APPROVAL OF MANUFACTURER CERTIFICATE

Certificate No:
AMMM000011J
Revision No:
3

This is to certify:

That

SeAH Besteel Corporation
522, Oehang-ro, Gunsan-si, Jeollabuk-do, Republic of Korea

is an approved manufacturer of
Steelmaking and Rolled Steel Products

in accordance with
DNV GL class programme CP-0351 – Manufacture of heat treated products – Heat treatment workshop
DNVGL-OS-E302 – Offshore mooring chain, Edition July 2018
DNVGL-OS-B101 – Metallic materials
DNV GL rules for classification – Ships

and the following particulars:

Product	**Round bars for chain cables,** **Rolled bars intended for machining into components,** **Semi-finished products; Ingots and blooms for forging and rolling stock**
Grades	**See pages 2 and 3**
Steelmaking	**See pages 2 and 3**
Deoxidation	**Killed**
Fine grain elements	**See pages 2 and 3**
Delivery conditions	**See pages 2 and 3**
Max. diameter	**See pages 2 and 3**
Remarks	**Including in-house heat treatment facility (see page 4).**

Manufacturer 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 **2020-06-16**

This Certificate is valid until **2022-12-31**.
DNV GL local station: **Mokpo**

Approval Engineer: **Dechun Lou**

for **DNV GL**

Digitally Signed By: Løken, Sondre
Location: DNV GL Høvik, Norway
Signing Date: 17.06.2020

Sondre Løken
Head of Section

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Particulars of the approval

Rolled round and rectangle bars[1)2)] intended for machining into components

Type	Steelmaking [3)]	Delivery condition [4)]	Max. diameter / Thickness (mm)
Round rolled bars			
Carbon and carbon-manganese	EAF, CC or IC	QT or N	300
Alloy	EAF, CC or IC	QT or N	300
Rectangle rolled bars			
Carbon and carbon-manganese	EAF, CC or IC	QT or N	250 x 387
Alloy	EAF, CC or IC	QT or N	250 x 387

Remarks:
[1)] Minimum rolling reduction ratio 6:1
[2)] Inspection and testing requirements shall be according to RU SHIP Pt.2 Ch.2 Sec. 6
[3)] EAF: Electric Arc Furnace; CC: Continuous Casting; IC: Ingot Casting.
[4)] N: Normalized; QT: Quenched and tempered.

Semi-finished products; blooms for forging and rolling stock

Type	Steelmaking [1)]	Thickness (mm)
Square blooms		
Carbon and carbon-manganese	EAF, CC	390 x 390
Alloy	EAF, CC	390 x 390

Remarks:
[1)] EAF: Electric Arc Furnace; CC: Continuous Casting.

Round bars for ship anchor chain cables

Grade	Max. diameter (mm)	Steelmaking[1)]	Fine grain elements	Delivery condition[2)]
VL K1	130	EAF, CC or IC	Al	AR
VL K2	130	EAF, CC or IC	Al	AR
VL K3	130	EAF, CC or IC	Al+V	AR
	130	EAF, CC or IC	Al+Nb+V	AR
	160	EAF, CC	Al	AR

Remarks:
[1)] EAF: Electric Arc Furnace; CC: Continuous Casting; IC: Ingot Casting
[2)] AR: As Rolled.

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Round Bars for offshore mooring Chain Cable

Grade [1]	Max. diameter (mm)	Steelmaking [2]	Fine grain elements	Delivery condition[3]
R3	165	EAF, VD, CC	Al+V	AR
R3 [4]	190	EAF, VD, CC [5]	Al+V	AR
R3S	165	EAF, VD, CC or IC	Al	AR
R3S [4]	190	EAF, VD, CC [5]	Al	AR
R4	155	EAF, VD, CC or IC	Al	AR
R4 [4]	190	EAF, VD, CC [5]	Al	AR
R4S [4]	190	EAF, VD, CC [5]	Al+V	AR
R5 [4]	190	EAF, VD, CC [5]	Al+V	AR

Remarks:
[1] For approved material specification see table S1
[2] EAF: Electric Arc Furnace; VD: Vacuum Degassing; CC: Continuous Casting; IC: Ingot Casting.
[3] AR: As Rolled.
[4] For quenching and tempering condition: The minimum tempering temperature shall be 590°C for R3, R3S, R4 and 640°C for R4S, R5.
[5] Dimensions (W x T x L) of bloom is 510mm x 390mm x 5500 mm.

Table S1 - Specification for chemical composition [1], round bars for offshore mooring Chain Cable

Grade,	dia. (mm)		C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Al	V	N
R3	165	Min	.20	.15	1.40	-	-	.50	.40	.20	-	.025	-	-
		Max	.26	.35	1.60	.030	.030	.70	.60	.30	.30	.050	-	.009
		Min	.28	.15	1.00	-	-	-	-	-	-	.020	.03	-
		Max	.33	.35	1.90	.035	.035	.25	.40	.08	.35	.065	.10	.009
R3	190	Min	.28	.15	1.00	-	-	-	-	-	-	.020	.03	-
		Max	.33	.35	1.90	.035	.035	.25	.40	.08	.35	.065	.05	.009
R3S	190	Min	.20	.15	1.40	-	-	.50	.40	.20	-	.025	-	-
		Max	.26	.35	1.60	.030	.030	.70	.60	.30	.30	.050	-	.009
R4	190	Min	.20	.15	1.40	-	-	.90	.50	.20	-	.025	-	-
		Max	.26	.35	1.60	.030	.030	1.10	.70	.42	.30	.050	-	.009
R4S	190	Min	.21	.20	1.20	-	-	1.00	.95	.45	-	.015	.09	-
		Max	.24	.35	1.40	.020	.008	1.10	1.15	.55	.25	.040	.12	.015
R5	190	Min	.21	.20	1.20	-	-	1.00	.95	.45	-	.015	.09	-
		Max	.24	.35	1.40	.020	.008	1.10	1.15	.55	.25	.040	.12	.015

Remarks:
[1] The content of Sn, Sb, As and B may be required determined. In such cases, the maximum content shall be 0.020 % for Sn, 0.010% for Sb, 0.010% for As and 0.0008 % for B

Approval details of in-house heat treatment facility:

Item	Description
Product types	Rolled round and square bars intended for machining into components
Steel Types	Carbon and carbon-manganese, Alloy
Maximum Loading Weight	As per HT Procedure
Max. Thickness	Ø 270mm
Heat Treatment Type	Quenchin & Tempering
Furnace Details	Continuous type, ID No : QT No. 3 Working zone (mm): Austenitizing zone; - Length 33980, - Width 1630 - Height 2095 Tempering zone; - Length 51980 - Width 1530 - Height 1990
Heat Treament Procedure	Doc. No. SB-E-1L01-01 Ver.0 dtd. 2015-10-15
Temperature Uniformity Survey Procedure	Doc. No. SB-E-1L04-01 Ver. 0 dtd. 2015-10-15