



Work Order - WO0298627
Steel Mill Approval - Renewal
Certificate No. STML-0298627

Attention: JIANGSU SHAGANG STEEL CO., LTD. (WCN: 488574)

The documents shown in the attached list are reviewed or filed for reference in accordance with the applicable requirement of the following and the facility is considered approved to manufacture products for hull application as outlined in the process/product approval.

- ABS RULES FOR MATERIALS AND WELDING PART 2 (2025)

Please note it is the responsibility of the facility to inform ABS of any changes to the manufacturing parameters and request renewal of approval prior to the five-year expiry date.

Refer to attachments, Process/Product Approval; Manufacturer Approval Certificate (STML-0298627).

For any clarifications, contact James Oehrle at JOehrle@eagle.org.

Very truly yours,

Gareth Burton
Senior Vice President of Engineering

Electronically Signed by: Satya Meruva

Documents List

Drawing No.	Rev. No.	Title	Status
Part 1	-	Renewal Report (ABS)	Reviewed
Part 2	-	Renewal Report (ABS)	Reviewed

Electronic copies of the documents, appropriately stamped, are available in the ABS MyFreedom™ Client Portal.

Process/Product Approval

Certificate No. STML-0298627

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
Approved Products					
Slabs	ABS – A*/B*/D	220 mm	Al	CC	N/A
Slabs	ABS – A*/B*/D*/E	220 mm	Al	CC	N/A
Slabs	ABS – AH*/DH 32*/36	220 mm	(Al+Ti) / (Al+Nb+Ti)	CC	N/A
Steel Making Practice¹: BOF +LF+RH Deoxidation Practice: Si- Al Killed Heat treatment Facility: N/A For 3500 Medium Plate Production Line					
Slabs	ABS – A*/B*/D*/E	320 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – AH*/DH*/EH32*/36	320 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – AH*/DH*/EH40	320 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – V-O75	220 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – VH32-O75	220 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – VH36-O75	220 mm	Al+Nb+Ti	CC	N/A
Steel Making Practice¹: BOF+LF+RH Deoxidation Practice: Si-Al Killed Heat treatment Facility: N/A					
Slabs	ABS – A*/B	320 mm	Al+Ti	CC	N/A
Slabs	ABS – A*/B*/D	320 mm	Al	CC	N/A
Slabs	ABS – A*/B*/D*/E	320 mm	(Al+Nb) / (Al+Nb+Ti)	CC	N/A
Slabs	ABS – AH*/DH*/EH 32*/36	320 mm	Al+Nb	CC	N/A

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
Slabs	ABS –AH*/DH*/EH*/FH32	320 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – AH*/DH*/EH*/FH 36*/40	320 mm	Al+Nb+V+Ti	CC	N/A
Slabs	ABS – AQ*/DQ*/EQ*/FQ43*/47	320 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – AQ*/DQ*/EQ*/FQ51*/56	320 mm	Al+Nb+Ti	CC	N/A
Slabs	ABS – AQ*/DQ*/EQ*/FQ63*/70	320 mm	Al+Nb+Ti	CC	N/A
Steel Making Practice¹: BOF Deoxidation Practice: Si-Al Killed Heat treatment Facility: N/A					
Slabs	Non-ABS – EN 10028-4 X7Ni9	220 mm	Al	CC	N/A
Slabs	Non-ABS – EN 10028-4 X12Ni5	220 mm	Al	CC	N/A
Steel Making Practice¹: BOF+LF+RH Deoxidation Practice: Al Killed Heat treatment Facility: N/A					
Plate	ABS – A*/B Z35	40 mm	Al	CC	AR
Steel Making Practice¹: BOF+LF+RH Deoxidation Practice: Si-Al Killed Heat treatment Facility: N/A					
Plate	ABS – A*/B*/D*/E Z35	40 mm	Al	CC	TMCP +AcC
Plate	ABS – AH*/DH 32*/36 Z35	40 mm	Al+Ti	CC	CR
Plate	ABS – AH*/DH 32*/36 Z35	40 mm	Al+Nb+Ti	CC	TMCP +AcC
Steel Making Practice¹: BOF+LF+RH Deoxidation Practice: Si-Al Killed Heat treatment Facility: In-house For 3500 Medium Plate Production Line					
Plate	ABS – A*/B*/D Z35	40mm	Al	CC	CR

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
Plate	ABS – A*/B*/D*/E Z35	100 mm	Al+Nb+Ti	CC	TMCP+ AcC
Plate	ABS – AH*/DH*/EH32*/36 Z35	100 mm	Al+Nb+Ti	CC	TMCP+ AcC
Plate	ABS – AH*/DH*/EH40 Z35	100 mm	Al+Nb+Ti	CC	TMCP+ AcC
Plate	ABS – V-O75 Z35	40 mm	Al+Nb+Ti	CC	TMCP +AcC
Plate	ABS – VH32-O75 Z35	40 mm	Al+Nb+Ti	CC	TMCP +AcC
Plate	ABS – VH36-O75 Z35	40 mm	Al+Nb+Ti	CC	TMCP +AcC
Steel Making Practice¹: BOF+LF+RH Deoxidation Practice: Si-Al Killed Heat treatment Facility: In-house					
Plate	ABS – AH*/DH*/EH 32*/36 BCA Z35	85 mm	Al+Nb+V+ Ti	CC	TMCP
Plate	ABS – AH/DH/EH40 BCA Z35	85 mm	Al+Nb+V+ Ti	CC	TMCP
Plate	ABS – AH*/DH*/EH32-W100	70 mm	Nb+V+Ti	CC	TMCP
Plate	ABS – AH*/DH*/EH36-W100	70 mm	Nb+V+Ti	CC	TMCP
Plate	ABS – AH*/DH*/EH32-W200	35 mm	Nb+V+Ti	CC	TMCP
Plate	ABS – AH*/DH*/EH36-W200	35 mm	Nb+V+Ti	CC	TMCP
Plate	Non-ABS – EN 10028-4 X7Ni9 Z35	(8 ~ 50) mm	Al	CC	Q&T
Plate	Non-ABS – EN 10028-4 X12Ni5 Z35	50 mm	Al	CC	Q&T
Steel Making Practice¹: BOF+LF+RH Deoxidation Practice: Al Killed Heat treatment Facility: In-house					
Plate	ABS – A*/B Z35	40 mm	Al	CC	AR
Plate	ABS – A*/B*/D Z35	35 mm	Al	CC	AR

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
Steel Making Practice¹: BOF Deoxidation Practice: Si Killed Heat treatment Facility: N/A					
Plate	ABS – A*/B Z35	60 mm	Al	CC	N/CR
Steel Making Practice¹: BOF Deoxidation Practice: Si Killed Heat treatment Facility: In-house					
Plate	ABS – AH 32/*36	30 mm	Al	CC	AR
Steel Making Practice¹: BOF Deoxidation Practice: Si-Al Killed Heat treatment Facility: N/A					
Plate	ABS – A*/B Z35	60 mm	Al	CC	N/CR
Plate	ABS – A*/B Z35	100 mm	Al+Ti	CC	N/CR
Plate	ABS – A*/B*/D*/E 35	100 mm	Al+Nb+Ti	CC	N
Plate	ABS – A*/B*/D*/E 35	60 mm	Al+Nb	CC	TMCP
Plate	ABS – AH*/DH32 35	40 mm	Al+Ti	CC	N/CR
Plate	ABS – AH*/DH32*/36 Z35	40 mm	Al+Nb+Ti	CC	N/CR
Plate	ABS – AH*/DH*/EH*/FH32 Z35	100 mm	Al+Nb+Ti	CC	N
Plate	ABS – AH*/DH*/EH*/FH32*/36 Z35	60 mm	Al+Nb	CC	TMCP
Plate	ABS – AH*/DH*/EH*/FH36*/40 Z35	100 mm	Al+Nb+V+Ti	CC	N
Plate	ABS – AH*/DH*/EH*/FH40 Z35	60 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AQ*/DQ*/EQ*/FQ43 Z35	60 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AQ*/DQ*/EQ*/FQ43*/47 Z35	100 mm	Al+Nb+Ti	CC	Q&T
Plate	ABS – AQ*/DQ*/EQ*/FQ47 Z35	60 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AQ*/DQ*/EQ*/FQ51 Z35	60 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AQ*/DQ*/EQ*/FQ51*/56 Z35	100 mm	Al+Nb+Ti	CC	Q&T

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
Plate	ABS – AQ*/DQ*/EQ*/FQ56 Z35	60 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AQ*/DQ*/EQ*/FQ 63*/70 Z35	100 mm	Al+Nb+Ti	CC	Q&T
Plate	ABS – AQ*/DQ*/EQ70 Z35	177.8 mm	Al+Nb+V+Ti	CC	Q&T
Plate	Non-ABS – ASTM A514/A517 Gr. Q MOD	177.8 mm	Al+Nb+V+Ti	CC	Q&T
Steel Making Practice¹: BOF Deoxidation Practice: Si-Al Killed Heat treatment Facility: In-house					
Plate	ABS – AH*/DH*/EH47 Z35	80 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AQ*/DQ*/EQ47 Z35	80 mm	Al+Nb+V+Ti	CC	TMCP
Steel Making Practice¹: BOF Deoxidation Practice: Al Killed Heat treatment Facility: In-house					
Plate	ABS – AH*/DH*/EH40 BCA1 Z35	85 mm	Al+Nb+V+Ti	CC	TMCP
Plate	ABS – AH*/DH*/EH47 BCA1 Z35	80 mm	Al+Nb+V+Ti	CC	TMCP

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
Steel Making Practice: BOF+LF+RH					
Deoxidation Practice: Silicon - Aluminum Killed					
Heat treatment Facility: In-house					
# Small scale production tests in lieu of large-scale test for BCA1 grade.					
The test parameters are as follows,					
1. NDTT test as per ASTM E208, with P-1, P-2 and P-3 type specimens.					
2. Frequency of test: Once per mother plate, two successful tests (2 specimens) for following positions.					
3. Acceptance criteria					
Grade/ Sample Location	Surface	Mid-Depth	Side Section		
EH40 BCA1	No break at -60°C (NDTT ≤ -65°C)	No break at -35°C (NDTT ≤ -40°C)	No break at -40°C (NDTT ≤ -45°C)		
EH47 BCA1	No break at -60°C (NDTT ≤ -65°C)	No break at -30°C (NDTT ≤ -35°C)	No break at -35°C (NDTT ≤ -40°C)		
4. Crack Arrest Toughness can be estimated from the NDTT test during production, using the equation proposed by Jiangsu Shagang Group. During production, if NDTT does not meet the specified acceptance criteria as stipulated in above table, the plates will be either designated without BCA properties or as scrap iaw manufacturer decision to satisfaction of ABS surveyor.					
Plate	ABS – EH36 BCA1 Z35, EH40 BCA1/BCA2 Z35	100 mm	Al+Nb+Ti	CC	TMCP-AcC
Plate	ABS – EH47 Z35, EH47 BCA1/BCA2 Z35	100 mm	Al+Nb+Ti	CC	TMCP-AcC
Steel Making Practice ¹ : BOF+LF+RH					
Deoxidation Practice: Aluminum Killed					
Heat treatment Facility: In-house					
# Small scale production tests in lieu of large-scale test for BCA1/BCA2 grade.					
The test parameters are as follows,					
5. NDTT test as per ASTM E208, with P-3 type specimens.					
6. Frequency of test: Once per mother plate					
7. Acceptance criteria					
Grade/ Sample Location	Surface	¼ Depth	½ Depth	Side Section	
EH36/40 BCA1/BCA2	No break at -60°C (NDTT ≤ -65°C)	No break at -40°C (NDTT ≤ -45°C)	No break at -40°C (NDTT ≤ -45°C)	No break at -45°C (NDTT ≤ -50°C)	

Product	Grade	Thickness	Fine Grain Practice	Casting Practice ¹	Delivery condition ¹
EH47 BCA1/BCA2	No break at -65°C (NDTT ≤ -70°C)	No break at -55°C (NDTT ≤ -60°C)	No break at -45°C (NDTT ≤ -50°C)	No break at -30°C (NDTT ≤ -35°C)	
Note: As specified by Jiangsu Shagang Group Co., Ltd., for NDTT test, two test specimens are to be taken from above each location, and plate is considered accepted when all the results meet the criteria. 8. Crack Arrest Toughness will be estimated from the NDTT, using the equation proposed by Jiangsu Shagang Group Co., Ltd. During production, if NDTT does not meet the specified acceptance criteria as stipulated in above table, a large-scale test (double tension test or CAT test) will be carried out to determine $K_{ca} \geq 6000 \text{ N/mm}^{1.5}$ (for BCA1) or $8000 \text{ N/mm}^{1.5}$ (for BCA2) at -10°C or CAT to be ≤ -10°C.					

* Approval of these grades is based on qualification tests carried out on the higher grade.

Note 1:

- a. CC: Continuous Casting
- b. AR: As Rolled
- c. N: Normalized
- d. CR: Controlled Rolling
- e. TMCP: Thermo-Mechanical Controlled Processing
- f. TMCP+AcC: Thermo-Mechanical Controlled Processing with Accelerated Cooling
- g. Q&T: Quench and Tempered
- h. BOF: Basic Oxygen Furnace
- i. LF: Ladle Furnace Refining
- j. RF: Ruhrstahl Heraeus – Vacuum Recirculation Process

Note 2: Use of Non-ABS grades on ABS classed vessels are subject to specific review at the time of application.

Note 3: Properties decrease with increase in thickness is to be considered in design.



CERTIFICATE NUMBER
STML-0298627

ISSUING OFFICE
Houston Materials

CERTIFICATE OF STEEL MILLS FACILITY AND PROCESS APPROVAL

This is to certify that a representative of ABS did, at the request of
JIANGSU SHAGANG STEEL CO., LTD.
JINFENG TOWN,ZHANGJIAGANG CITY,JIANGSU
PROVINCE, ZHANGJIAGANG, China

attend its facilities as indicated in the ABS City CN GZ Nantong Port port office survey report number 6976269 dated 14 May 2025 in order to carry out a survey of the facilities and associated quality procedures. The facility is considered capable of manufacturing

Semi-finished product and Plate components for marine applications

in accordance with the ABS Approval letter (Reference WO0298627), ABS Rules, designated standards and ABS approved drawings. The approval is valid till 02 June 2030 subject to adherence to relevant ABS Rules and Survey requirements.

Marcus Cridland
Chief Metallurgist, ABS

ISSUE DATE: 14 May 2025
EXPIRY DATE: 02 June 2030

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS or a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. This Certificate is a representation only that the structure, item of material, equipment, machinery or any other item covered by this Certificate has met one or more of the Rules, Guides, standards or other criteria of ABS as of the date of issue. Parties are advised to review the Rules for the scope and conditions of classification and to review the survey records for a full description of any restrictions or limitation on the vessel's service or surveys. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of ABS who shall remain the sole judge thereof. Nothing contained in this Certificate or in any notation made in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.