APPROVAL OF MANUFACTURER CERTIFICATE

Certificate No:
AMMM000000A
Revision No:
5

This is to certify:

That

SIDENOR ACEROS ESPECIALES, S.L.
Basauri, Reinosa and Azkoitia plants
Basauri, Bizkaia, Spain

is an approved manufacturer of
Steelmaking and Rolled Steel Products

in accordance with
DNV GL rules for classification – Ships
Offshore Standard DNVGL-OS-B101
DNVGL-OS-E302 – Offshore mooring chain, Edition July 2015

and the following particulars:

Product	**Round bars for chain cables,** **Rolled round bars intended to be machined into components,** **Semi-finished products; ingots, blooms and billets for forging and rolling stock**
Grades	**See page 2**
Steelmaking	**See page 2**
Deoxidation	**Killed**
Fine grain elements	**See page 2**
Delivery conditions	**See page 2**
Max. diameter	**See page 2**

Manufacturers approved by this certificate is accepted to deliver according to DNV GL, DNV and GL rules. Materials to be applied to DNV GL classed object shall fulfill the material requirements in the applicable DNV GL class rules.

Issued at **Høvik** on **2018-10-17**

for **DNV GL**

This Certificate is valid until **2019-04-19**.
DNV GL local station: **Bilbao**

Approval Engineer: **Dechun Lou**

Hanne Anita Hjerpetjønn
Head of Section

Job Id: **263.11-003845-3**
Certificate No: **AMMM000000A**
Revision No: **5**

Particulars of the approval:

Rolled round bars [1][2][6] intended to be machined into components (as a substitute for forged bars); Semi-finished products for forging or rolling stock				
Steel types	**Steelmaking [3]**	**Fine grain elements**	**Delivery conditions [4]**	**Max. diameter (mm)**
Carbon and carbon-manganese	EAF, IC or CC	Al or Al+V	N [5]	220 [5]
Alloy [6]	EAF, IC or CC	Al or Al+V	QT [5]	220 [5]

Remarks:
[1] Minimum rolling reduction ratio 6:1
[2] Sampling, inspection and testing requirements shall be according RU-SHIP Pt.2 Ch.2 Sec. 6
[3] EAF: Electric Arc Furnace; IC: Ingot Casting; CC: Continuous Casting.
[4] N: Normalised; QT: Quenched and Tempered.
[5] Not applicable for semi-finished products.
[6] Including clean steel of grade 18CrNiMo7-6 according to EN 10084, DNVGL RU-SHIP Pt.2 Ch.2 Sec.6 and DNVGL-CP-0247 Sec. 3 [2.1].

Round bars for chain cables				
Grade [5]	**Max. diameter (mm)**	**Steelmaking [1]**	**Fine grain elements**	**Delivery condition [2]**
R3	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC[3]		
	150	EAF, VD, CC[4]		
	203	EAF, VD, CC[4]	Al+V	HA
R3S	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC[3]		
	150	EAF, VD, CC[4]		
	186.5	EAF, VD, CC[4]	Al+V	HA
R4	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC[3]		
	191	EAF, VD, CC[4]		
R4S	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC[3]		
	174	EAF, VD, CC[4]		
R5	230	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC[3]		
	174	EAF, VD, CC[4]		

Remarks:
[1] EAF: Electric Arc Furnace; VD: Vacuum Degassing; IC: Ingot Casting; CC: Continuous Casting.
[2] AR: As Rolled; HA: Annealed for Hydrogen diffusion.
[3] Dimensions of billet: 185 x 185 mm
[4] Dimensions of bloom: 300 x 400 mm or 350 x 470 mm.
[5] Specification for chemical composition according to table S1

Ingots, blooms and billets for chain cables		
Grade [2]	**Steelmaking [1]**	**Fine grain elements**
R3, R3S R4, R4S R5	EAF, IC or CC	Al+V

Remarks:
[1] EAF: Electric Arc Furnace; IC: Ingot Casting; CC: Continuous Casting.
[2] Specification for chemical composition according to table S2

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Table S1 - Specification for chemical composition - Round bars for chain cables														
Grade, dia. (mm)			C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Al	V	N
R3	203	Min.												
		Max.												
R3S	185	Min.												
		Max.												
	186.5	Min.												
		Max.												
R4	185	Min.												
		Max.												
R4S	185	Min.												
		Max.												
NV R5	185	Min.												
		Max.												
NV R5	230	Min.												
		Max.												

Remarks:
The content of Sn, Sb and As may be required determined. In such cases, the maximum content shall be 0.030 % for Sn, 0.025% for As, 0.005 % for Sb and 0.001% for B.

Table S2 - Specification for chemical composition – Ingots, blooms and billets for chain cables														
Grade		C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Al	V	Ti	N
R3 [1] **R3S** [1]	Min.													
	Max.													
R3 [1] **R3S** [1]	Min.													
	Max.													
R4 [1]	Min.													
	Max.													
R4S [1]	Min.													
	Max.													
R5 [1]	Min.													
	Max.													
R3 [2] **R3S** [2] **R4** [2]	Min.													
	Max.													
R3 [3] **R3S** [3] **R4** [3]	Min.													
	Max.													
R3 [4] **R3S** [4] **R4** [4]	Min.													
	Max.													

Remarks:
[1] The content of Sn, Sb and As may be required determined. In such cases, the maximum content shall be 0.030 % for Sn, 0.025% for As, 0.005 % for Sb and 0.001% for B.
[2] The content of Sn, Sb, As and B may be required. In such cases, the maximum content shall be 0.030 % for Sn, 0.030 % for Sb, 0.030% for As.
[3] The content of Sn, Sb, As and B may be required determined. In such cases, the maximum content shall be 0.040 % for Sn and 0.030 % for Sb, 0.030 % As and 0.001 % for B.
4) The content of Sn, Sb and As may be required determined. In such cases, the maximum content shall be 0.030 % for Sn, 0.005 % for Sb and 0.025 % for As.