GUIDANCE CHANGE NOTICE No.1 April 2022

Part 1 Seagoing Ships

Volume G

GUIDANCE FOR THE CORROSION PROTECTION

2019

Biro Klasifikasi Indonesia

Jl. Yos Sudarso No. 38-40, Tanjung Priok
Jakarta 14320 - Indonesia
rules@bki.co.id
www.bki.co.id

Foreword

This Guidance Change Notices (GCN) No. 1 provide amendment and corrigenda to the Guidance for the Corrosion Protection (Pt.1, Vol.G) 2019 edition along with effective date from which these changes are applicable.

Amendments to the preceding edition are marked by strikethrough, red color, and expanded text. These new additions and amendments are to be read in conjunction with the requirements given in the 2019 Edition of the Guidance.

The summary of current amendments for each section including the implementation date are indicated in *Table 1 - Amendments Incorporates in This Notice*.

This publication is available in electronic version at www.bki.co.id. Once downloaded, this document will be uncontrolled. Please check the latest version on the website.

Any quires or comments concerning these Guidance are welcomed through communication with BKI Head Office.

Guidance Changes Notice No. 1 – April 2022

Table 1 – Amendments Incorporates in This Notice

These amendments will come into force as indicated in the Table

Paragraph	Title/Subject	Status/Remark
Chapter 1, Section 1 – General Fundamentals *The amendments are effective from 1 July 2022*		
D	**Symbols and Abbreviations Used**	
-	-	To change definition of Q_s and add new symbol
Chapter 1, Section 8 – Cathodic Corrosion Protection *The amendments are effective from 1 July 2022*		
B.	**External Protection through Sacrificial Anodes**	
B.2.3	Calculation of the Required Anode Weight	To supersede amendment the formula and formula explanation of anode weight calculation.
B.3.1	Table 8.3 Table 8.4	To change requirements related efficiency value
C.	**Internal Protection through Sacrificial Anodes**	
C.2.2	Anode Weight	To supersede the formula of anode weight calculation.

Chapter 1 Corrosion Protection and Coating Systems

Section 1 General Fundamentals

D. Symbols and Abbreviations Used

A_G = total area to be protected

A_{KSZ} = area of a cathodic protection zone

AY = acrylic resin

DTZ = Immersed Zone

EP = epoxy resin

FB = shop primer

f_B = loading factor

FRP = fibre-reinforced plastic

I_G = total protective current

IC = intercrystalline corrosion

I_{CPZ} = requirement in protective current for a CPZ

i_{CPZ} = protective current density for a CPZ

i_s = protective current density

CCP = cathodic corrosion protection

CPZ = cathodic protection zone

MCU = synthetic mineral blasting medium, made of copper works' slag

m_G = total anode weight

m_{CPZ} = anode weight of a CPZ

MQS = natural mineral blasting medium, made of silica sand

PMMA = polymethyl methacrylate

PUR = polyurethane

$Q_{~~s~~g}$ = electrochemical capacity ~~efficiency~~ of the anode alloy

R_z, R_{y5} = average surface roughness

CFC = corrosion fatigue cracking

SCC = stress corrosion cracking

SWZ = splash zone

TBT = tributyltin

t_s = protection period

U_H = potential against standard hydrogen electrode

UP = unsaturated polyester

PRE = pitting resistance equivalent

WTZ = tidal zone

μ = efficiency

end

Chapter 1 Corrosion Protection and Coating Systems

Section 8 Cathodic Corrosion Protection

B. External Protection through Sacrificial Anodes

2. Design Fundamentals

2.3 Calculation of the Required Anode Weight

The required total anode weight is:

Equation III: $$m_G = \frac{I_G \cdot t_S \cdot 8760}{Q_g \cdot \mu}$$

where:

m_G = required total anode weight [kg]

I_G = total protective current [A]

t_S = Protective period [year(s)]

Q_g = electrochemical capacity ~~efficiency~~ of the anode alloy [Ah/kg]

μ = efficiency, see Table 8.3 or Table 8.4

The required anode weight of a CPZ to be handles separately is:

Equation IV: $$m_{CPZ} = \frac{I_{CPZ} \cdot t_S \cdot 8760}{Q_g \cdot \mu}$$

If an area which has to be considered separately, such as a bow thruster, consists of several cathodic protection zones (impeller, bracket, tunnel), the required total mass must be calculated by addition of the individual values.

---------- *end* ----------

3. Anode Selection

3.1 Anode Materials

For the materials for galvanic anodes, aluminium or zinc alloys as per the requirements set out in Tables 8.3 and 8.4: Sacrificial anodes of aluminium alloys for applications in seawater or as per EN 12496, VG 81255 or equivalent standards must be applied.

The manufacture and acceptance of the sacrificial anodes should be carried out in accordance with the recommendations of EN 12496.

Other material combinations, as specified in Tables 8.3 and 8.4: Sacrificial anodes of aluminium alloys for applications in seawater, are only permissible for sacrificial anodes if their suitability and protective effect can be verified, either through successful and documented service over many years or through suitable testing methods.

Table 8.3 Sacrificial anodes of zinc alloys for applications in seawater

Element	KI-Zn1	KI-Zn2
Al	0,10 – 0,50	≤ 0,10
Cd	0,025 – 0,07	≤ 0,004
Cu	≤ 0,005	≤ 0,005
Fe	≤ 0,005	≤ 0,0014
Pb	≤ 0,006	≤ 0,006
Zn	> 99,22	≥ 99,88
Potential (T = 20 °C)	-1,03 V Ag/AgCl/See	-1,03 V Ag/AgCl/See
Q_g (T = 20 °C)	780 Ah/kg	780 Ah/kg
μ (Efficiency) (T = 20 °C)	95%[1)]	
Note: [1)] This value is used for calculation of the required anode weight.		

Table 8.4 Sacrificial anodes of aluminium alloys for applications in seawater

Element	KI-Al1	KI-Al2	KI-Al3
Si	≤ 0,10	≤ 0,10	-
Fe	≤ 0,10	≤ 0,13	-
Cu	≤ 0,005	≤ 0,005	≤ 0,02
Mn	N/A	N/A	0,15 – 0,50
Zn	2,0-6,0	4,0-6,0	2,0-5,0
Ti	-	-	0,01-0,05
In	0,01-0,03	-	0,01-0,05
Sn	-	0,05-0,15	-
Other El.	≤ 0,1	≤ 0,1	≤ 0,1
Al	Remainder	Remainder	Remainder
Potential (T = 20 °C)	-1,05 V Ag/AgCl/See	-1,05 V Ag/AgCl/See	-1,05 V Ag/AgCl/See
Q_g (T = 20 °C)	2000 Ah/kg	2000 Ah/kg	2700 Ah/kg
μ (Efficiency) (T = 20 °C)	95%[1)]		
Note: [1)] This value is used for calculation of the required anode weight.			

Anodes of magnesium alloys are not permissible in ship and offshore technology, neither for cargo tanks and ballast water tanks nor for the protection of the ship's outer shell nor as a temporary protection. An exception here is presented by application solely in fresh water.

In the case of ambient temperatures exceeding 25 °C, the reduced capacity and effectiveness of the sacrificial anodes must be taken into account for the design and arrangement. This is especially applicable to hot transverse bulkheads (e.g. walls adjoining fuel tanks). Conventional sacrificial anodes of zinc must only be used up to an ambient temperature of 50 °C for the protection of steel. If special alloys are to be used at temperatures exceeding 50 °C, their electrochemical characteristic and protective effect must be verified separately. The capacity of aluminium anodes is also reduced. In the case of high temperatures, it can be calculated as an approximation within the temperature range from T = 20 to 80 °C using the following equation:

Equation V: $Q_g\,(t) = 2000 - 27 \cdot (T - 20\,°C)$ [Ah/kg]

Experience shows that there are also special alloy for aluminium anodes which possess greater current capacities at high temperatures than the values calculated according to Equation V. The manufactures must then verify and guarantee these values.

---------- *end* ----------

C. Internal Protection through Sacrificial Anodes

2. Design Fundamentals

2.2 Anode Weight

The required anode weight per CPZ is obtained by

Equation VI:

$$m_{CPZ} = \frac{I_{CPZ} \cdot t_S \cdot 8760 \cdot f_B}{Q_g \cdot \mu}$$

f_B = loading factor

---------- *end* ----------