



APPROVAL OF MANUFACTURER CERTIFICATE

Certificate No:
AMMM000011J
Revision No:
4

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-OS-E302 – Offshore mooring chain, Edition July 2022
DNV class programme CP-0237 – Manufacture of offshore mooring chain and accessories
DNV rules for classification – Ships
DNV-OS-B101 – Metallic materials
DNV class programme CP-0242 – Manufacture of semi-finished steel products – Steelmaker
DNV class programme CP-0243 – Manufacture of rolled ferritic steel products – Steel rolling mill
DNV class programme CP-0351 – Manufacture of heat treated products – Heat treatment workshop

and the following particulars:

Products	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 page 2 and 3
Steelmaking	See page 2 and 3
Deoxidation	Killed
Fine grain elements	See page 2 and 3
Delivery conditions	See page 2 and 3
Max. thickness/diam.	See page 2 and 3
Remarks	See particulars of the approval

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

Issued at **Høvik** on **2022-11-09**

for **DNV**

This Certificate is valid until **2025-12-31**.

DNV local unit: **Mokpo**

Approval Engineer: **Dechun Lou**

Sondre Løken
Head of Section

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Form code: AM 311

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Particulars of the approval:

Rolled round and rectangle bars ^{1), 2)} intended for machining into components acc. to DNV rules for classification-Ships and DNV-CP-0243

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 DNV-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 acc. to DNV rules for classification-Ships/DNV-OS-B101 and DNV-CP-0242

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 acc. to DNV rules for classification-Ships and DNV-CP-0243

Grade	Max. diameter (mm)	Steelmaking ¹⁾	Fine grain elements	Delivery condition ²⁾
NV K1	130	EAF, CC or IC	Al	AR
NV K2	130	EAF, CC or IC	Al	AR
NV 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.

Round Bars for offshore mooring Chain Cable as per DNV-OS-E302 and DNV- CP-0237

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 5500mm.

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 acc. to DNV rules for classification-Ships and DNV-CP-0351

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 Treatment 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