Chapter, where t_0 is to be multiplied by $\sqrt{K}$ (the value of K is taken according to A4.2.1.2), and the minimum deck plating thickness is not to be less than 6.5 mm.”

The existing paragraph A4.8.6.1 is replaced by the following:
“A4.8.6.1 The thickness t of the plane bulkhead plate forming part of the boundary structure of integral cargo tanks is not to be less than the value obtained from the following formula:

$$t = t_0 + t_c \quad \text{mm}$$

where t_0 is to be taken as the value obtained from the following formulae, whichever is the greatest:

$$t = 4s\sqrt{\rho h_1 + 100(P_v - 0.02)} \qquad \text{mm}$$

$$t = 2.8s\sqrt{\rho h}$$

mm

$$t = 2.9s\sqrt{2.45 + h_1} \qquad \text{mm}$$

$$t = 6.5 + \frac{L}{40}$$

mm, but not less than 7.5mm

where: t_c——corrosion addition, in mm, to be taken according to A4.8.6.2;

s——spacing of stiffeners, in m;

h_1——vertical distance measured from lower edge of bulkhead plate to tank top (excluding hatch), in m;

h——vertical distance measured from lower edge of bulkhead plate to top of the overflow, in m;

Other symbols are the same as those in A4.8.4.1."

The existing paragraph A4.8.6.2 is replaced by the following:

"A4.8.6.2 Where the plane bulkhead plate forming part of the boundary structure of integral cargo tanks is of stainless steel, the plate thickness is to be calculated according to A4.8.6.1 of this Chapter, where t_0 is to be multiplied by $\sqrt{K}$ (the value of K is taken according to A4.2.1.2). However, the minimum bulkhead plate thickness is not to be less than 6.5 mm. In addition, for carbon steel, t_c=2.5 mm; for stainless steel (excluding stainless clad steel plates), t_c is to be taken according to the table below:

where the bulkhead is fitted between cargo tanks	t_c=2.0
where the bulkhead is fitted between a cargo tank and a coated compartment or space	t_c=1.5

Note: for structures adjacent to the heating system, t_c is to be increased by 0.5 mm."

The existing paragraph A4.8.8.1 is replaced by the following:

"A4.8.8.1 The scantlings of the symmetrical corrugated bulkheads forming part of the boundary structure of integral cargo tanks are to be in accordance with the following formulae:

$$d_w t\left(a + \frac{b}{3}\right) \geq KCsl^2\left[\rho h_1 + 100(P_v - 0.02)\right]$$

$$d_w t\left(a + \frac{b}{3}\right) \geq 0.50KCs\rho hl^2$$

$$d_w t\left(a+\frac{b}{3}\right) \geq 0.53KCsl^2\left(2.45+h_1\right)$$

$$d_w \geq 40l$$

where: K ——material factor. For higher tensile steel, it is to be taken according to 1.5.3.2, PART TWO of CCS Rules for Classification of Sea-Going Steel Ships; for stainless steel, it is to be taken according to A4.2.1.2;

Other symbols are the same as those in existing A4.8.8.1 of Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, 2009."

The existing paragraph A4.8.11.1 is replaced by the following:

"A4.8.11.1 The thickness t of inner bottom plating forming part of the boundary structure of integral cargo tanks is not to be less than the value obtained from the following formula:

$$t = t_0 + t_c \qquad \text{mm}$$

where t_0 is to be taken as the value obtained from the following formulae, whichever is the greatest:

$$t = 4s\sqrt{\rho h_1 + 100\left(P_v - 0.02\right)} \qquad \text{mm}$$

$$t = 2.8s\sqrt{\rho h}$$

mm

$$t = 2.9s\sqrt{2.45+h_1} \qquad \text{mm}$$

$$t = 6.5+\frac{L}{40}$$

mm, but not less than 7.5mm

where: s ——spacing of inner bottom longitudinals, in m;

h_1 ——vertical distance measured from inner bottom plating to the tank top at central longitudinal plane, in m;

h ——vertical distance measured from inner bottom plating to top of the overflow, in m;

Other symbols are the same as those in A4.8.4.1."

The existing paragraph A4.8.11.2 is replaced by the following:

"A4.8.11.2 Where the inner bottom plating forming part of the boundary structure of integral cargo tanks is of stainless steel, the plating thickness is to be calculated according to A4.8.11.1 of this Chapter, where t_0 is to be multiplied by $\sqrt{K}$ (the value of K is taken according to A4.2.1.2), and the minimum plating thickness is not to be less than 7 mm."

The existing paragraph A4.8.12.1 is replaced by the following:

"A4.8.12.1 The section modulus W of inner bottom longitudinals forming part of the boundary structure of integral cargo tanks is, in addition to complying with the relevant requirements of Chapter 2 of PART TWO of CCS Rules for Classification of Sea-Going Steel Ships, not to be less than the values obtained from the following formulae:

$$W = 8.2sl^2\left[\rho h_1 + 100\left(P_v - 0.02\right)\right]K \qquad \text{cm}^3$$

$$W = 4.1s\rho hl^2K$$

cm^3

$$W = 4.3sl^2\left(2.45 + h_1\right)K \qquad \text{cm}^3$$

where: l——span of inner bottom longitudinals, in m;

Other symbols are the same as those in A4.8.11.1."