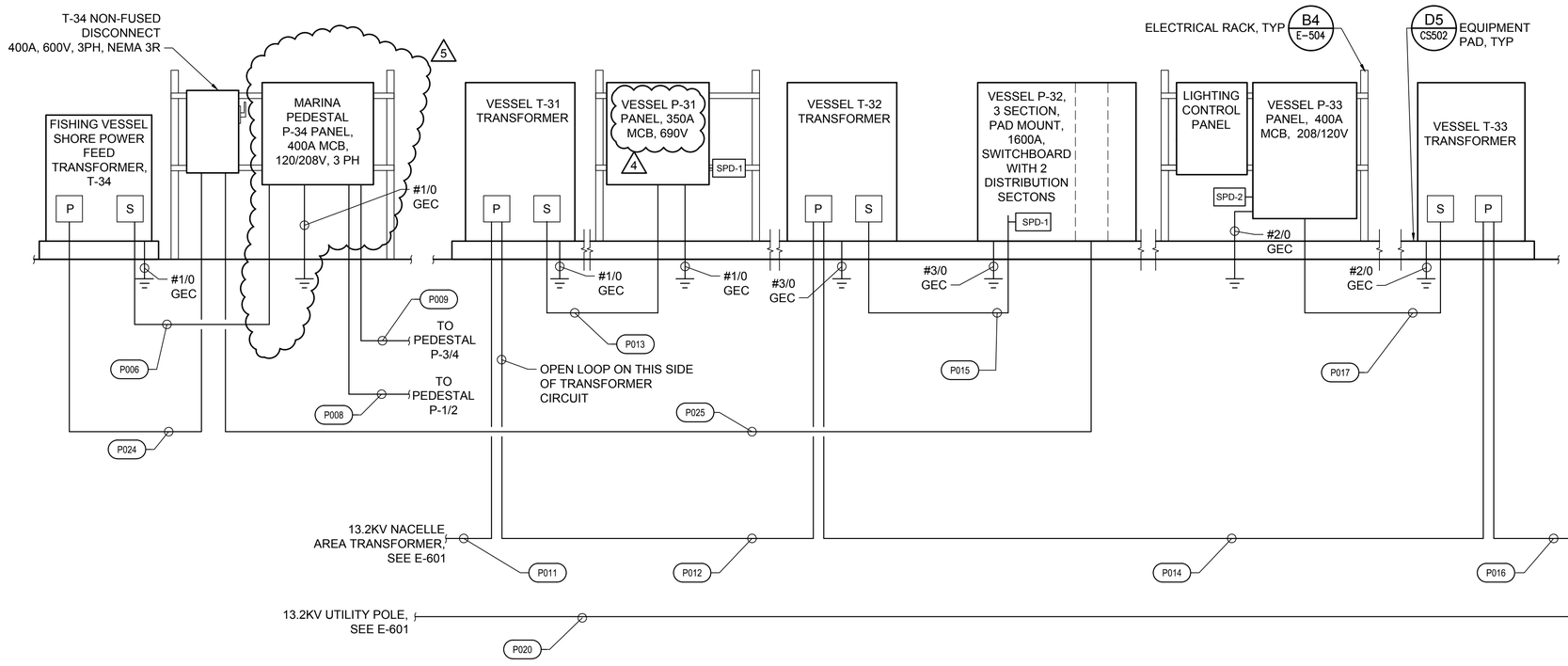
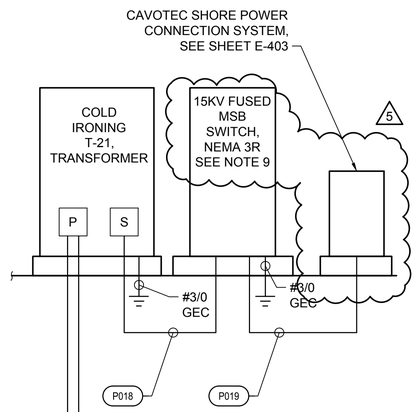

Approx. CMS pathway/range (typ.)
Approx. location of proposed SPOs
747.77 ft
Fri Mar 22 2024
Imagery © 2029 Nearmap, HERE
Nearmap

DocuSign Envelope ID: 1184999F-34AA-4900-8A18-A2E4C41A00DE

VESSEL LOADING AREA



COLD IRONING/LOADING AREA



NOTES:

1. UTILITY PROVIDED MEDIUM VOLTAGE, POLE MOUNTED TRANSFORMER BANK FOR SERVICES WEST OF STATE ROAD.
2. SEE SHEET E-631 FOR POWER CABLE SCHEDULE.
3. SEE E-611 FOR ELECTRICAL EQUIPMENT SIZES AND RATING.
4. OPERATION NORMAL POSITION OF BOTH FUSED CUTOUT SWITCHES IN NORMALLY CLOSED POSITION.
5. OPERATION NORMAL POSITION OF OPEN POINT IN POWER LOOP TO BE LOCATED AT TRANSFORMER T-31. SEE SHEET E-602.
6. COORDINATE CONNECTION DETAILS OR REQUIREMENTS WITH EVERSOURCE.
7. THE ONE-LINE IS A LINEAR LAYOUT OF EQUIPMENT AND MAY NOT DEPICT THE ACTUAL ORIENTATION. THE ONE-LINE DEPICTS WHICH COMPONENTS ARE RACK MOUNTED AND WHICH ARE PAD MOUNTED. FOR THE ACTUAL ORIENTATION ON THE SITE, REFER TO THE APPLICABLE ENLARGED PLAN.

5

8. PROVIDE GROUND-FAULT PROTECTION (GFP) FOR PANELBOARD P-34. GFP MANUFACTURER SHALL BE BENDER MARINAGUARD MODEL MG-T.2 OR ENGINEER APPROVED EQUAL. IF REQUIRED, PROVIDE 120V TO GFP FROM HML POWER OUTLET ASSEMBLY. IN THE EVENT OF A GROUND FAULT, THE GFP SHALL PROVIDE A TRIP SIGNAL TO THE APPLICABLE BREAKER (MAIN OR BRANCH) SHUNT TRIP BREAKER IN PANEL P-34, DE-ENERGIZING THE CIRCUIT CONTAINING THE GROUND FAULT.
9. COLD IRONING DISCONNECT SHALL BE MEDIUM VOLTAGE SWITCH OVER FIXED MOUNTED VACUUM BREAKER IN THE SAME ENCLOSURE (EATON MSB BASIS OF DESIGN) WITH SHUNT TRIP, GROUND FAULT MONITORING AND GROUND CHECK.
10. SEE CIVIL PLANS AND DETAILS FOR PAD DESIGN RAISING ELECTRICAL EQUIPMENT ABOVE BASE FLOOD ELEVATION.

Connecticut Port Authority

Mark	Description	Date	Appr
5	SCOPE REVISION	2022-06-03	DAW
4	CONFORMED REVISION	2021-11-12	DAW
2	COLD IRON DISC WAS RACK MTG	2021-04-28	DAW
1	EQUIP SIZE CHANGE	2021-04-06	DAW

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

ELECTRICAL ONE-LINE DIAGRAM 2

Rev: 5
Date: 2021-04-02
M&N Project No. 10630
Drawing code:
Drawing Scale:
Plot scale: 1:1 (D SHEET)
Designed by: DAW
Drawn by: DLA
Chkd by: JRV
Reviewed by: SJ
Submitted by: JOSHUA SINGER MOFFATT & NICHOL

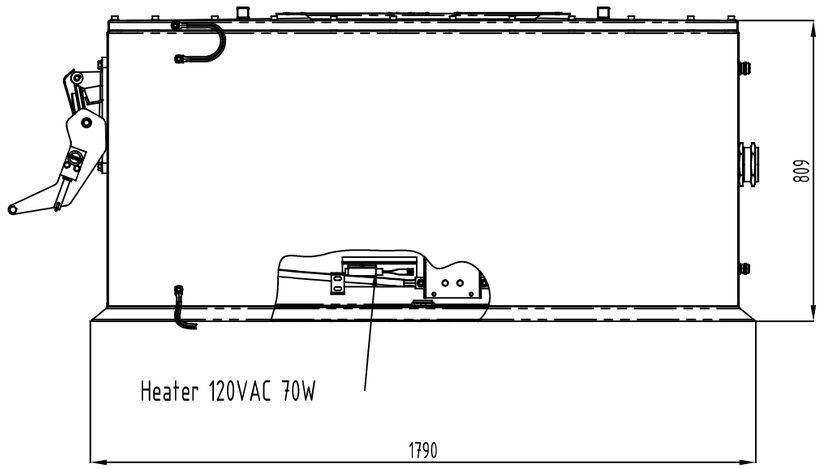
moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

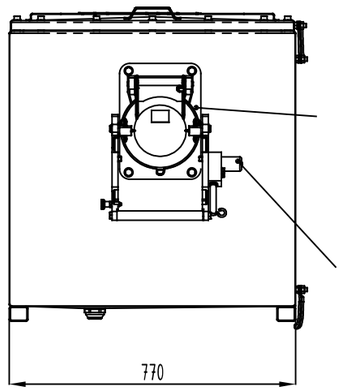
STATE OF CONNECTICUT
DAVID K. WILLIAMS JR.
PROFESSIONAL ENGINEER
DocuSigned by:
1E7...
06/03/2022

Sheet Reference No.
E-602
INDEX: 225 OF 232

File: Q:\BOS\Projects\10630 Detail Design State pier\500 CADD_Active_DesignSet\03_Electrical\10630E-602 - Plotted: 6/3/2022 10:45 AM by AUCOIN, DAVID - Saved: 6/2/2022 9:30 PM by DAUCOIN

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

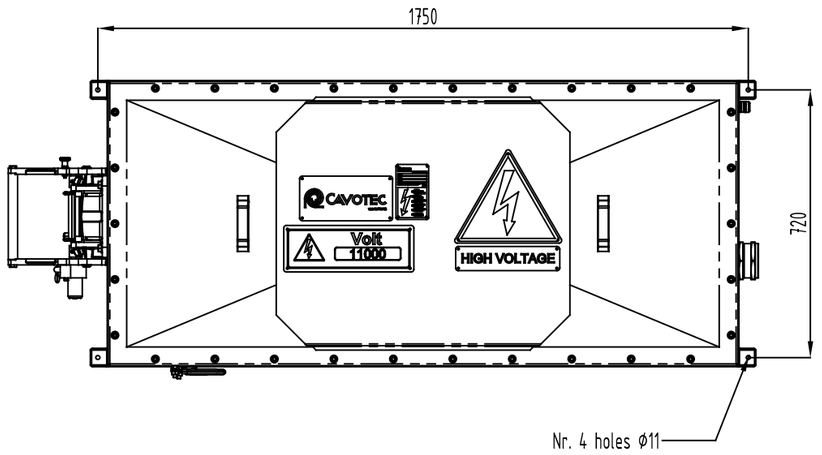




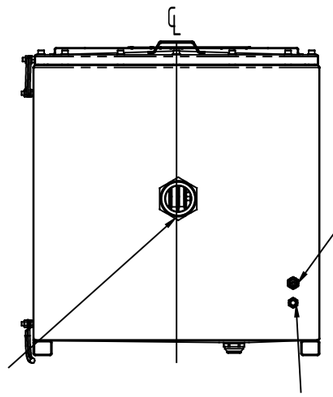
Notes
Pilot circut upstream and
mechanical interlock desing not in
Cavotec scope

Socket PC5 max voltage 7,2 kV (nominal 6,6 kV)
Socket code model number
PC5-VX04-K18533KL-MT1
suitable for cable 3x185 sqmm phase + 1x95 sqmm ground
Mating plug model number code PC5-SX04-K18533F-MT1 (for cable 3x185+1x95)
latchbolt code (to be added to plug code) SC-070430-SP1
Mechanical interlock (Kirk key release once plug is connected)

Preliminary incoming yard cables (not Cavotec scope)
- HV cables 3 phase + ground
- Pilot cable at least 3 cores 4 sqmm
- Heater cable 3 cores 2,5 sqmm



REAR VIEW



Pilot cables
Cable glands for OD 9÷17

Power cables
Cable glands for OD 65÷74
3-phase + ground cable
gland to be confirmed according cable datasheet

Heater cable
Cable gland for OD 7÷13
120 VAC - 70 w

Junction box
Material AISI 316
Surface finish - steel
IP 55
HV phase cable core to be crimped directly on HV sockets (terminal to be verified during order stage according yard HV cable datasheet/info) - terminations not in Cavotec scope
Ground to be terminated on ground bar
Pilots pins of the HV socket will be wired by Cavotec to terminal

To be installed in underground pit

PRELIMINARY

REV	DESCRIPTION	DRAWN BY	DATE	REF
B	Corrected mating plug description	DR	23/03/2022	
A	Issued for proposal	DR	10/03/2022	

CAVOTEC
Cavotec Specimas SpA

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www.cavotec.com

DRAWING NUMBER: 037199-T02		REVISION: B
PART NUMBER:		APPROVED:
MATERIAL:	TITLE: IHV PowerFeed	
FINISH: SEE	INFO:	MASS (kg): 230
DIMENSIONS IN mm UNLESS OTHERWISE STATED	TOLERANCING: ISO 2768-mK / SCALE: 1:17.5 / SHEET SIZE: A3	SHEET: 1 OF 1

DocuSign Envelope ID: 1184999F-34AA-4900-8A18-A2E4C41A00DE

THIS DOCUMENT AND THE DATA DISCLOSED HEREIN OR WHEREWITH IS NOT TO BE REPRODUCED, USED OR DISCLOSED IN WHOLE OR IN PART TO ANYONE WITHOUT THE PERMISSION OF ESL.

NOTES:

1. CABINET SHALL BE POWDER COATED (SEE TITLEBLOCK FOR COLOR) PER PROCESS SPECIFIED IN DRAWING 9910-01 TO COMPLY WITH C57.12.28.
2. AFTER INSTALLATION, ALL CONDUIT ENTRIES MUST BE COMPLETELY SEALED WITH EXPANDING FOAM. FAILURE TO SEAL MAY ALLOW CONDENSATION AND WILL VOID MANUFACTURER'S WARRANTY.
3. ENCLOSURE IS UL50 LABELED.
4. SEE 0901-520065J FOR WIRING SCHEMATIC.
5. SEE 5200-65J-NAMEPLATE FOR LABEL SCHEDULE.
6. ALL HARDWARE TO BE 316SS.

NOTES:

1. DRAWING CONTENT BY ESL POWER SYSTEMS.
2. DRAWING SUPPLIED FOR REFERENCE ONLY.

REMOVABLE CAM PLATE WITH (1)BLACK, (1)WHITE, (1)RED 15 DEGREE ANGLED, 690A, 600V SINGLE POLE FEMALE RECEPTACLE PER PLATE.

690A, 600V SINGLE POLE 15 DEGREE ANGLED PANEL MOUNT FEMALE RECEPTACLE WITH MICROSWITCH AND TETHERED CAP (3X)

E-STOP PUSHBUTTON RED SNAPBACK COVER

OUTLET "A" 400A, 480V

22" X 22" GASKETED ACCESS COVER (20" X 20" OPENING)

"INTERIOR ACCESS" NAMEPLATE

VOLTAGE LABEL

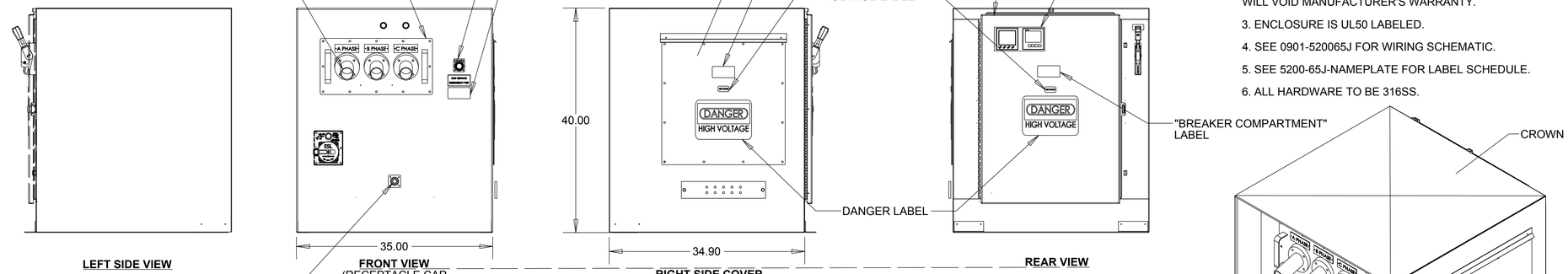
DANGER LABEL

REAR DOOR WITH CONTINUOUS HINGE AND 90 DEGREE DOOR STOP. GASKETED, CLAMPED AND PADLOCKABLE

PLEXIGLASS WINDOW TO VIEW AMMETER AND POWER METER

"BREAKER COMPARTMENT" LABEL

CROWN



LEFT SIDE VIEW

FRONT VIEW (RECEPTACLE CAP NOT SHOWN)

RIGHT SIDE COVER

REAR VIEW

400A, 600V SINGLE POLE STRAIGHT FEMALE GROUND CAM WITH MICROSWITCH

ISOMETRIC VIEW (RECEPTACLE CAP NOT SHOW)

GREEN LED LIGHT TO INDICATE RECEPTACLES ARE DE-ENERGIZED

RED LED LIGHT TO INDICATE RECEPTACLES ARE ENERGIZED

ESL INTERLOCK MODULE R32-480-30-35SNQP-SP 32A 480VAC RECEPTACLE RATED 35KAIC AT 480VAC

DIN RAIL WITH TERMINAL BLOCKS, PHASE LOSS RELAY, AND TIME DELAY RELAY

DIN RAIL WITH PRIMARY AND SECONDARY FUSES

TERMINAL BLOCKS AND DIN RAIL FOR E-SWITCH, RECEPTACLE MICROSWITCH AND SHUNT TRIP CONNECTIONS

FLANGE MOUNTED DISCONNECT HANDLE WITH FLEXIBLE CABLE MECHANISM

POWER METER

AMMETER

LSIG CIRCUIT BREAKER 400A, 480VAC, 3-POLE 100% RATED 100kAIC@480VAC WITH 120VAC SHUNT TRIP, WITH FLANGE MOUNTED DISCONNECT HANDLE

AMMETER CURRENT TRANSFORMER (3X)

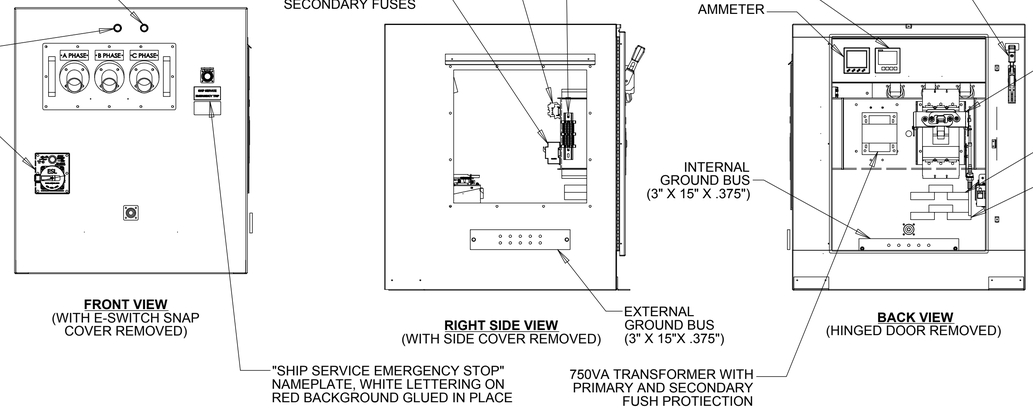
POWER METER CURRENT TRANSFORMER (3X)

INTERNAL GROUND BUS (3" X 15" X .375")

EXTERNAL GROUND BUS (3" X 15"X .375")

"SHIP SERVICE EMERGENCY STOP" NAMEPLATE, WHITE LETTERING ON RED BACKGROUND GLUED IN PLACE

750VA TRANSFORMER WITH PRIMARY AND SECONDARY FUSH PROTIECTION



FRONT VIEW (WITH E-SWITCH SNAP COVER REMOVED)

RIGHT SIDE VIEW (WITH SIDE COVER REMOVED)

BACK VIEW (HINGED DOOR REMOVED)

CERTIFIED
SAFETY US-CA
E466766

ESL POWER SYSTEMS

400A 440VAC 50/60Hz

MFG. DATE:

ESL CAT.# E1-690-480-520065J

SHORT CIRCUIT CURRENT RATING: 10,000 RMS SYMMETRICAL AMPS

Type ESL ESL Modules Cat.#M4

Corona, CA 92880 <> (800)922-4188 <>(951)739-7000 < info@eslpwr.com

REV.	BY	DATE	DESCRIPTION
2	KW	5/26/2022	CHANGED TRANSFORMER TO 750VA
1	EH	5/17/2022	CHANGED BREAKER TO LSIG
0	EH	05/16/22	FOR APPROVAL

MODEL: 5200-65J

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES:
DECIMALS ANGULAR
.x ±.03 ±1/2°
.XX ±.01
.XXX ±.005
BREAK ALL SHARP EDGES .005 - .010
DIMENSIONS TO BE HELD AFTER PLATING AND HEAT TREATING

MATERIAL: 304 SS
THICKNESS: 12 GAUGE
COLOR: TC1 ASA 61 GRAY
REFERENCE: 1180-60L

ENGINEER
CHECKED
APPROVAL
DATE
DO NOT SCALE DRAWING

ESL POWER SYSTEMS, INC.
CORONA, CALIFORNIA 92880
(951) 739-7000 (800) 922-4188
eslpwr.com - info@eslpwr.com

PATH: C:\ESL Vault\5200\

QTY= 1

EST. WEIGHT: Lbs.

STATE OF CONNETICUT
400A, 440VAC
3-PHASE, 3-WIRE
SHORE SIDE POWER UNIT

DRAWING NUMBER: 5200-65J

SHEET: 1 OF 3

5

A1 E-553 ESL 400V SHORE POWER CONNECTION SYSTEM
SCALE: NTS

Connecticut PORT AUTHORITY

Rev.	Description	Date	Appr
5	SCOPE REVISION	2022-06-03	DAW
4	CONFORMED REVISION	2021-11-12	DAW
Mark			

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

SHORE POWER RECEPTACLE ENCLOSURE

Designed by: DAW
Drawn by: DLA
Checked by: JRY
Reviewed by: SJ
Submitted by: JOSHUA SINGER MOFFATT & NICHOL

Date: 2021-04-02
M&N Project No. 10630
Drawing code:
Drawing Scale:
Plot scale: 1:1 (D SHEET)

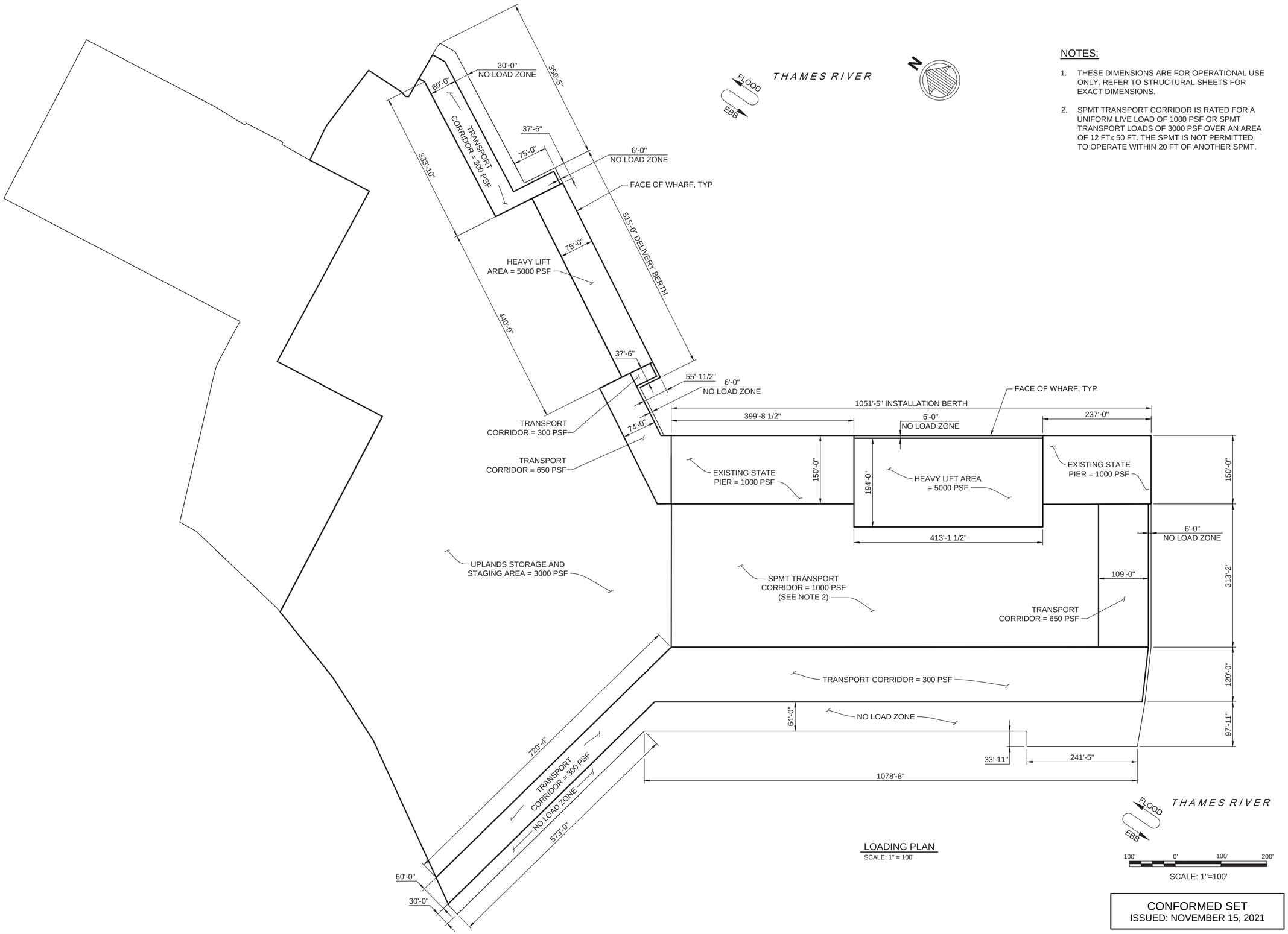
moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

STATE OF CONNECTICUT
DAVID W. WITTSTEIN
No. 25651
LICENSED PROFESSIONAL ENGINEER
06/03/2022

Sheet Reference No.
E-553
INDEX: 223 OF 232

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DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



LOADING PLAN
SCALE: 1" = 100'

SCALE: 1"=100'

NOTES:

1. THESE DIMENSIONS ARE FOR OPERATIONAL USE ONLY. REFER TO STRUCTURAL SHEETS FOR EXACT DIMENSIONS.
2. SPMT TRANSPORT CORRIDOR IS RATED FOR A UNIFORM LIVE LOAD OF 1000 PSF OR SPMT TRANSPORT LOADS OF 3000 PSF OVER AN AREA OF 12 FTx 50 FT. THE SPMT IS NOT PERMITTED TO OPERATE WITHIN 20 FT OF ANOTHER SPMT.

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

Connecticut PORT AUTHORITY

Mark	Description	Date	Appr

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

LOADING PLAN

Rev: 0
Date: 2021-03-12
M&N Project No. 10630
Drawing code:
Drawing Scale:
Plot scale: 1:1 (D SHEET)

Designed by: EH
Drawn by: CMI
Cad by: BA
Reviewed by: MT
Submitted by: JOSHUA SINGER MOFFATT & NICHOL

moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED
PROFESSIONAL ENGINEER
Matthew Trowbridge

Sheet Reference No.
G-121
INDEX: 6 OF 232

File: Q:\BOS\Projects\10630 Detail Design State pier\500 CADD_Active_Design Set\00_General\10630G-121 - Plotted: 3/12/2021 7:39 PM by MOYA IGLESIAS, CRISTIAN - Saved: 3/12/2021 12:43 PM by ACHABANE

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

BERTHING SYSTEM NAME: INSTALLATION BERTH
FACILITY OWNER/OPERATOR: CONNECTICUT PORT AUTHORITY
FACILITY LOCATION: STATE PIER COMPLEX, NEW LONDON, CONNECTICUT

STATEMENT OF TERMINAL OPERATING LIMITS
S2L-TYPE VESSEL AT INSTALLATION BERTH

REFERENCE CALULATIONS:

NEW LONDON STATE PIER MOORING ANALYSIS
DATED JANUARY 15, 2021 BY MOFFATT & NICHOL.

GENERAL NOTES:

BERTHING NOTES:

1) MAXIMUM BERTHING VELOCITY IS 0.3 FT/S AT MAXIMUM ALLOWED BERTHING DISPLACEMENT.

2) TUG ASSIST IS REQUIRED FOR THE VESSEL USING THE TERMINAL. DESIGN VESSEL BOW THRUSTERS SHALL BE LIMITED TO 40% POWER DURING OPERATION NEAR THE BERTH AND MAIN PROPELLER SHALL BE LIMITED TO DEAD SLOW AHEAD MODE (5% POWER).

MOORING LINE DESCRIPTION:

1) MINIMUM NUMBER OF MOORING LINES = 8

2) ALL MOORING LINES SHALL HAVE A MINIMUM BREAKING STRENGTH OF 60 METRIC TONS (132.3 KIPS).

MOORING DEVICE INFORMATION			
MOORING POINT	DEVICE TYPE	CAPACITY (KIPS)	CAPACITY (MT)
B12 TO B29	BOLLARD	165	75

VESSEL DESCRIPTION:

DESIGN VESSEL: S2L-TYPE VESSEL

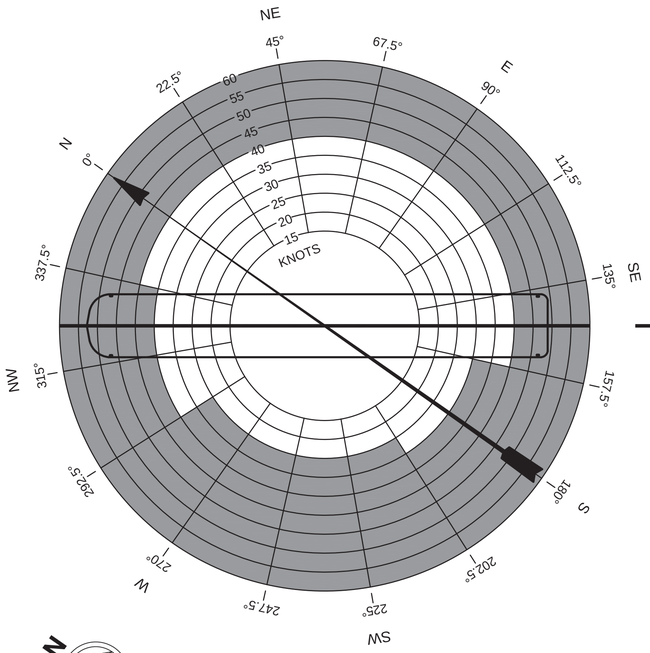
MAXIMUM LOA	= 608.3 FT
DWT CAPACITY	= 23,660 MT
MAXIMUM ARRIVAL DISPLACEMENT	= 43,500 MT
MAXIMUM BEAM	= 83 FT
MAX DRAFT (FULLY LOADED)	= 34.8 FT
MIN DESIGN WATER DEPTH	= 36 FT AT MLLW
MIN UNDERKEEL CLEARANCE	= 1 FT

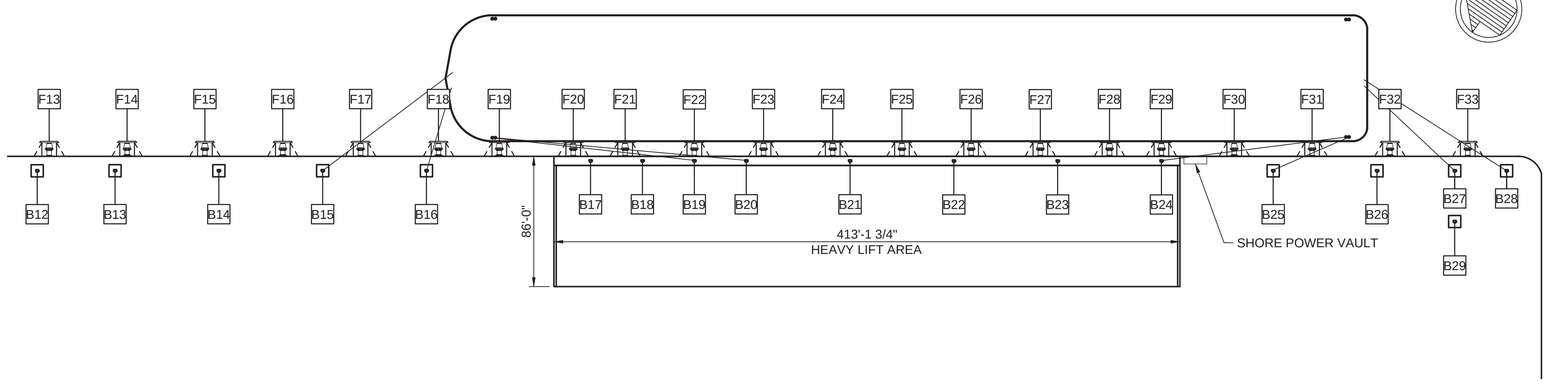
WIND FROM DIRECTION	IN KNOTS, 2-MINUTE DEPARTURE CONDITION
N	40
NE	40
E	40
SE	40
S	30
SW	25
W	25
NW	35

ENVIRONMENTAL CONDITION LIMITS:

1) WIND SPEED RESTRICTIONS ARE BASED ON 2-MINUTE AVERAGE.

2) WIND RESTRICTION DIAGRAM IS APPLICABLE FOR MAXIMUM CURRENT SPEED (EBB OR FLOOD) OF 1.5 KNOT.





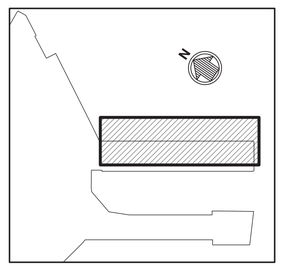
FENDER LINE

WIND RESTRICTION DIAGRAM
(WIND DIRECTION FROM)

LEGEND:

OPERATIONAL CONDITION

DEPARTURE CONDITION: PLANNED BERTH VACANCY / DEPART BERTH



KEY PLAN

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Connecticut PORT AUTHORITY

Rev.	Date	Description	Appr

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

INSTALLATION BERTH VESSEL OPERATIONS PLAN (1 OF 2)

Designed by: EH	Cad by: BA	Reviewed by: MT	Date: 2021-03-12
Dwn by: CMI		Submitted by: JOSHUA SINGER, MOFFATT & NICHOL	M&N Project No. 10630
			Drawing code:
			Drawing Scale:
			Plot scale: 1:1 (1) SHEET)

moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED
PROFESSIONAL ENGINEER

Matthew Trowbridge

Sheet Reference No.
G-134
INDEX: 10 OF 232

File: Q:\BOS\Projects\10630 Detail Design State pier\500 CADD_Active_Design\Ser\00_General\10630G-134 ; Plotted: 3/12/2021 7:40 PM by MOYA IGLESIAS, CRISTIAN ; Saved: 3/12/2021 12:42 PM by ACHABANE

BERTHING SYSTEM NAME: INSTALLATION BERTH
FACILITY OWNER/OPERATOR: CONNECTICUT PORT AUTHORITY
FACILITY LOCATION: STATE PIER COMPLEX, NEW LONDON, CONNECTICUT

STATEMENT OF TERMINAL OPERATING LIMITS
SEAJACKS FUTURE VESSEL AT INSTALLATION BERTH

REFERENCE CALULATIONS:

NEW LONDON STATE PIER MOORING ANALYSIS
DATED JANUARY 15, 2021 BY MOFFATT & NICHOL.

GENERAL NOTES:

BERTHING NOTES:

1) MAXIMUM BERTHING VELOCITY IS 0.3 FT/S AT MAXIMUM ALLOWED BERTHING DISPLACEMENT.

2) TUG ASSIST IS REQUIRED FOR THE VESSEL USING THE TERMINAL. DESIGN VESSEL BOW THRUSTERS SHALL BE LIMITED TO 40% POWER DURING OPERATION NEAR THE BERTH AND MAIN PROPELLER SHALL BE LIMITED TO DEAD SLOW AHEAD MODE (5% POWER).

MOORING LINE DESCRIPTION:

1) MINIMUM NUMBER OF MOORING LINES = 8

2) ALL MOORING LINES SHALL HAVE A MINIMUM BREAKING STRENGTH OF 224 METRIC TONS (493.8 KIPS).

MOORING DEVICE INFORMATION			
MOORING POINT	DEVICE TYPE	CAPACITY (KIPS)	CAPACITY (MT)
B12 TO B29	BOLLARD	165	75

VESSEL DESCRIPTION:

DESIGN VESSEL: SEAJACKS FUTURE VESSEL

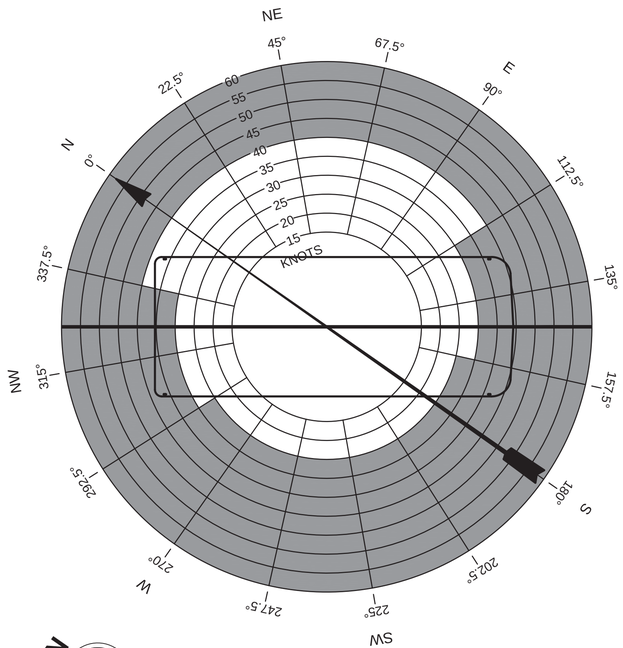
MAXIMUM LOA	= 473 FT
MAXIMUM ARRIVAL DISPLACEMENT	= 40,489 MT
MAXIMUM BEAM	= 184 FT
SPUD-CAN DRAFT	= 28 FT
MIN DESIGN WATER DEPTH	= 38 FT AT MLLW
MIN UNDERKEEL CLEARANCE	= 3 FT

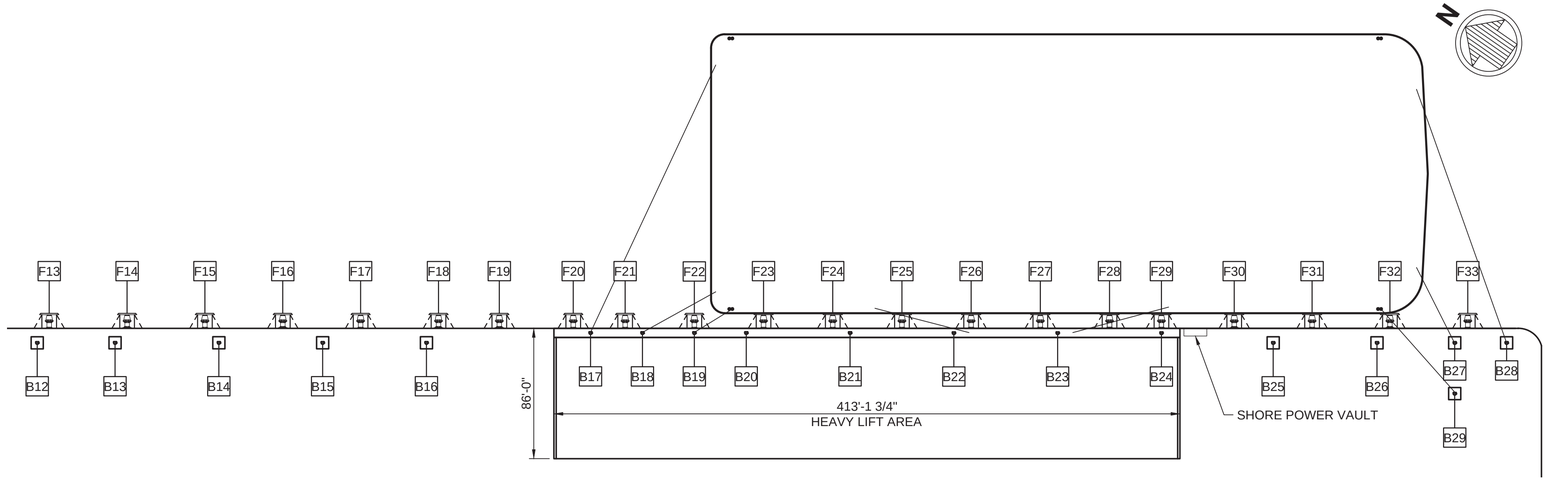
WIND FROM DIRECTION	IN KNOTS, 2-MINUTE DEPARTURE CONDITION
N	40
NE	40
E	40
SE	30
S	25
SW	25
W	25
NW	30

ENVIRONMENTAL CONDITION LIMITS:

1) WIND SPEED RESTRICTIONS ARE BASED ON 2-MINUTE AVERAGE.

2) WIND RESTRICTION DIAGRAM IS APPLICABLE FOR MAXIMUM CURRENT SPEED (EBB OR FLOOD) OF 1.5 KNOT.



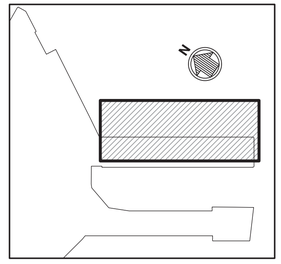


WIND RESTRICTION DIAGRAM
(WIND DIRECTION FROM)

LEGEND:

OPERATIONAL CONDITION

DEPARTURE CONDITION: PLANNED BERTH VACANCY / DEPART BERTH



KEY PLAN

FENDER LINE

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

Connecticut PORT AUTHORITY

Rev.	Date	Description	Appr

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

INSTALLATION BERTH VESSEL OPERATIONS PLAN (2 OF 2)

Date: 2021-03-12
M&N Project No. 10630
Drawing code:
Drawing Scale:
Plot scale: 1:1 (10 SHEET)

Designed by: EH
Drawn by: CMI
Cad by: BA
Reviewed by: MT
Submitted by: JOSHUA SINGER, MOFFATT & NICHOL

moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED
PROFESSIONAL ENGINEER
Matthew Trowbridge

Sheet Reference No.
G-135
INDEX: 11 OF 232

File: Q:\BOS\Projects\10630 Detail Design State pier\500 CADD_Active_Design\Ser\00_General\10630G-135 ; Plotted: 3/12/2021 7:41 PM by: MOYA IGLESIAS, CRISTIAN ; Saved: 3/12/2021 6:51 PM by: BFORD

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

moffatt & nichol

180 Wells Ave, Suite 302
Newton, MA 02459
(617) 299-7330
www.moffattnichol.com

REVIEW OF SUBMITTAL
No. 35 59 13.19-03,
355913.19.362.02 Trelleborg Bollards Rev 4

To: Kiewit Infrastructure Co.

Date: 8/22/22

Project: Infrastructure Improvements State Pier Complex

Attn: Nick Malatestinic

Phone:

M&N Job No: 10630/02

Ref: Specification/Drawing No.:

WE ARE SENDING YOU VIA:

☐ E-Mail	☐ USPS	☐ FedEx
☐ Messenger	☒ Attached	☐ Other:

Reviewed as follows:

☐ No Exceptions Taken	☐ Revise and Resubmit
☒ Make Corrections Noted	☒ Submit Specified Item
☐ Rejected	☐ For Information Only / No Action

moffatt & nichol

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Newton, MA 02459
(617) 299-7330
www.moffattnichol.com

Checking is only for general conformance with the design concept and general compliance with information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications and does not authorize changes involving costs unless covered by change order. This review does not cover assemblies of which items being reviewed are components. Contractor is responsible for: dimensions, quantities and details which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of his work with that of all other trades: safety precautions and the satisfactory performance of his work.

COMMENTS:

Make Corrections Noted – submittal is approved as noted based on integration of previous comments.

Submit Specified Items:

1. Per spec 35 59 33 Part 1.04 B, submit for review;
   a. Mill test certifications for each heat number
   b. Record showing heat numbers and serial numbers
   c. Galvanizing certificate for hardware
   d. Certificate of conformance for line pull rating
   e. One bollard from each heat must be made with two coupons. One coupon must be tested at the factory, and the results are to be sent to the Engineer prior to shipment of the bollards. The second coupon will remain attached to the bollard until final delivery for testing by Owner.
2. Submit work plan for locating and preventing damage to rebar within existing State Pier prior to fabrication. Coordinate with RFI 406.
3. Submit product data sheets and manufacturer installation procedures for grout per Spec 35 59 33 Part 1.04 A 2.
4. Submit proposed sealant per A1/S-503.

Moffatt & Nichol

By: Derek Franzese **Signature:** Derek Franzese

Date: 8/22/2022

DATE:	Project:	
8/18/22	Infrastructure Improvements to Connecticut State Pier - New London, CT	☐ New Submittal ☑ Re-Submittal
SECTION I: Title		

Number / Spec Section: 355933.19.362 **Submittal Number:** 355933.19.362.02 REV 4	**Activity Numbers Covered in Submittal:** 362

ITEM NO.	DESCRIPTION OF ITEM	TYPE (SHOP DRAWING, PRODUCT DATA, ETC.)	NO. OF PAGES SUBMITTED
1	Message of Submittal	Document	Pg 1
2	Cover Sheet	Document	3
3	Table of Contents	Document	5
4	Shop Drawings & Design Calcs	Shop Drawings	10
5	Paint Specs	Document	65
6	Bollard Handling	Document	80
7	Certs & Reference Letters	Documents	106

Kiewit	Elizabeth Spitzenberger
TRADE CONTRACTOR NAME	SUBMITTED BY

Submittal Number: 355933.19.362.02

Message:

Submittal 355933.19.362.02 REV 4 is being resubmitted in its entirety based on previous discussions with the CA, EOR and CMR.

COLLINS ENGINEERS INC.

Sheet No.	1 of 1
Project No.	66-12929.04
Phase No.	-
Revision No.	-
Date	8/17/2022

Design Calculations

Project Title: Connecticut State Pier, Connecticut Port Authority

Client: Trelleborg

Purpose of Calculations: Complete check of mooring hardware calculations provided by Trelleborg for MSB 50 & 75 mooring bollards at Delivery Berth and Installation Berth Types 1, 2, and 3. The review verified the required design parameters are addressed, applicable codes and standards are incorporated, and the design adequately satisfies the specified performance requirements. The shop drawings reviewed for consistency with the design calculations.

Design Codes and References Used in Calculations:

1. AISC, *Steel Construction Manual*, 13th ed.
2. From Trelleborg:
   a. 25135 – TMS Submittal MSB 75 and MSB 50 dated May 13, 2022
   b. 25135 – Fender System Drawings prepared by Moffit & Nichol dated 3/12/2021 with latest revision date of 04/09/2021
   c. 25135 - Section 35 59 33 – Marine Bollards

Summary:

The design calculations and shop drawing prepared by Trelleborg Marine Systems North America Inc. are accurate and in conformance with the above referenced design codes and specifications.

Assumptions:

1. The client is aware that the steel washers specified for the bollards will not conform to ASTM F436 and will instead be Q355B steel which is of Chinese Origin.

Originated By: _____ **Date:** 8/17/2022

Printed Name: Seth Lemoine

Checked By: _____ **Date:** 8/17/2022

Printed Name: Robert Snelgrove, P.E.

STATE OF CONNECTICUT
ROBERT F. SNELGROVE
PEN.0032194
LICENSED
PROFESSIONAL ENGINEER

The following calculations were prepared under my direct supervision.

NOTE: These calculations were prepared for the specific loadings and conditions associated with this specific site. Any reuse of these calculations or structure(s), without the express written consent of Collins Engineers, Inc., will be at the sole risk of the user and without liability or legal exposure to Collins Engineers, Inc.

Submittal Document

TMS Project #:	25135
Project Name:	Connecticut Port Authority - State Pier
Project Location:	New London, Connecticut
System Detail:	(Delivery Berth) MSB-50 Cast Steel Single Bitt Bollard (Main Platform) (New Concrete) MSB-75 Cast Steel Single Bitt Bollard (Main Platform) (Concrete Pedestal) MSB-75 Cast Steel Single Bitt Bollard
Date Submitted:	May 13, 2022
Prepared By:	Akash Patel Design Engineer
Checked By:	Kaushal Patel Team Leader - USA
Approved By:	Parthiv Shah Engineering Director

Note: This document contains information that is confidential and proprietary to Trelleborg Marine Systems North America, Inc. The information contained herein shall not be disclosed or duplicated or used whole in part for any reason other to evaluate the document, without the written consent of TMS.

Please review and sign the document as “approved for manufacturing”. Note that production of items will not begin until a signed, approved copy of this submittal has been received.

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

Submittal Contents

1. Project Bill of Materials
2. Shop Drawings

   (Delivery Berth)

   a) MSB-50 Cast Steel Single Bitt Bollard General Arrangement 25135-3M01.

   b) MSB-50 Bollard Template Detail 25135-3T01.

   (Main Platform) (New Concrete)

   c) MSB-75 Cast Steel Single Bitt Bollard General Arrangement 25135-7M01.

   d) MSB-50 Bollard Template Detail 25135-7T01.

   (Main Platform) (Concrete Pedestal)

   e) MSB-75 Cast Steel Single Bitt Bollard General Arrangement 25135-8M01.

   f) MSB-75 Bollard Marking Template Detail 25135-8T01.

3. Design Calculations
4. Paint Specification
5. Bollard Handling, Storage, Installation & Maintenance Manual
6. Certificates of Conformance
7. Reference Letters
8. List of Completed Project

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure



1. Project Bill of Materials

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

Project	Connecticut Port Authority - State Pier (Delivery Berth)
Doc No	**25135-3DL01**
Country	USA
Ref No	25135
No of set	7

REV	ISSUED	BY	CHECK. BY
A	09/22/2021	VG	VG
B	10/18/2021	AD	VG
C	12/14/2021	VG	VG
0	12/14/2021	VP	KDP
1	05/05/2022	AP	KDP
2	05/13/2022	ST	KDP

PART NO.		DESCRIPTION	DRAWING NO	DRAWING REV.	FINISH	MATERIAL	QTY PER SYSTEM	TOTAL QTY.
1		**MSB-50 Cast Steel Single Bitt Bollard**	25135-3M01	2	Painted	ASTM A27 Gr. 65-35	1	7
2		**End Threaded Anchor Rod (Ø1 3/8"- 6 UNC-2A x 3'-7 5/8" L)**	25135-3M01	2	HDG	ASTM F1554 Gr. 105	6	42
3		**Hex Nut (Ø1 3/8"- 6 UNC-2B)**	25135-3M01	2	HDG	ASTM A563DH	12	84
4		**Round Washer, Ø1 3/8" (OD 3 1/4" x ID 1 1/2" x 1/8" Thk.)**	-	-	HDG	ASTM F436	6	42
5		**Plate Washer (5" x 5" x 3/4" Thk)**	25135-3M01	2	HDG	Q355B	6	42
6		**MSB-50 Bollard Template Detail**	25135-3T01	1	Painted	Q355B	-	2

Remarks :

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
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Project	Connecticut Port Authority - State Pier (Main Platform) (New Concrete)
Doc No	**25135-7DL01**
Country	USA
Ref No	25135
No of set	8

REV	ISSUED	BY	CHECK. BY
A	09/22/2021	VG	VG
B	10/18/2021	AD	KDP
C	12/14/2021	VG	VG
0	12/14/2021	VP	KDP
1	05/05/2022	AP	KDP
2	05/13/2022	ST	KDP

PART NO.		DESCRIPTION	DRAWING NO	DRAWING REV.	FINISH	MATERIAL	QTY PER SYSTEM	TOTAL QTY.
1		**MSB - 75 Cast Steel Single Bitt Bollard**	25135-7M01	2	Painted	ASTM A27 Gr. 65-35	1	8
2		**End Threaded Anchor Rod (Ø1 3/4"- 5 UNC-2A x 3'-8 1/2" L)**	25135-7M01	2	HDG	ASTM F1554 Gr. 105	6	48
3		**Hex Nut (Ø1 3/4"- 5 UNC-2B)**	25135-7M01	2	HDG	ASTM A563DH	12	96
4		**Round Washer, Ø1 3/4" (OD 3 3/8" x ID 1 7/8" x 1/4" Thk)**	-	-	HDG	ASTM F436	6	48
5		**Plate Washer (6" x 6" x 3/4" Thk)**	25135-7M01	2	HDG	Q355B	6	48
6		**MSB-75 Bollard Template Detail**	25135-7T01	1	Painted	Q355B	-	2

Remarks :

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

Project	Connecticut Port Authority - State Pier (Main Platform) (Concrete Pedestal)
Doc No	**25135-8DL01**
Country	USA
Ref No	25135
No of set	10

REV	ISSUED	BY	CHECK. BY
A	09/22/2021	VG	VG
B	10/18/2021	AD	KDP
C	12/14/2021	VG	VG
0	12/14/2021	VP	KDP
1	05/05/2022	AP	KDP
2	05/13/2022	ST	KDP

PART NO.		DESCRIPTION	DRAWING NO	DRAWING REV.	FINISH	MATERIAL	QTY PER SYSTEM	TOTAL QTY.
1		**MSB - 75 Cast Steel Single Bitt Bollard**	25135-8M01	2	Painted	ASTM A27 Gr. 65-35	1	10
2		**End Threaded Anchor Rod (Ø1 3/4"- 5 UNC-2A x 3'-3" L)**	25135-8M01	2	HDG	ASTM F1554 Gr. 105	6	60
3		**Hex Nut (Ø1 3/4"- 5 UNC-2B)**	25135-8M01	2	HDG	ASTM A563DH	12	120
4		**Round Washer, Ø1 3/4" (OD 3 3/8" x ID 1 7/8" x 1/4" Thk)**	-	-	HDG	ASTM F436	6	60
5		**Plate Washer (7" x 7" x 1" Thk)**	25135-8M01	2	HDG	Q355B	6	60
6		**MSB-75 Bollard Marking Template**	25135-8T01	1	Painted	Q355B	-	1

Remarks :

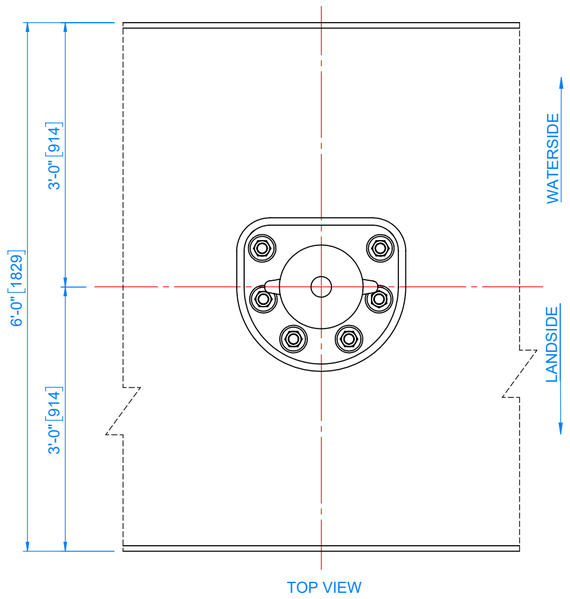
Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

2. Shop Drawings

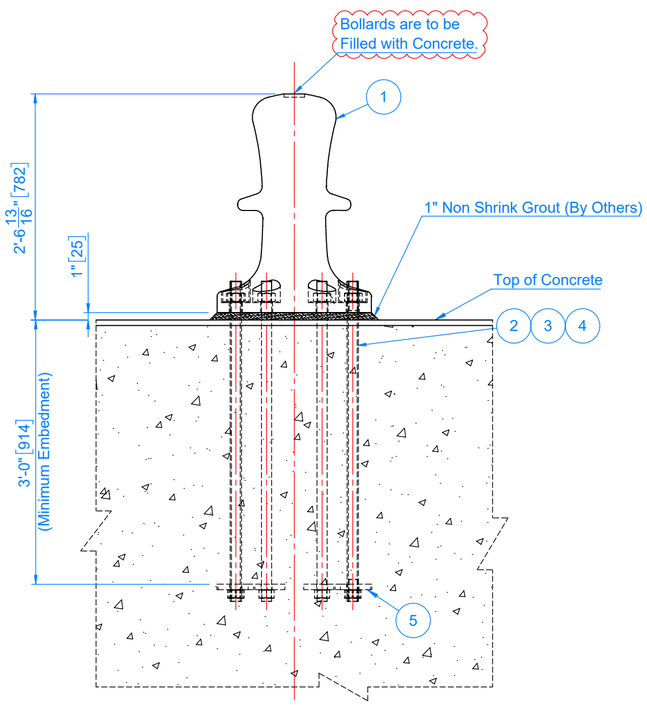
Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

Total Number of Systems:- 7 Nos

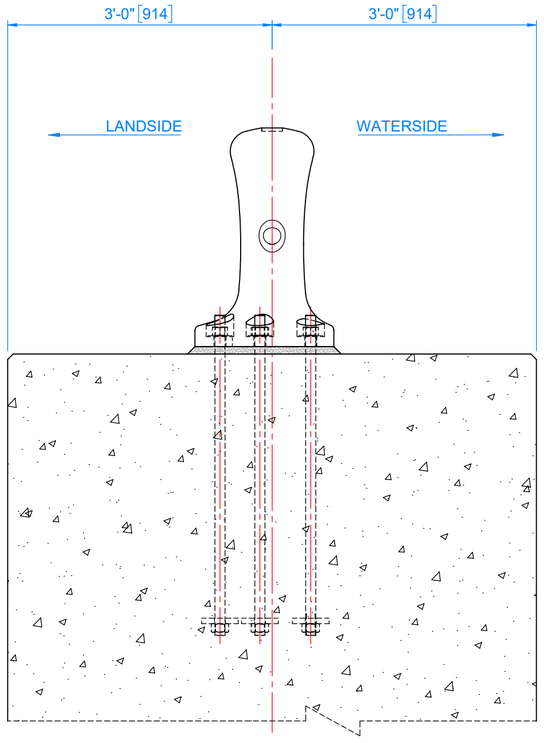
Part No.	Description	Size	Qty / System	Material
1	MSB - 50 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35 (Painted)
2	End Threaded Anchor Rod	Ø1 3/8" - 6 UNC-2A x 3'-7 5/8" L	6	ASTM F1554 Gr. 105 (HDG)
3	Hex Nut	Ø1 3/8" - 6 UNC-2B	12	ASTM A563 DH (HDG)
4	Round Washer, Ø1 3/8"	OD 3 1/4" x ID 1 1/2" x 1/8" Thk	6	ASTM F436 (HDG)
5	Plate Washer	5" x 5" x 3/4" Thk	6	Q355B (HDG)



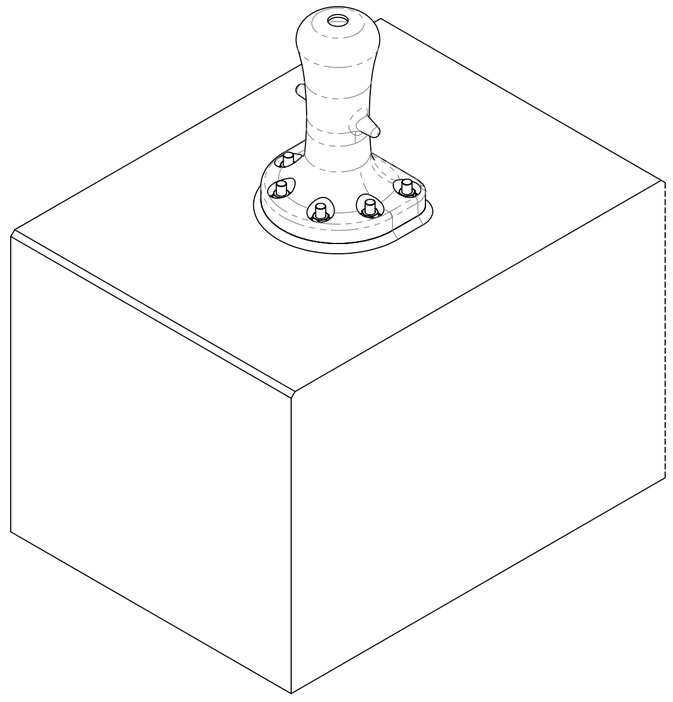
TOP VIEW



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	05/12/22	REVISED AS NOTED	VP	PS	
1	05/05/22	ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
B	10/18/21	ANCHOR LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:15
SIZE A2	

FOR CONSTRUCTION

Trelleborg Marine Systems North America Inc.
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Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
MSB - 50 CAST STEEL SINGLE BITT BOLLARD
DELIVERY BERTH

DRAWING NO :- 25135-3M01

Rev. 2

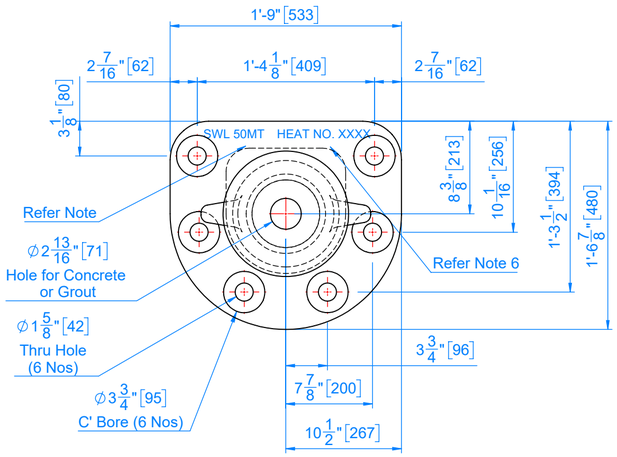
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 2

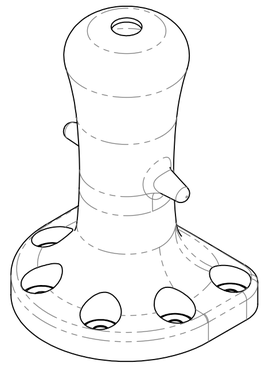
VER.: 20

Total Number of Systems:- 7 Nos

Part No.	Description	Size	Qty / System	Material
1	MSB - 50 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35 (Painted)
2	End Threaded Anchor Rod	Ø1 3/8" - 6 UNC-2A x 3'-7 5/8" L	6	ASTM F1554 Gr. 105 (HDG)
3	Hex Nut	Ø1 3/8" - 6 UNC-2B	12	ASTM A563 DH (HDG)
4	Round Washer, Ø1 3/8"	OD 3 1/4" x ID 1 1/2" x 1/8" Thk	6	ASTM F436 (HDG)
5	Plate Washer	5" x 5" x 3/4" Thk	6	Q355B (HDG)



TOP VIEW
(Only Bollard Shown for Clarity)



ISOMETRIC VIEW

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.
- Manufacturing shall be in accordance with specifications as referred in the associated purchase order.
- Threads needs to be re-threaded & re-tapped after galvanizing to maintain coating on threads.
- All hardware to be HDG as per A153 or A123 as required to minimum thickness of 85 microns.
- Bollard to have allowable line pull of 50 tones maximum.
- All exterior edges to be ground to 1/8"[3] min. radius to avoid sharp edges, prior to painting.

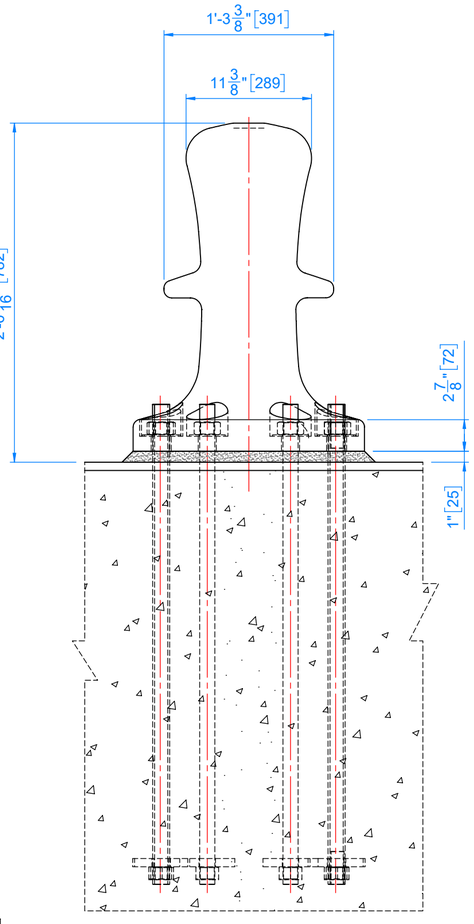
As cast notes:-

1. Surface finish to be at least equivalent to 500 ▽
2. Additional hand grinding to remove irregularities & flaws may be necessary.
3. Provide mechanical & chemical certificates for all castings.
4. Pre-delivery inspection by TES/TMS or appointed third party prior to dispatch.
5. Inspection to be in accordance with TES/TMS specification / ITP.
6. Heat no. and SWL to be located at this position, text height 0.2in and raised text to be approx. 2 mm embossed. (As shown).
7. Standard tolerance is as per ASTM A27.
8. Tolerance on dimensions: ±1/16" [2].
9. Tolerance on hole locations: ±1/8" [3].

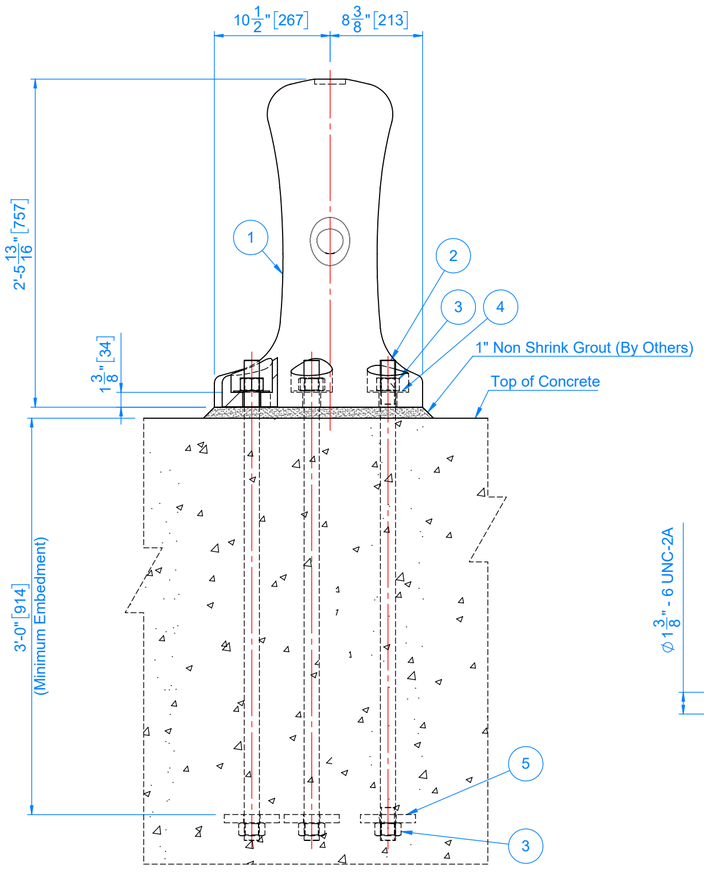
Blasting & Painting:-

- Blast all outside surfaces to SSPC SP 10 finish before applying primer coat.

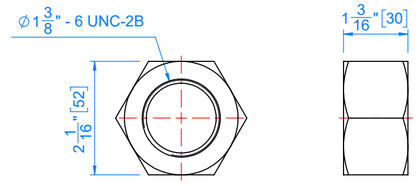
a. Primer coat : 3.0- 5.0 mils of Carbozinc 859.
b. Intermediate coat : 4.0- 6.0 mils of Carboguard 890.
c. Top coat : 2.0- 3.0 mils of Carbothane 134HG.
d. Total D.F.T to be 12 mils minimum.



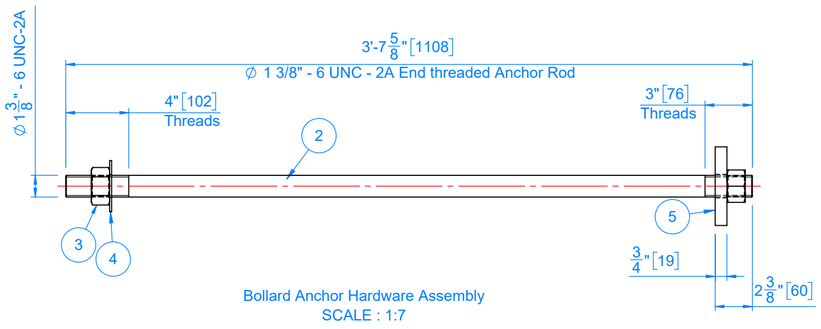
FRONT VIEW



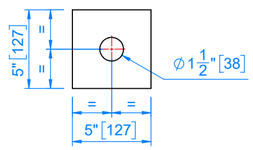
SIDE VIEW



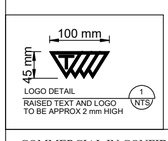
3. Hex Nut, Ø1 3/8" - 6 UNC-2B
Qty / System: 12 Nos
SCALE 1:2



Bollard Anchor Hardware Assembly
SCALE : 1:7



5. Plate Washer
SCALE : 1:7



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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	05/12/22	REVISED AS NOTED	VP	PS	
1	05/05/22	MATERIAL UPDATED & ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	HEX NUT DETAIL ADDED & ISSUED FOR CONSTRUCTION	VP	PS	
B	10/18/21	ANCHOR LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:10
SIZE	A2

FOR CONSTRUCTION

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston,
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Tel : +1 (713) 800-7640
Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

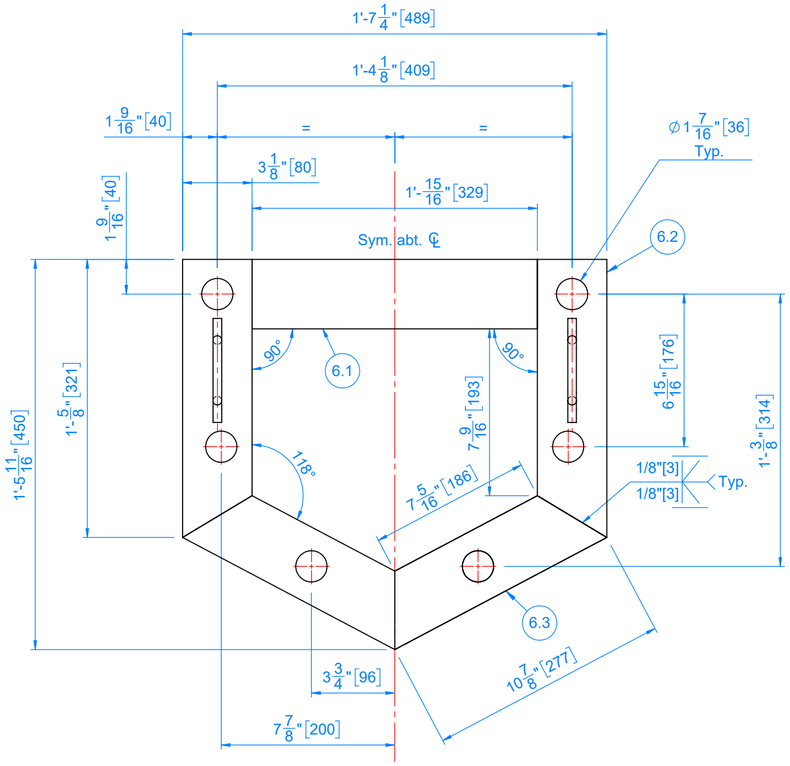
TITLE:- GENERAL ARRANGEMENT
MSB - 50 CAST STEEL SINGLE BITT BOLLARD
DELIVERY BERTH

DRAWING NO :- 25135-3M01 Rev. 2

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 2 OF 2 | VER.: 20

06. MSB-50 Bollard Template				Total Qty. : 2 Nos.
Part No.	Description	Dimension	Qty / Template	Material
6.1	Plate-1	1'-15/16" x 3 1/8" x 5/16"	1	Q355B
6.2	Plate-2	1'-5/8" x 3 1/8" x 5/16"	2	Q355B
6.3	Plate-3	10 7/8" x 3 1/8" x 5/16"	2	Q355B
6.4	Rod	∅10 mm	2	Q355B

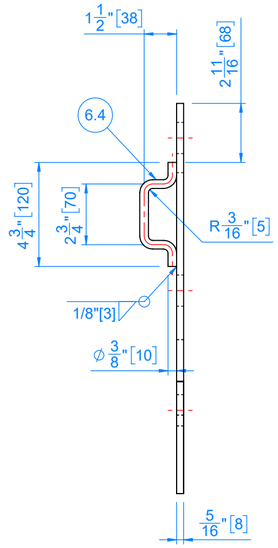


FRONT VIEW

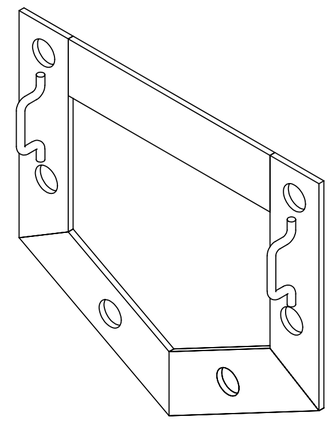
6. MSB-50 Bollard Template Detail

Material : Q355B

Weight : 17.38 lbs [7.88 kg]



SIDE VIEW



ISOMETRIC VIEW

NOTE:
- All dimensions are in feet & inches[mm] unless noted otherwise.
- All views are in sheet scale unless noted otherwise.
- Marking hole shall be drilled only after assembled and welded to maintain accuracy.
- All holes shall be drilled or machined or bored whichever is applicable.
- Standard tolerance for hole spacing linear & non cumulative shall be ±0.04in [1mm] & diagonal & cumulative shall be ±0.08in [2mm].
- Template assembly must be handled carefully to avoid bending.
- Welding to be in accordance with AWS D1.1.
- Fabrication to be in accordance with AISC manual of steel construction, latest Edition.
- Use minimum E70xx (70 ksi) weld electrodes.
- All weld spatter shall be remove prior to blasting.
- Butt welds:single V-butt welds, joint preparation should be as such, full penetration if possible or else partial penetration as shown or at least 70-90% weld deposition.
- Continuous welds everywhere unless otherwise stated.
- Weld testing in accordance with AWS D.1.1.

Blasting & Painting:-
- Blast all outside surface to SSPC SP 6 finish before applying primer coat.
- Primer coat : 3.0- 5.0 mils of Carbozinc 859.

FOR CONSTRUCTION

Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
1	05/05/22	ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
A	10/18/21	ISSUED FOR APPROVAL	AD	PS	

DRAWN	Ayan.Dey
DESIGNED	
CHECKED	Ayan.Dey
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:5
SIZE A2	

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TRELLEBORG

TITLE:- TEMPLATE DETAIL MSB - 50 CAST STEEL SINGLE BITT BOLLARD DELIVERY BERTH

DRAWING NO :- 25135-3T01 Rev. 1

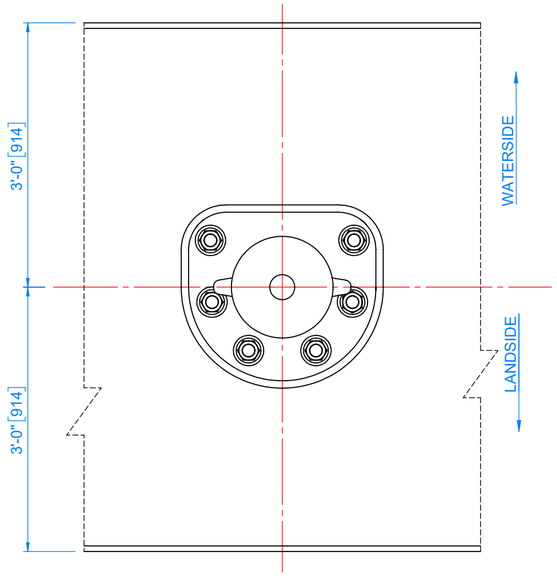
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 1 VER.: 12

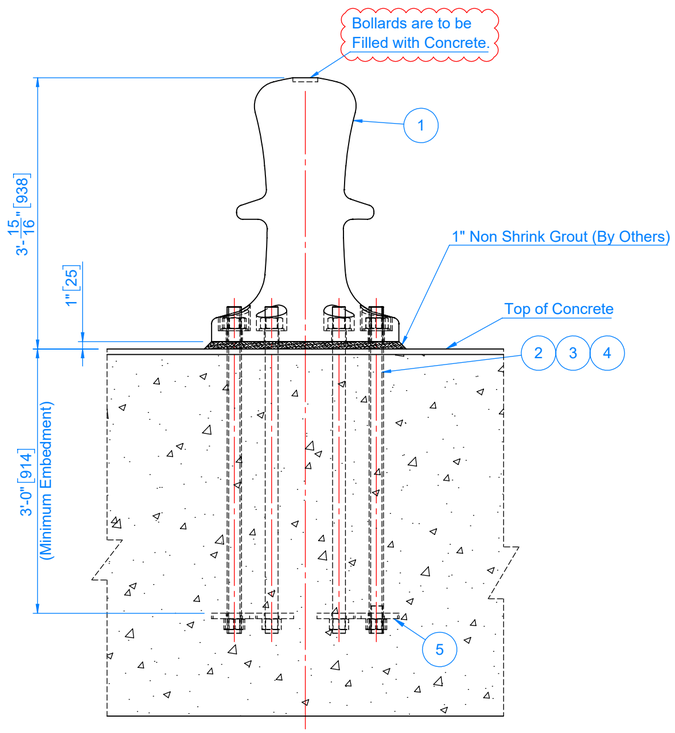
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Total Number of Systems:- 8 Nos

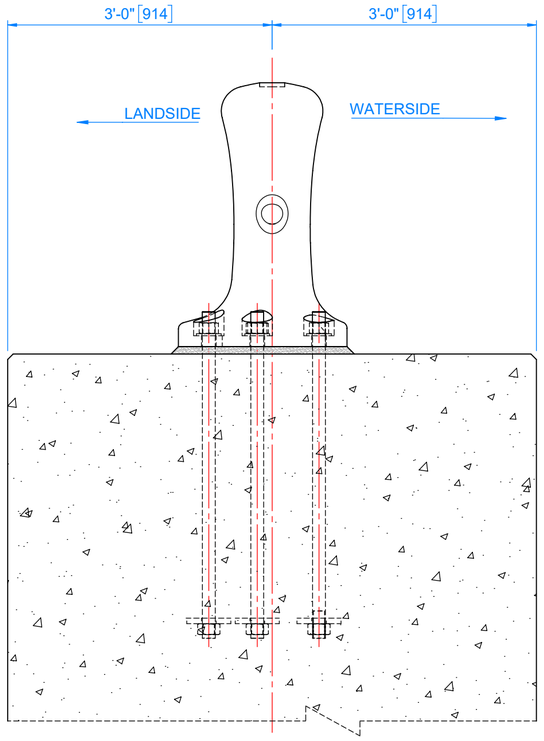
Part No.	Description	Size	Qty / System	Material
1	MSB - 75 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35 (Painted)
2	End Threaded Anchor Rod	Ø1 3/4" - 5 UNC-2A x 3'-8 1/2" L	6	ASTM F1554 Gr. 105 (HDG)
3	Hex Nut	Ø1 3/4" - 5 UNC-2B	12	ASTM A563 DH (HDG)
4	Round Washer, Ø1 3/4"	OD 3 3/8" x ID 1 7/8" x 1/4" Thk	6	ASTM F436 (HDG)
5	Plate Washer	6" x 6" x 3/4" Thk	6	Q355B (HDG)



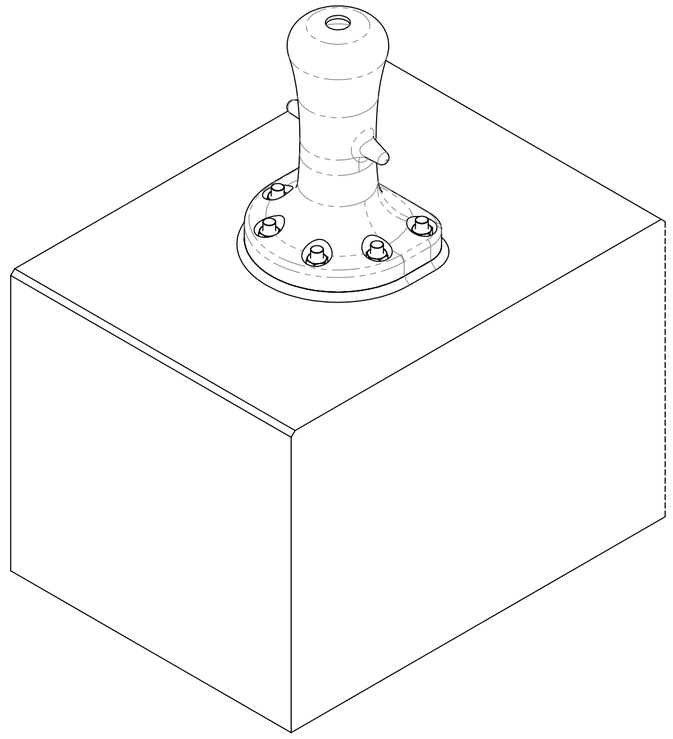
TOP VIEW



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	05/12/22	REVISED AS NOTED	VP	PS	
1	05/05/22	ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
B	10/18/21	ANCHOR LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:15
SIZE A2	

FOR CONSTRUCTION

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TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
MSB - 75 CAST STEEL SINGLE BITT BOLLARD
MAIN PLATFORM (NEW CONCRETE)

DRAWING NO :- 25135-7M01

Rev. 2

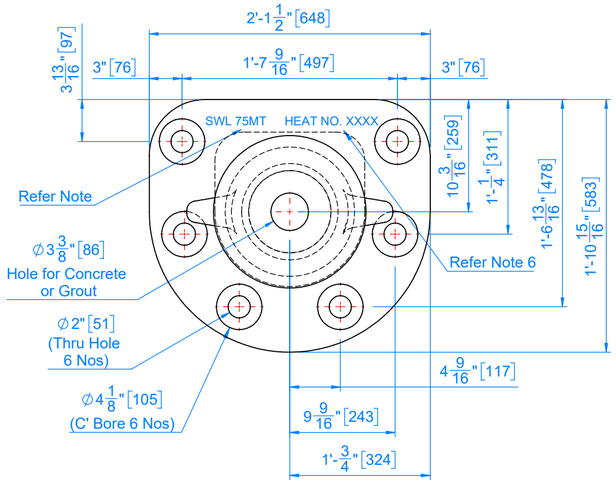
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 2

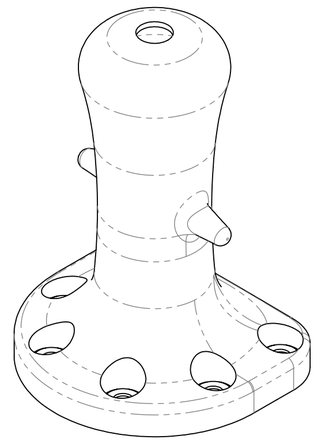
VER.: 20

Total Number of Systems:- 8 Nos

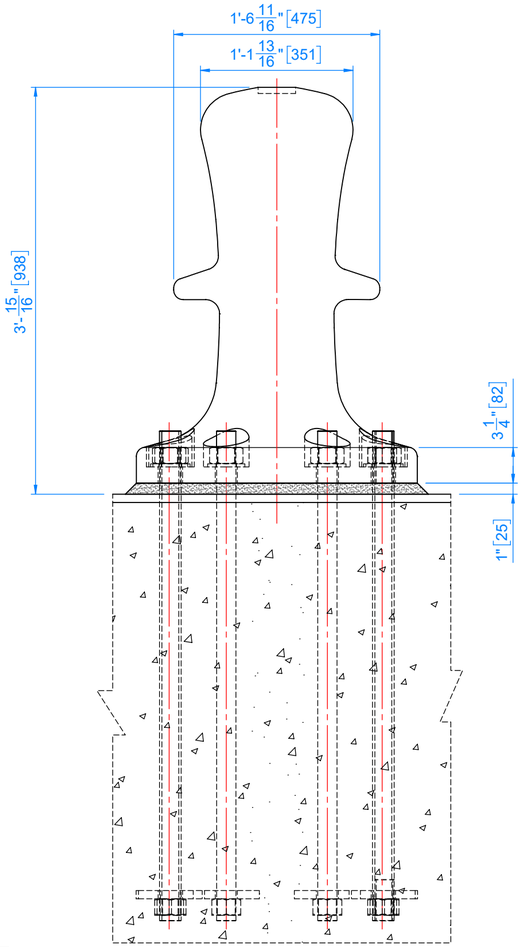
Part No.	Description	Size	Qty / System	Material
1	MSB - 75 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35 (Painted)
2	End Threaded Anchor Rod	Ø1 3/4" - 5 UNC-2A x 3'-8 1/2" L	6	ASTM F1554 Gr. 105 (HDG)
3	Hex Nut	Ø1 3/4" - 5 UNC-2B	12	ASTM A563 DH (HDG)
4	Round Washer, Ø1 3/4"	OD 3 3/8" x ID 1 7/8" x 1/4" Thk	6	ASTM F436 (HDG)
5	Plate Washer	6" x 6" x 3/4" Thk	6	Q355B (HDG)



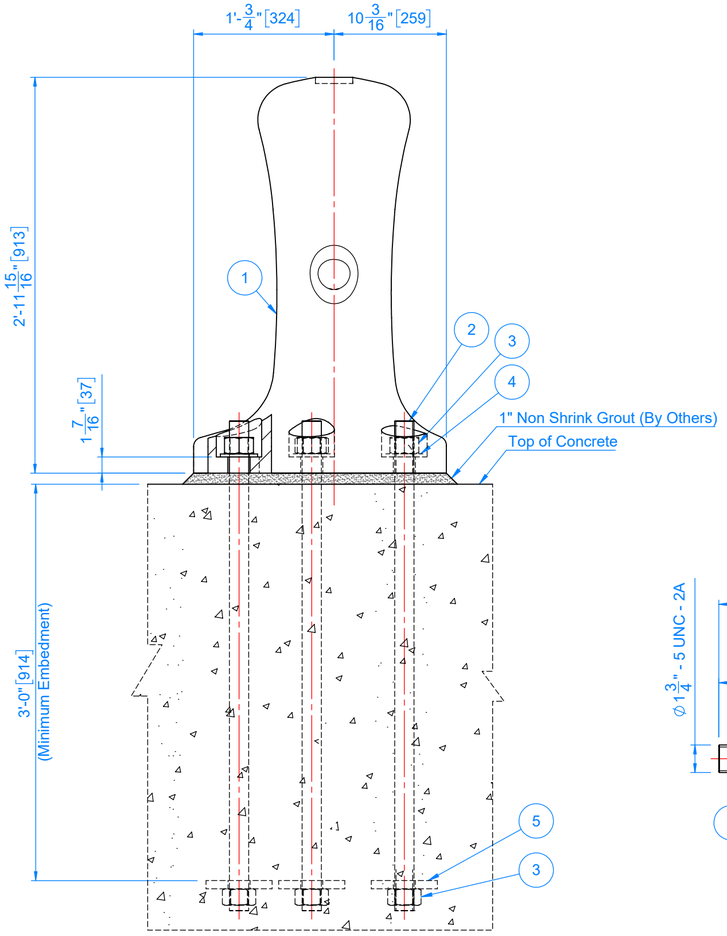
TOP VIEW
(Only Bollard Shown for Clarity)



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.
- Manufacturing shall be in accordance with specifications as referred in the associated purchase order.
- Threads needs to be re-threaded & re-tapped after galvanizing to maintain coating on threads.
- All hardware to be HDG as per A153 or A123 as required to minimum thickness of 85 microns.
- Bollard to have allowable line pull of 75 tones maximum.
- All exterior edges to be ground to 1/8"[3] min. radius to avoid sharp edges, prior to painting.

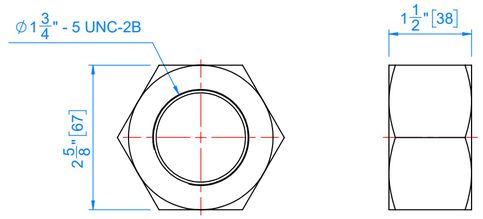
As cast notes:-

1. Surface finish to be at least equivalent to 500
2. Additional hand grinding to remove irregularities & flaws may be necessary.
3. Provide mechanical & chemical certificates for all castings.
4. Pre-delivery inspection by TES/TMS or appointed third party prior to dispatch.
5. Inspection to be in accordance with TES/TMS specification / ITP.
6. Heat no. and SWL to be located at this position, text height 0.2in and raised text to be approx. 2 mm embossed. (As shown).
7. Standard tolerance is as per ASTM A27.
8. Tolerance on dimensions: ±1/16" [2].
9. Tolerance on hole locations: ±1/8" [3].

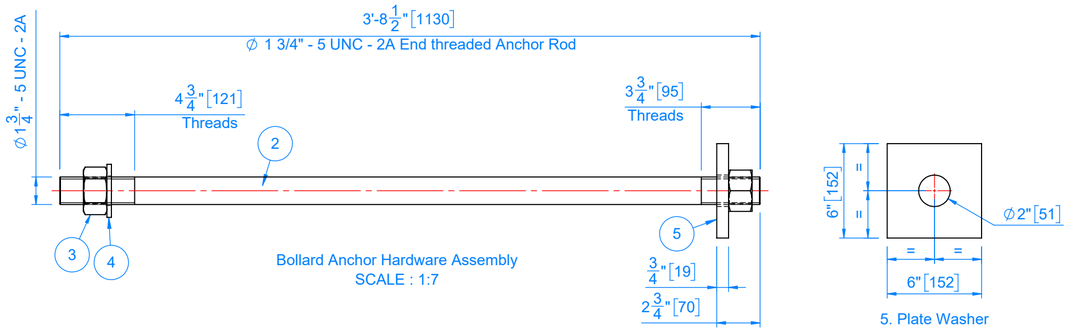
Blasting & Painting:-

- Blast all outside surfaces to SSPC SP 10 finish before applying primer coat.

a. Primer coat : 3.0- 5.0 mils of Carbozinc 859.
b. Intermediate coat : 4.0- 6.0 mils of Carboguard 890.
c. Top coat : 2.0- 3.0 mils of Carbothane 134HG.
d. Total D.F.T to be 12 mils minimum.



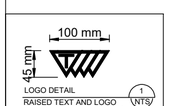
3. Hex Nut, Ø1 3/4" - 5 UNC-2B
Qty / System: 12 Nos
SCALE 1:2



Bollard Anchor Hardware Assembly
SCALE : 1:7

5. Plate Washer
SCALE : 1:7

FOR CONSTRUCTION



LOGO DETAIL
RAISED TEXT AND LOGO TO BE APPROX 2 mm HIGH
1 NTS

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	05/12/22	REVISED AS NOTED	VP	PS	
1	05/05/22	MATERIAL UPDATED & ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	HEX NUT DETAIL ADDED & ISSUED FOR CONSTRUCTION	VP	PS	
B	10/18/21	ANCHOR LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:10
SIZE	A2

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TRELLEBORG

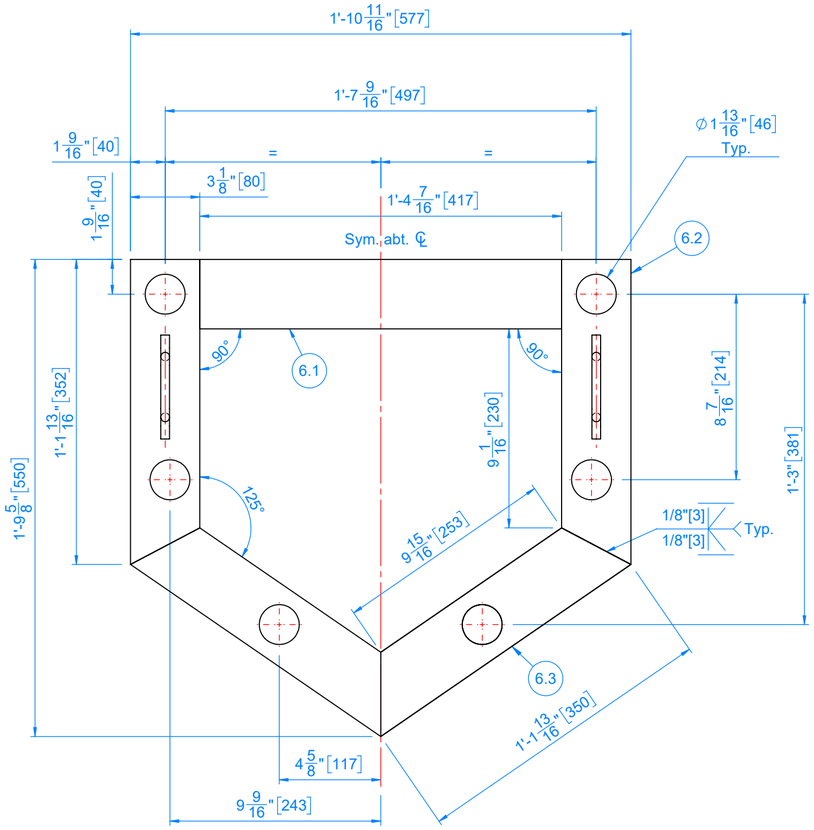
TITLE:- GENERAL ARRANGEMENT
MSB - 75 CAST STEEL SINGLE BITT BOLLARD
MAIN PLATFORM (NEW CONCRETE)

DRAWING NO :- 25135-7M01 Rev. 2

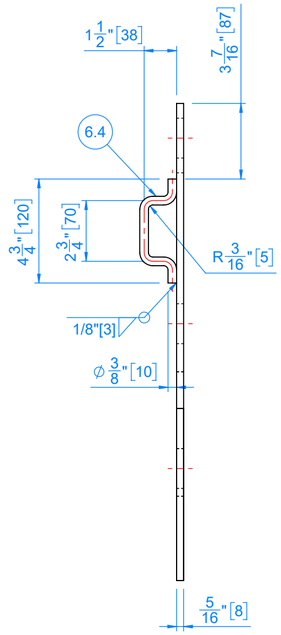
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 2 OF 2 VER.: 20

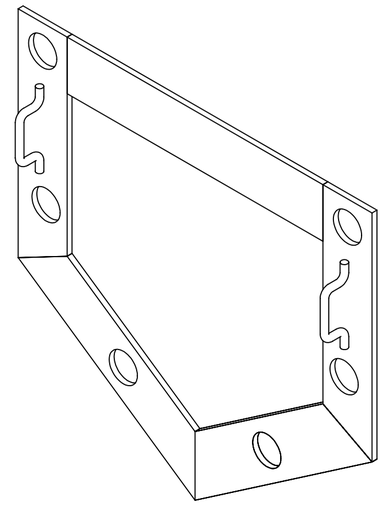
06. MSB-75 Bollard Template				Total Qty. : 2 Nos.
Part No.	Description	Dimension	Qty / Template	Material
6.1	Plate-1	1'-4 7/16" x 3 1/8" x 5/16"	1	Q355B
6.2	Plate-2	1'-1 13/16" x 3 1/8" x 5/16"	2	Q355B
6.3	Plate-3	1'-1 13/16" x 3 1/8" x 5/16"	2	Q355B
6.4	Rod	∅10 mm	2	Q355B



FRONT VIEW
6. MSB-75 Bollard Template Detail
Material : Q355B
Weight : 20.81 lbs [9.44 kg]



SIDE VIEW



ISOMETRIC VIEW

NOTE:
- All dimensions are in feet & inches[mm] unless noted otherwise.
- All views are in sheet scale unless noted otherwise.
- Marking hole shall be drilled only after assembled and welded to maintain accuracy.
- All holes shall be drilled or machined or bored whichever is applicable.
- Standard tolerance for hole spacing linear & non cumulative shall be ±0.04in [1mm] & diagonal & cumulative shall be ±0.08in [2mm].
- Template assembly must be handled carefully to avoid bending.
- Welding to be in accordance with AWS D1.1.
- Fabrication to be in accordance with AISC manual of steel construction, latest Edition.
- Use minimum E70xx (70 ksi) weld electrodes.
- All weld spatter shall be remove prior to blasting.
- Butt welds:single V-butt welds, joint preparation should be as such, full penetration if possible or else partial penetration as shown or at least 70-90% weld deposition.
- Continuous welds everywhere unless otherwise stated.
- Weld testing in accordance with AWS D.1.1.

Blasting & Painting:-
- Blast all outside surface to SSPC SP 6 finish before applying primer coat.
- Primer coat : 3.0- 5.0 mils of Carbozinc 859.

FOR CONSTRUCTION

Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
1	05/05/22	ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
A	10/18/21	ISSUED FOR APPROVAL	AD	PS	

DRAWN	Ayan.Dey
DESIGNED	
CHECKED	Ayan.Dey
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:5
SIZE A2	

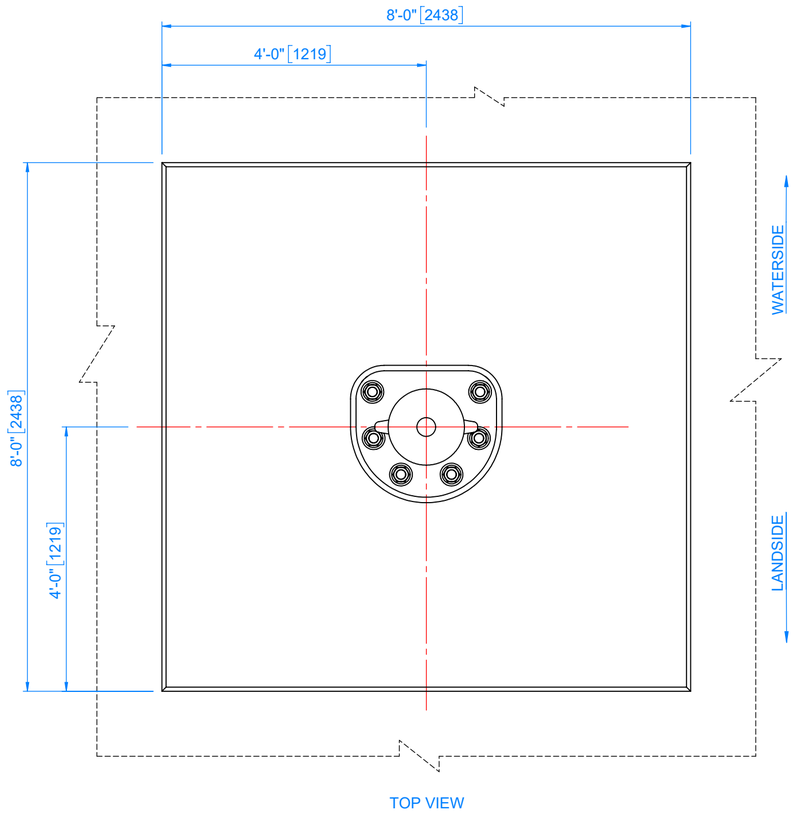
Trelleborg Marine Systems North America Inc.
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TX 77042, USA

Tel : +1 (713) 800-7640
Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:-	DRAWING NO :-	Rev.
TEMPLATE DETAIL MSB - 75 CAST STEEL SINGLE BITT BOLLARD MAIN PLATFORM (NEW CONCRETE)	25135-7T01	1
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER	SHEET: 1 OF 1	VER.: 12

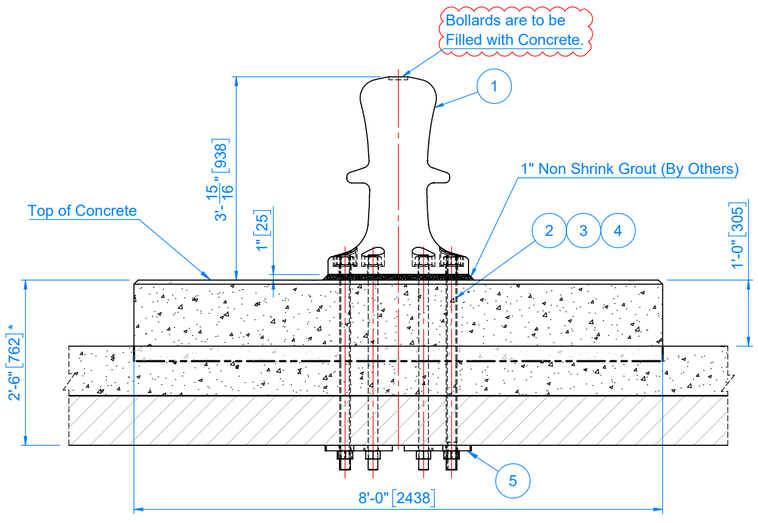
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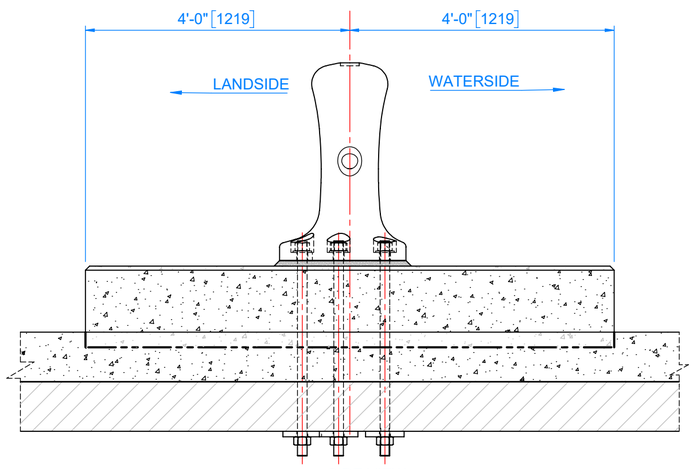
TOP VIEW

Total Number of Systems:- 10 Nos

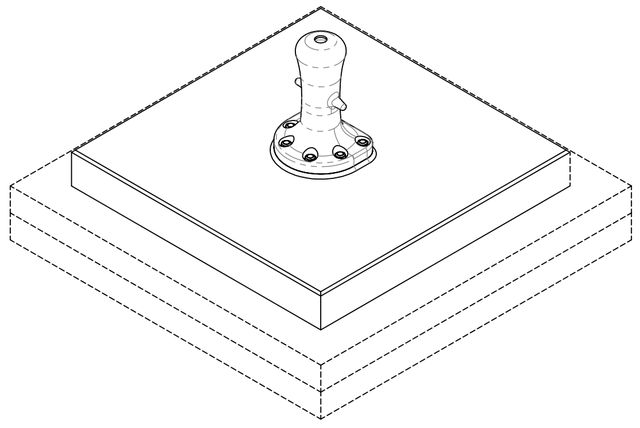
Part No.	Description	Size	Qty / System	Material
1	MSB - 75 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35 (Painted)
2	End Threaded Anchor Rod	Ø1 3/4" - 5 UNC-2A x 3'-3" L	6	ASTM F1554 Gr. 105 (HDG)
3	Hex Nut	Ø1 3/4" - 5 UNC-2B	12	ASTM A563 DH (HDG)
4	Round Washer, Ø1 3/4"	OD 3 3/8" x ID 1 7/8" x 1/4" Thk	6	ASTM F436 (HDG)
5	Plate Washer	7" x 7" x 1" Thk	6	Q355B (HDG)



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW
SCALE : 1:30

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- * Dimensions to be confirmed by client.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.

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2	05/12/22	REVISED AS NOTED	VP	PS	
1	05/05/22	ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
B	10/19/21	THREAD LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:20
SIZE A2	

FOR CONSTRUCTION

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TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
MSB - 75 CAST STEEL SINGLE BITT BOLLARD
MAIN PLATFORM (CONCRETE PEDESTAL)

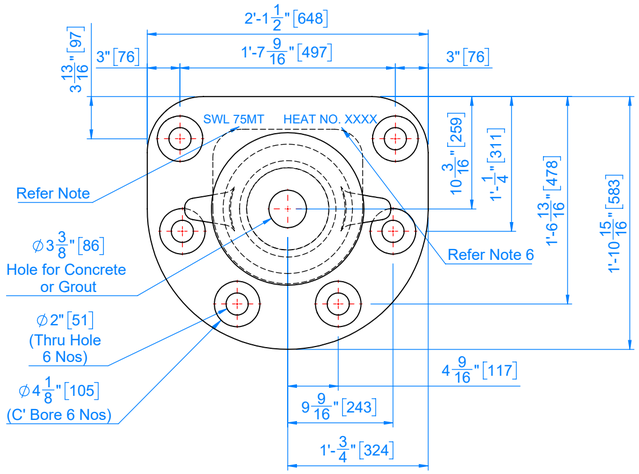
DRAWING NO :- 25135-8M01 Rev. 2

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

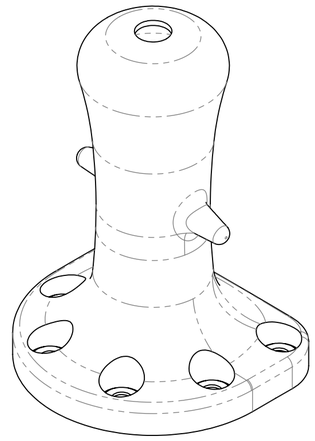
SHEET: 1 OF 2 VER.: 20

Total Number of Systems:- 10 Nos

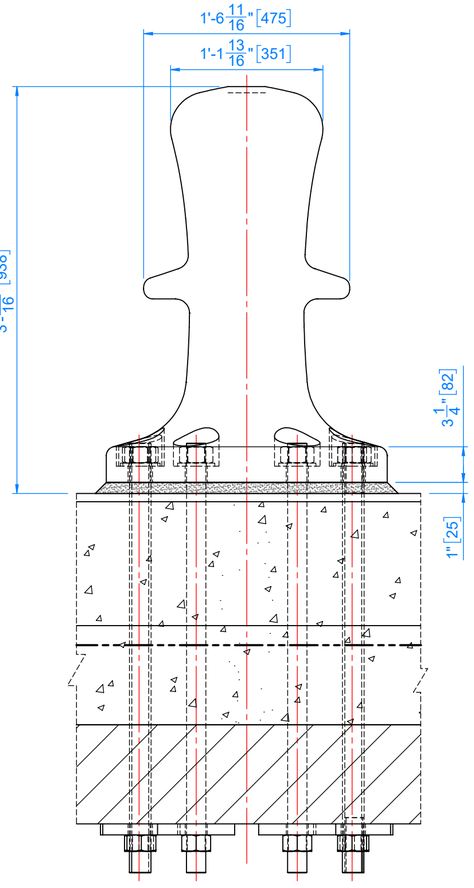
Part No.	Description	Size	Qty / System	Material
1	MSB - 75 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35 (Painted)
2	End Threaded Anchor Rod	Ø1 3/4" - 5 UNC-2A x 3'-3" L	6	ASTM F1554 Gr. 105 (HDG)
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4	Round Washer, Ø1 3/4"	OD 3 3/8" x ID 1 7/8" x 1/4" Thk	6	ASTM F436 (HDG)
5	Plate Washer	7" x 7" x 1" Thk	6	Q355B (HDG)



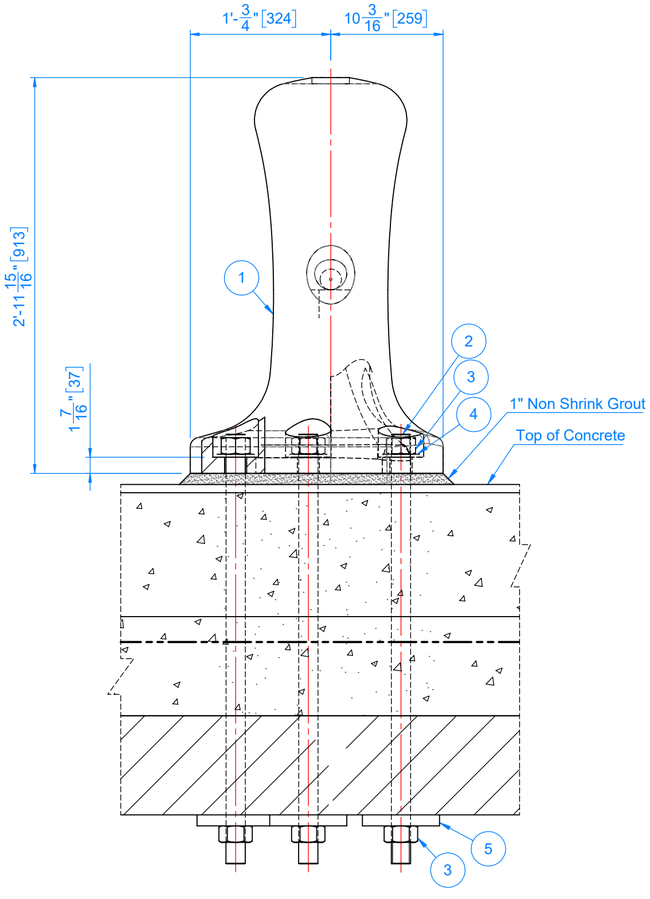
TOP VIEW
(Only Bollard Shown for Clarity)



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

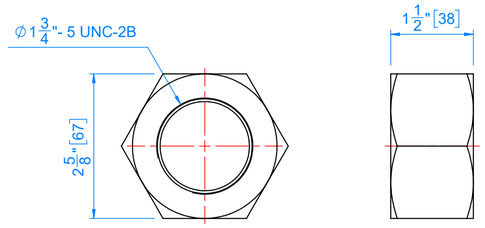
Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.
- Manufacturing shall be in accordance with specifications as referred in the associated purchase order.
- Threads needs to be re-threaded & re-tapped after galvanizing to maintain coating on threads.
- All hardware to be HDG as per A153 or A123 as required to minimum thickness of 85 microns.
- Bollard to have allowable line pull of 75 tones maximum.
- All exterior edges to be ground to 1/8"[3] min. radius to avoid sharp edges, prior to painting.

As cast notes:-

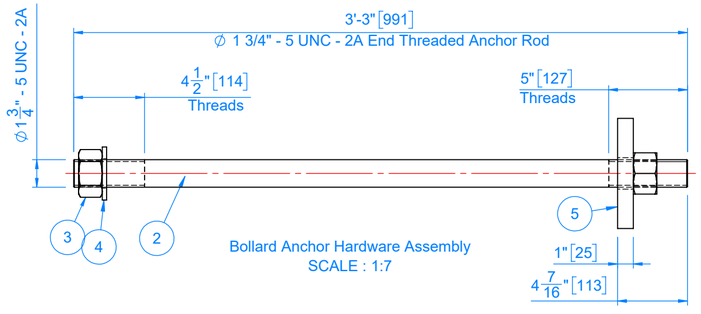
1. Surface finish to be at least equivalent to 500 ▽
2. Additional hand grinding to remove irregularities & flaws may be necessary.
3. Provide mechanical & chemical certificates for all castings.
4. Pre-delivery inspection by TES/TMS or appointed third party prior to dispatch.
5. Inspection to be in accordance with TES/TMS specification / ITP.
6. Heat no. and SWL to be located at this position, text height 0.2in and raised text to be approx. 2 mm embossed. (As shown).
7. Standard tolerance is as per ASTM A27.
8. Tolerance on dimensions: ±1/16" [2].
9. Tolerance on hole locations: ±1/8" [3].

Blasting & Painting:-

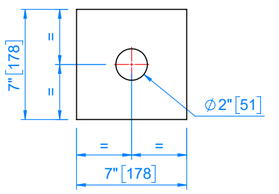
- Blast all outside surfaces to SSPC SP 10 finish before applying primer coat.
a. Primer coat : 3.0- 5.0 mils of Carbozinc 859.
b. Intermediate coat : 4.0- 6.0 mils of Carboguard 890.
c. Top coat : 2.0- 3.0 mils of Carbothane 134HG.
d. Total D.F.T to be 12 mils minimum.



3. Hex Nut, Ø1 3/4" - 5 UNC-2B
Qty / System: 12 Nos
SCALE 1:2



Bollard Anchor Hardware Assembly
SCALE : 1:7



5. Plate Washer
SCALE : 1:7

100 mm
45 mm
LOGO DETAIL
RAISED TEXT AND LOGO TO BE APPROX 2 mm HIGH
1 NTS

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	05/12/22	REVISED AS NOTED	VP	PS	
1	05/05/22	MATERIAL UPDATED & ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	HEX NUT DETAIL ADDED & ISSUED FOR CONSTRUCTION	VP	PS	
B	10/19/21	THREAD LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:10
SIZE A2	

FOR CONSTRUCTION

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston,
TX 77042, USA

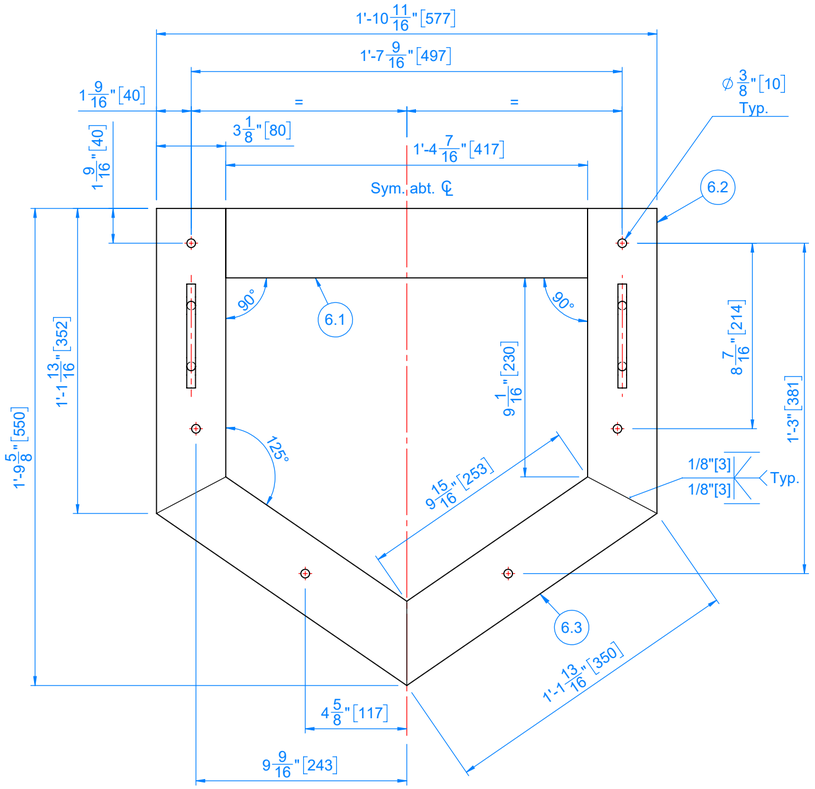
Tel : +1 (713) 800-7640
Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT MSB - 75 CAST STEEL SINGLE BITT BOLLARD MAIN PLATFORM (CONCRETE PEDESTAL)	DRAWING NO :- 25135-8M01		Rev.
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER	SHEET: 2 OF 2	VER.: 20	2

06. MSB-75 Bollard Marking Template — Total Qty. : 1 No.

Part No.	Description	Dimension	Qty / Template	Material
6.1	Plate-1	1'-4 7/16" x 3 1/8" x 5/16"	1	Q355B
6.2	Plate-2	1'-1 13/16" x 3 1/8" x 5/16"	2	Q355B
6.3	Plate-3	1'-1 13/16" x 3 1/8" x 5/16"	2	Q355B
6.4	Rod	∅10 mm	2	Q355B

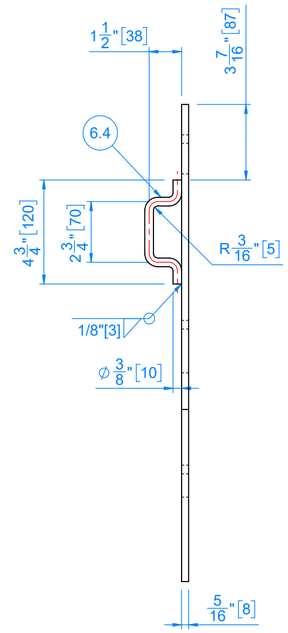


FRONT VIEW

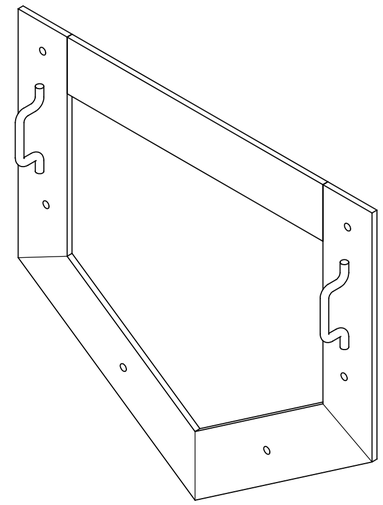
6. MSB-75 Bollard Marking Template Detail

Material : Q355B

Weight : 20.81 lbs [9.44 kg]



SIDE VIEW



ISOMETRIC VIEW

NOTE:
- All dimensions are in feet & inches[mm] unless noted otherwise.
- All views are in sheet scale unless noted otherwise.
- Marking hole shall be drilled only after assembled and welded to maintain accuracy.
- All holes shall be drilled or machined or bored whichever is applicable.
- Standard tolerance for hole spacing linear & non cumulative shall be ±0.04in [1mm] & diagonal & cumulative shall be ±0.08in [2mm].
- Template assembly must be handled carefully to avoid bending.
- Welding to be in accordance with AWS D1.1.
- Fabrication to be in accordance with AISC manual of steel construction, latest Edition.
- Use minimum E70xx (70 ksi) weld electrodes.
- All weld spatter shall be remove prior to blasting.
- Butt welds:single V-butt welds, joint preparation should be as such, full penetration if possible or else partial penetration as shown or at least 70-90% weld deposition.
- Continuous welds everywhere unless otherwise stated.
- Weld testing in accordance with AWS D1.1.

Blasting & Painting:-
- Blast all outside surface to SSPC SP 6 finish before applying primer coat.
- Primer coat : 3.0- 5.0 mils of Carbozinc 859.

FOR CONSTRUCTION

Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
1	05/05/22	ISSUED FOR CONSTRUCTION	AP	PS	
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
A	10/18/21	ISSUED FOR APPROVAL	AD	PS	

DRAWN	Ayan.Dey
DESIGNED	
CHECKED	Ayan.Dey
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:5
SIZE A2	

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
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Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- MARKING TEMPLATE DETAIL
MSB - 75 CAST STEEL SINGLE BITT BOLLARD
MAIN PLATFORM (CONCRETE PEDESTAL)

DRAWING NO :- 25135-8T01 — Rev. 1

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 1 | VER.: 12

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3. Design Calculations

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Delivery Berth

NOTES:

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Bollard Callout

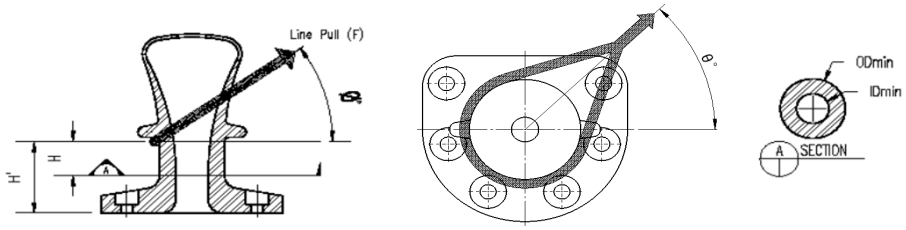
Bollard Name MSB-50 **Bollard Type** Single Bit

Material Properties

Bollard Material ASTM A27 65-35 **Cast Steel**

Yield Strength (F_y)	35	ksi
Tensile Strength (F_u)	65	ksi

Loading Scenario



Line Pull per Bit (P) 50 **Tonnes** 110.0 **kips**

	Primary Load Case	Alternate Load Cases		
	Case 1	Case 2	Case 3	
Vertical Angle (ø)	10	20	30	deg
Horizontal Angle (θ)	45	45	45	deg

	Case 1	Case 2	Case 3	
Force Parallel to Dock (P_x)	76.6	73.1	67.4	kip
Force Perpendicular to Dock (P_y)	76.6	73.1	67.4	kip
Vertical Component of Force (P_z)	19.1	37.6	55.0	kip
Horizontal Component of Force (P_H)	108.3	103.4	95.3	kip

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Section Properties

Min Throat Height (H)	5.1	in	Section Modulus at Cross Section (S)	55.5	in^3
Base Height (H')	12.1	in	Section Area (A)	33.4	in^2
Minimum Horn OD	9.0	in	Moment of Area of Half Section (Q)	40.9	in^3
Minimum Horn ID	6.2	in	Moment of Inertia at min X-section (I_x')	249.5	in^4
Rope Diameter (R_d)	2	in			

Design Stresses

The bollard is designed to meet or exceed AISC 15th. Ed. Part 16, Chapters D & G

Tensile Yielding (Eq. D2-1)

$$P_n = 0.9 F_y A$$

Tensile Rupture (Eq. D2-2)

$$P_n = 0.75 F_u A$$

Shear Yielding (Sec. G1)

$$V_n = 0.9 F_y A$$

Normal Stress

$$f_N = \frac{P_z}{A}$$

Bending Stress

$$f_B = \frac{M_x}{s_{x'}}$$

Shear Stress

$$f_v = \frac{P_H \cdot Q}{I_x' t}$$

AISC Live Load Factor (Φ)	1.6	
AISC Allowable Shear Strength	31.5	ksi
AISC Allowable Yield Strength	31.5	ksi
AISC Allowable Tensile Strength	48.8	ksi

Design Criteria

Factored Stress ≤ Allowable Strength

	Primary Load Case		**Alternate Load Cases**		
	Case 1		Case 2	Case 3	
Actual Shear Stress (f_v)	6.3	ksi	6.0	5.6	ksi
Factored Shear Stress (Φ x f_v)	10.1	ksi	9.7	8.9	ksi

Bollard shear strength exceeds AISC design requirements

Normal Stress (f_N)	0.6	ksi	1.1	1.6	ksi
Moment in Section (M_x)	657.5	kip-in	734.1	788.3	kip-in
Bending Stress (f_B)	11.9	ksi	13.2	14.2	ksi
Actual Total Tensile Stress (f_T)	12.4	ksi	14.4	15.9	ksi
Factored Total Tensile Stress (Φ x f_T)	19.9	ksi	23.0	25.4	ksi

Bollard tensile strength exceeds AISC design requirements

Factors of Safety

$$FOS_{yield} = \frac{f}{F_y}$$

$$FOS_{Breaking} = \frac{f}{F_u}$$

	Case 1	Case 2	Case 3
Factor of Safety on Yield	**2.8**	**2.4**	**2.2**
Factor of Safety on Breaking	**5.2**	**4.5**	**4.1**

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Delivery Berth

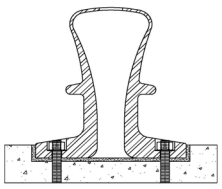
NOTES:

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3) For details on the supplied material, please reference the specified material standard.
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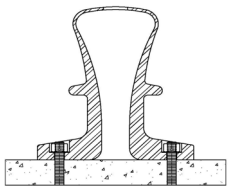
Anchor Properties

Anchor Size	1 3/8	**in**
Anchor Material	F1554 Gr 105	
Yield Strength (f_y)	105	ksi
Tensile Strength (f_u)	125	ksi
Bollard Keyed Into Concrete?	No	

Keyed-In



Not Keyed-In

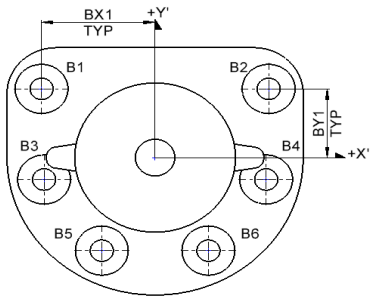


NOTE: The anchor calculations are detailed for Case 1 only. The results for all three cases are displayed following the calculations. Please contact Trelleborg if calculation details for Cases 2 & 3 are required.

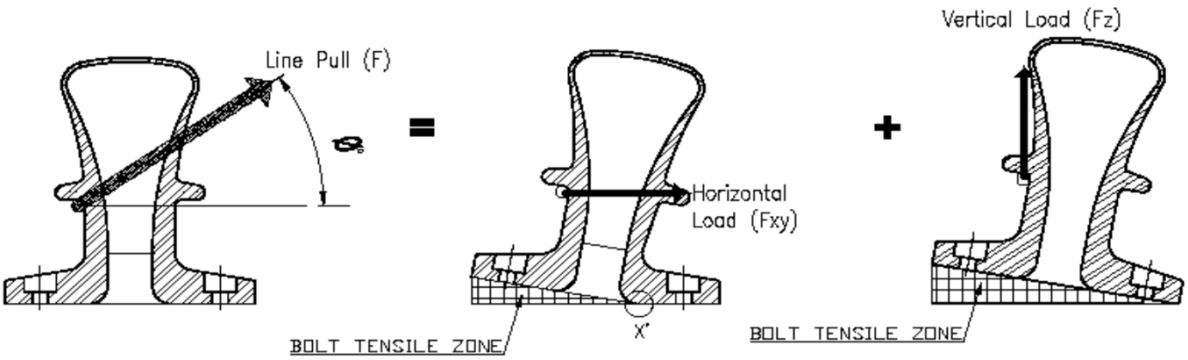
Bollard Anchor Location

Number of Anchors: 6

BX1	-8.0	in	BY1	5.3	in
BX2	8.0	in	BY2	5.3	in
BX3	-7.9	in	BY3	-1.6	in
BX4	7.9	in	BY4	-1.6	in
BX5	-3.8	in	BY5	-7.1	in
BX6	3.8	in	BY6	-7.1	in
BX7	0.0	in	BY7	0.0	in
BX8	0.0	in	BY8	0.0	in
BX9	0.0	in	BY9	0.0	in
BX10	0.0	in	BY10	0.0	in
BX11	0.0	in	BY11	0.0	in
BX12	0.0	in	BY12	0.0	in



Anchor Loading Scenario



Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Delivery Berth

NOTES:

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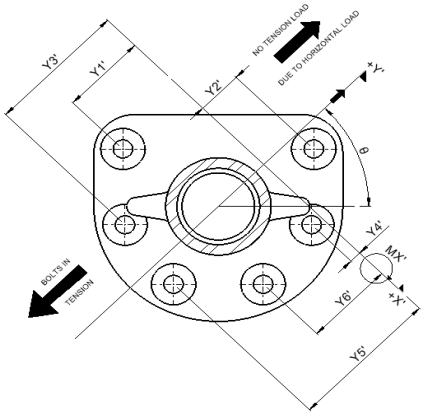
Horizontal Load Component

Horizontal load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- The axis of rotation is offset 1" from the horn base.
3- All anchors on the positive side of the axis see no load.
4- All anchors on the negative side of the axis go into tension such that the load case is in static equilibrium.
5- The tensile load on the anchors magnitude is proportional to the distance they are from the axis of rotation.

Relative anchor location to pivot axis at base of Horn

Y1'	-7.4	in
Y2'	3.9	in
Y3'	-12.2	in
Y4'	-1.1	in
Y5'	-13.2	in
Y6'	-7.9	in
Y7'	NA	in
Y8'	NA	in
Y9'	NA	in
Y10'	NA	in
Y11'	NA	in
Y12'	NA	in



Governing Equations

Static Equilibrium;

$$\sum m_{x'} = 0$$

$$\sum m_{x'} = \sum (Byi' * Fbi') - M_{x'}$$

Tensile load to location proportionality;

$$\frac{Fb_1'}{Y_1'} = \frac{Fb_2'}{Y_2'} = \frac{Fb_3'}{Y_3'} = \frac{Fb_n'}{Y_n'} \ldots$$

Calculations

External Moment ($M_{X'}$) 1310.8 kip-in

$$Mx' = Fxy * H'$$

Induced Moment 1310.8 kip-in

$$\sum (Yi' * Fbi')$$

	Anchor Tensile Load		Moment Contribution	
Fb1'	22.1	kip	164.3	kip-in
Fb2'	0.0	kip	0.0	kip-in
Fb3'	36.2	kip	442.6	kip-in
Fb4'	3.2	kip	3.5	kip-in
Fb5'	39.1	kip	515.9	kip-in
Fb6'	23.4	kip	184.4	kip-in
Fb7'	NA	kip	NA	kip-in
Fb8'	NA	kip	NA	kip-in
Fb9'	NA	kip	NA	kip-in
Fb10'	NA	kip	NA	kip-in
Fb11'	NA	kip	NA	kip-in
Fb12'	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Delivery Berth

NOTES:

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Vertical Load Component

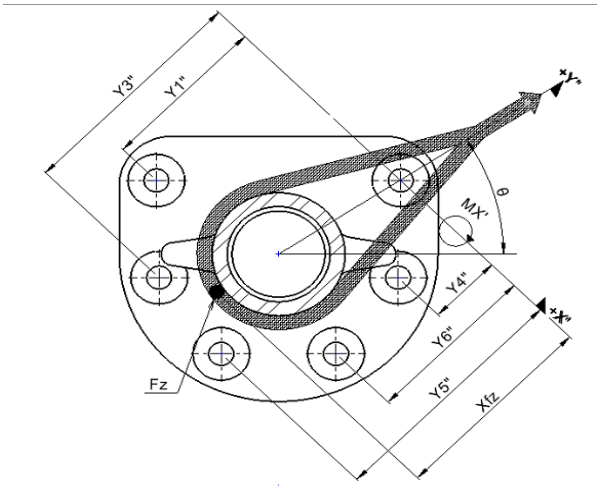
Vertical load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- Axis of rotation is self determined by reaching equilibrium.
3- The magnitude of the anchor tensile load is proportional to the distance from the axis of rotation.
4- Moment will be calculated about an axis parallel to the axis of rotation but set at the centroid of the farthest anchor away from the vertical load component in the direction of the horizontal load component.

Relative Load Location (Xfz)	14.9	in

Relative Anchor Location

Y1''	11.3	in
Y2''	0.0	in
Y3''	16.1	in
Y4''	4.9	in
Y5''	17.1	in
Y6''	11.8	in
Y7''	NA	in
Y8''	NA	in
Y9''	NA	in
Y10''	NA	in
Y11''	NA	in
Y12''	NA	in



Governing Equations

Static Equilibruim: $\sum m_{x''} = 0$

$$\sum m_{x''} = \sum_{2}^{n} (Yi'' * Fbi'') - M_{x''}$$

Tensile load to location proportionality;

$$\frac{Fb_{1}''}{Y_{1}''} = \frac{Fb_{2}''}{Y_{2}''} = \frac{Fb_{n}''}{Y_{n}''} \ldots$$

Calculations

External Moment ($M_{X''}$)	284.0	kip-in

$$M_{x''} = F_z * X_{fz}$$

Induced Moment	284.0	kip-in

$$\sum (Yi'' * Fbi'')$$

	Anchor Tensile Load		Moment Contribution	
Fb1"	3.8	kip	43.3	kip-in
Fb2"	0.0	kip	0.0	kip-in
Fb3"	5.4	kip	87.4	kip-in
Fb4"	1.7	kip	8.3	kip-in
Fb5"	5.8	kip	98.3	kip-in
Fb6"	4.0	kip	46.7	kip-in
Fb7"	NA	kip	NA	kip-in
Fb8"	NA	kip	NA	kip-in
Fb9"	NA	kip	NA	kip-in
Fb10"	NA	kip	NA	kip-in
Fb11"	NA	kip	NA	kip-in
Fb12"	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Delivery Berth

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Anchor Stresses

Anchor Size	1 3/8	in
Nominal Stress Area	1.48	in^2
Tensile Stress Area	1.15	in^2
Load Factor	1.6	
Reduction Factor (Φ)	0.75	

Nominal Tensile Strength (F_{nt}=0.75 x F_u)	93.8	ksi
Design Tension Strength (ΦF_{nt})	70.3	ksi
Nominal Shear Strength (F_{nv}=0.45 x F_u)	56.3	ksi
Design Shear Strength (ΦF_{nv})	42.2	ksi

	Tensile Load				Tensile Stress			
	Case 1	**Case 2**	**Case 3**		**Case 1**	**Case 2**	**Case 3**	
Bolt 1	41.4	45.8	48.7	kip	27.9	30.8	32.8	ksi
Bolt 2	0.0	0.0	0.0	kip	0.0	0.0	0.0	ksi
Bolt 3	66.7	72.4	76.0	kip	44.9	48.8	51.2	ksi
Bolt 4	7.8	10.2	12.2	kip	5.3	6.8	8.2	ksi
Bolt 5	71.8	77.9	81.6	kip	48.4	52.4	54.9	ksi
Bolt 6	43.8	48.2	51.2	kip	29.5	32.5	34.5	ksi
Bolt 7	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 8	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 9	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 10	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 11	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 12	NA	NA	NA	kip	NA	NA	NA	ksi

Maximum Tensile Stress			
48.4	**52.4**	**54.9**	**ksi**
Passes	Passes	Passes	

AISC 15th Eq. (J3-2)

$$R_n = F_{nt}' A_b$$

AISC 15th Eq. (J3-3a)

$$F_{nt}' = 1.3F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_v \leq F_{nt}$$

	Allowable Shear Stress (f_v)				Allowable Shear (V)			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	23.8	22.7	22.0	ksi	35.4	33.7	32.6	kip
Bolt 2	34.3	34.3	34.3	ksi	50.9	50.9	50.9	kip
Bolt 3	17.4	16.0	15.1	ksi	25.9	23.7	22.4	kip
Bolt 4	32.3	31.7	31.2	ksi	48.0	47.1	46.3	kip
Bolt 5	16.1	14.6	13.7	ksi	24.0	21.7	20.3	kip
Bolt 6	23.2	22.1	21.3	ksi	34.5	32.8	31.7	kip
Bolt 7	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 8	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 9	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 10	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 11	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 12	NA	NA	NA	ksi	NA	NA	NA	kip

Max Allowable Shear (V_{max})				
218.6	**210.0**	**204.2**	**kip**
Passes	Passes	Passes	

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Delivery Berth

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Bollard Callout

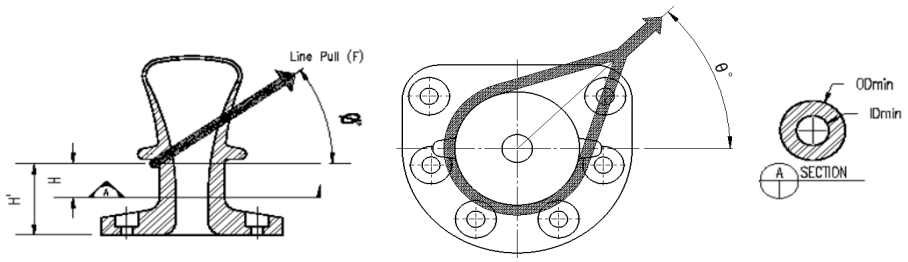
Bollard Name MSB-50 **Bollard Type** Single Bit

Material Properties

Bollard Material ASTM A27 65-35 **Cast Steel**

Yield Strength (F_y)	35	ksi
Tensile Strength (F_u)	65	ksi

Loading Scenario



Line Pull per Bit (P) 50 **Tonnes** 110.0 **kips**

	Primary Load Case	Alternate Load Cases		
	Case 1	Case 2	Case 3	
Vertical Angle (ø)	10	-25	-25	deg
Horizontal Angle (θ)	45	0	180	deg

	Case 1	Case 2	Case 3	
Force Parallel to Dock (P_x)	76.6	99.7	-99.7	kip
Force Perpendicular to Dock (P_y)	76.6	0.0	0.0	kip
Vertical Component of Force (P_z)	19.1	-46.5	-46.5	kip
Horizontal Component of Force (P_H)	108.3	99.7	99.7	kip

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

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4) All units and calculations are detailed in US Customary units.

Section Properties

Min Throat Height (H)	5.1	in	Section Modulus at Cross Section (S)	55.5	in^3
Base Height (H')	12.1	in	Section Area (A)	33.4	in^2
Minimum Horn OD	9.0	in	Moment of Area of Half Section (Q)	40.9	in^3
Minimum Horn ID	6.2	in	Moment of Inertia at min X-section (I_x')	249.5	in^4
Rope Diameter (R_d)	2	in			

Design Stresses

The bollard is designed to meet or exceed AISC 15th. Ed. Part 16, Chapters D & G

Tensile Yielding (Eq. D2-1)

$$P_n = 0.9 F_y A$$

Tensile Rupture (Eq. D2-2)

$$P_n = 0.75 F_u A$$

Shear Yielding (Sec. G1)

$$V_n = 0.9 F_y A$$

Normal Stress

$$f_N = \frac{P_z}{A}$$

Bending Stress

$$f_B = \frac{M_x}{s_{x'}}$$

Shear Stress

$$f_v = \frac{P_H \cdot Q}{I_x' t}$$

AISC Live Load Factor (Φ)	1.6	
AISC Allowable Shear Strength	31.5	ksi
AISC Allowable Yield Strength	31.5	ksi
AISC Allowable Tensile Strength	48.8	ksi

Design Criteria

Factored Stress ≤ Allowable Strength

	Primary Load Case		**Alternate Load Cases**		
	Case 1		Case 2	Case 3	
Actual Shear Stress (f_v)	6.3	ksi	5.8	5.8	ksi
Factored Shear Stress (Φ x f_v)	10.1	ksi	9.3	9.3	ksi

Bollard shear strength exceeds AISC design requirements

Normal Stress (f_N)	0.6	ksi	-1.4	-1.4	ksi
Moment in Section (M_x)	657.5	kip-in	252.8	252.8	kip-in
Bending Stress (f_B)	11.9	ksi	4.6	4.6	ksi
Actual Total Tensile Stress (f_T)	12.4	ksi	3.2	3.2	ksi
Factored Total Tensile Stress (Φ x f_T)	19.9	ksi	5.1	5.1	ksi

Bollard tensile strength exceeds AISC design requirements

Factors of Safety

$$FOS_{yield} = \frac{f}{F_y}$$

$$FOS_{Breaking} = \frac{f}{F_u}$$

	Case 1	Case 2	Case 3
Factor of Safety on Yield	**2.8**	**11.1**	**11.1**
Factor of Safety on Breaking	**5.2**	**20.5**	**20.5**

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Delivery Berth

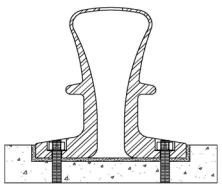
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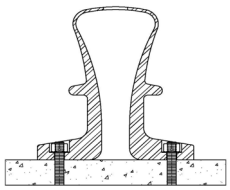
Anchor Properties

Anchor Size	1 3/8	**in**
Anchor Material	F1554 Gr 105	
Yield Strength (f_y)	105	ksi
Tensile Strength (f_u)	125	ksi
Bollard Keyed Into Concrete?	No	

Keyed-In



Not Keyed-In

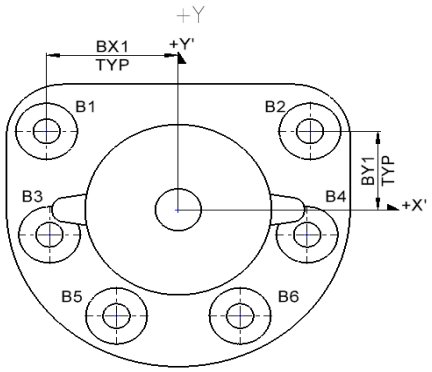


NOTE: The anchor calculations are detailed for Case 1 only. The results for all three cases are displayed following the calculations. Please contact Trelleborg if calculation details for Cases 2 & 3 are required.

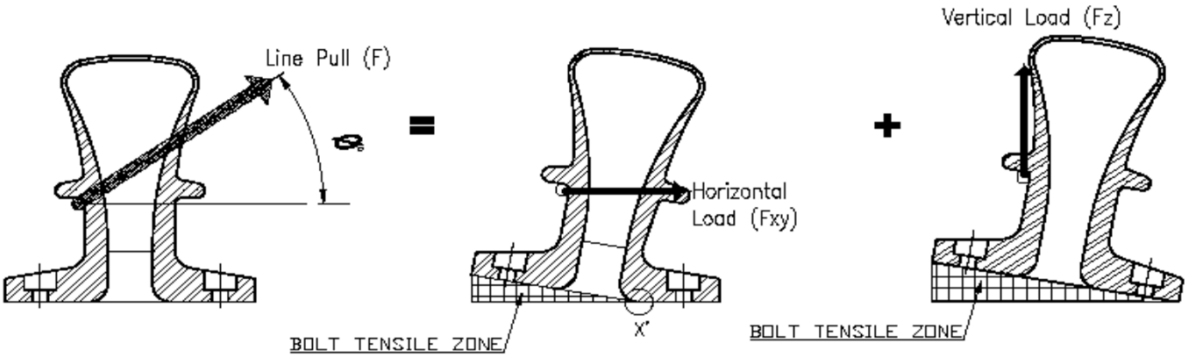
Bollard Anchor Location

Number of Anchors: 6

BX1	-8.0	in	BY1	5.3	in
BX2	8.0	in	BY2	5.3	in
BX3	-7.9	in	BY3	-1.6	in
BX4	7.9	in	BY4	-1.6	in
BX5	-3.8	in	BY5	-7.1	in
BX6	3.8	in	BY6	-7.1	in
BX7	0.0	in	BY7	0.0	in
BX8	0.0	in	BY8	0.0	in
BX9	0.0	in	BY9	0.0	in
BX10	0.0	in	BY10	0.0	in
BX11	0.0	in	BY11	0.0	in
BX12	0.0	in	BY12	0.0	in



Anchor Loading Scenario



Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135

Project Name: Connecticut Port Authority - State Pier

Delivery Berth

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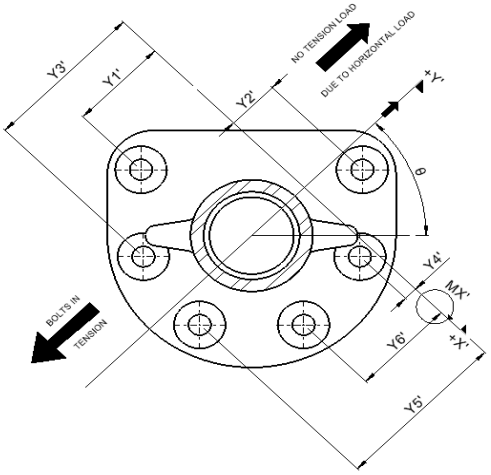
Horizontal Load Component

Horizontal load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- The axis of rotation is offset 1" from the horn base.
3- All anchors on the positive side of the axis see no load.
4- All anchors on the negative side of the axis go into tension such that the load case is in static equilibrium.
5- The tensile load on the anchors magnitude is proportional to the distance they are from the axis of rotation.

Relative anchor location to pivot axis at base of Horn

Y1'	-7.4	in
Y2'	3.9	in
Y3'	-12.2	in
Y4'	-1.1	in
Y5'	-13.2	in
Y6'	-7.9	in
Y7'	NA	in
Y8'	NA	in
Y9'	NA	in
Y10'	NA	in
Y11'	NA	in
Y12'	NA	in



Governing Equations

Static Equilibrium;

$$\sum m_{x'} = 0$$

$$\sum m_{x'} = \sum (Byi' * Fbi') - M_{x'}$$

Tensile load to location proportionality;

$$\frac{Fb_1'}{Y_1'} = \frac{Fb_2'}{Y_2'} = \frac{Fb_3'}{Y_3'} = \frac{Fb_n'}{Y_n'} \ldots$$

Calculations

External Moment ($M_{X'}$) 1310.8 kip-in

$$Mx' = Fxy * H'$$

Induced Moment 1310.8 kip-in

$$\sum (Yi' * Fbi')$$

	Anchor Tensile Load		Moment Contribution	
Fb1'	22.1	kip	164.3	kip-in
Fb2'	0.0	kip	0.0	kip-in
Fb3'	36.2	kip	442.6	kip-in
Fb4'	3.2	kip	3.5	kip-in
Fb5'	39.1	kip	515.9	kip-in
Fb6'	23.4	kip	184.4	kip-in
Fb7'	NA	kip	NA	kip-in
Fb8'	NA	kip	NA	kip-in
Fb9'	NA	kip	NA	kip-in
Fb10'	NA	kip	NA	kip-in
Fb11'	NA	kip	NA	kip-in
Fb12'	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Delivery Berth

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Vertical Load Component

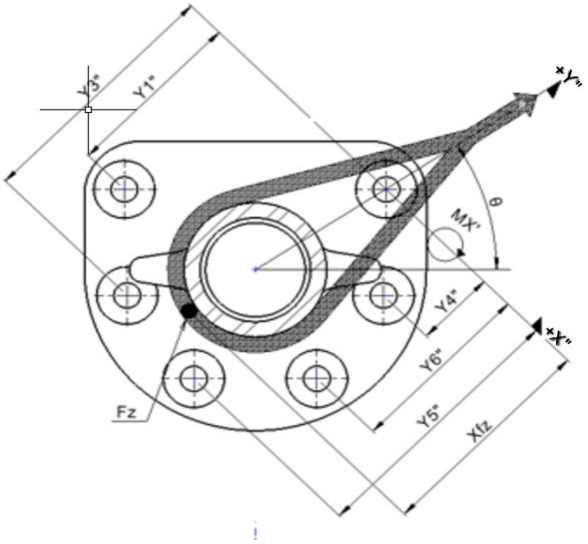
Vertical load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- Axis of rotation is self determined by reaching equilibrium.
3- The magnitude of the anchor tensile load is proportional to the distance from the axis of rotation.
4- Moment will be calculated about an axis parallel to the axis of rotation but set at the centroid of the farthest anchor away from the vertical load component in the direction of the horizontal load component.

Relative Load Location (Xfz)	14.9	in

Relative Anchor Location

Y1''	11.3	in
Y2''	0.0	in
Y3''	16.1	in
Y4''	4.9	in
Y5''	17.1	in
Y6''	11.8	in
Y7''	NA	in
Y8''	NA	in
Y9''	NA	in
Y10''	NA	in
Y11''	NA	in
Y12''	NA	in



Governing Equations

Static Equilibruim: $\sum m_{x''} = 0$

$$\sum m_{x''} = \sum_{2}^{n} (Yi'' * Fbi'') - M_{x''}$$

Tensile load to location proportionality;

$$\frac{Fb_{1}''}{Y_{1}''} = \frac{Fb_{2}''}{Y_{2}''} = \frac{Fb_{n}''}{Y_{n}''} \ldots$$

Calculations

External Moment ($M_{X''}$)	284.0	kip-in

$$M_{x''} = F_z * X_{fz}$$

Induced Moment	284.0	kip-in

$$\sum (Yi'' * Fbi'')$$

	Anchor Tensile Load		Moment Contribution	
Fb1''	3.8	kip	43.3	kip-in
Fb2''	0.0	kip	0.0	kip-in
Fb3''	5.4	kip	87.4	kip-in
Fb4''	1.7	kip	8.3	kip-in
Fb5''	5.8	kip	98.3	kip-in
Fb6''	4.0	kip	46.7	kip-in
Fb7''	NA	kip	NA	kip-in
Fb8''	NA	kip	NA	kip-in
Fb9''	NA	kip	NA	kip-in
Fb10''	NA	kip	NA	kip-in
Fb11''	NA	kip	NA	kip-in
Fb12''	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Delivery Berth

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Anchor Stresses

Anchor Size	1 3/8	in
Nominal Stress Area	1.48	in^2
Tensile Stress Area	1.15	in^2
Load Factor	1.6	
Reduction Factor (Φ)	0.75	

Nominal Tensile Strength (F_{nt}=0.75 x F_u)	93.8	ksi
Design Tension Strength (ΦF_{nt})	70.3	ksi
Nominal Shear Strength (F_{nv}=0.45 x F_u)	56.3	ksi
Design Shear Strength (ΦF_{nv})	42.2	ksi

	Tensile Load				Tensile Stress			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	41.4	33.7	0.0	kip	27.9	22.7	0.0	ksi
Bolt 2	0.0	0.0	33.7	kip	0.0	0.0	22.7	ksi
Bolt 3	66.7	33.4	-0.2	kip	44.9	22.5	-0.1	ksi
Bolt 4	7.8	-0.2	33.4	kip	5.3	-0.1	22.5	ksi
Bolt 5	71.8	21.9	1.1	kip	48.4	14.8	0.7	ksi
Bolt 6	43.8	1.1	21.9	kip	29.5	0.7	14.8	ksi
Bolt 7	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 8	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 9	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 10	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 11	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 12	NA	NA	NA	kip	NA	NA	NA	ksi

Maximum Tensile Stress			
48.4	**22.7**	**22.7**	**ksi**
Passes	Passes	Passes	

AISC 15th Eq. (J3-2)

$$R_n = F_{nt}' A_b$$

AISC 15th Eq. (J3-3a)

$$F_{nt}' = 1.3F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_v \leq F_{nt}$$

	Allowable Shear Stress (f_v)				Allowable Shear (V)			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	23.8	25.8	34.3	ksi	35.4	38.2	50.9	kip
Bolt 2	34.3	34.3	25.8	ksi	50.9	50.9	38.2	kip
Bolt 3	17.4	25.8	34.3	ksi	25.9	38.4	51.0	kip
Bolt 4	32.3	34.3	25.8	ksi	48.0	51.0	38.4	kip
Bolt 5	16.1	28.7	34.0	ksi	24.0	42.7	50.5	kip
Bolt 6	23.2	34.0	28.7	ksi	34.5	50.5	42.7	kip
Bolt 7	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 8	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 9	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 10	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 11	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 12	NA	NA	NA	ksi	NA	NA	NA	kip

Max Allowable Shear (V_{max})	**218.6**	**271.7**	**271.7**	**kip**
	Passes	Passes	Passes	

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

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Bollard Callout

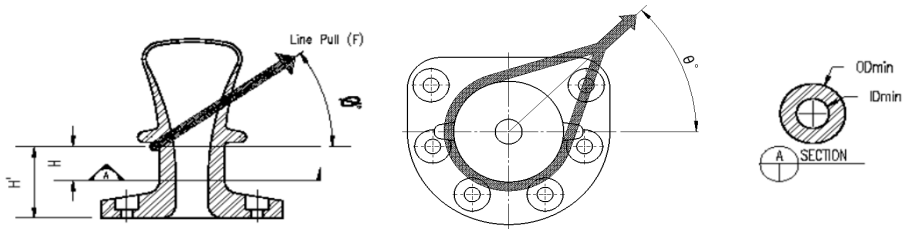
Bollard Name MSB-50 **Bollard Type** Single Bit

Material Properties

Bollard Material ASTM A27 65-35 **Cast Steel**

Yield Strength (F_y)	35	ksi
Tensile Strength (F_u)	65	ksi

Loading Scenario



Line Pull per Bit (P) 50 **Tonnes** 110.0 **kips**

	Primary Load Case	Alternate Load Cases		
	Case 1	Case 2	Case 3	
Vertical Angle (ø)	10	ø 45	45	deg
Horizontal Angle (θ)	45	θ 0	180	deg

	Case 1	Case 2	Case 3	
Force Parallel to Dock (P_x)	76.6	77.8	-77.8	kip
Force Perpendicular to Dock (P_y)	76.6	0.0	0.0	kip
Vertical Component of Force (P_z)	19.1	77.8	77.8	kip
Horizontal Component of Force (P_H)	108.3	77.8	77.8	kip

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

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Section Properties

Min Throat Height (H)	5.1	in	Section Modulus at Cross Section (S)	55.5	in^3
Base Height (H')	12.1	in	Section Area (A)	33.4	in^2
Minimum Horn OD	9.0	in	Moment of Area of Half Section (Q)	40.9	in^3
Minimum Horn ID	6.2	in	Moment of Inertia at min X-section (I_x')	249.5	in^4
Rope Diameter (R_d)	2	in			

Design Stresses

The bollard is designed to meet or exceed AISC 15th. Ed. Part 16, Chapters D & G

Tensile Yielding (Eq. D2-1)

$$P_n = 0.9 F_y A$$

Tensile Rupture (Eq. D2-2)

$$P_n = 0.75 F_u A$$

Shear Yielding (Sec. G1)

$$V_n = 0.9 F_y A$$

Normal Stress

$$f_N = \frac{P_z}{A}$$

Bending Stress

$$f_B = \frac{M_x}{s_{x'}}$$

Shear Stress

$$f_v = \frac{P_H \cdot Q}{I_x' t}$$

AISC Live Load Factor (Φ)	1.6	
AISC Allowable Shear Strength	31.5	ksi
AISC Allowable Yield Strength	31.5	ksi
AISC Allowable Tensile Strength	48.8	ksi

Design Criteria

Factored Stress ≤ Allowable Strength

	Primary Load Case		**Alternate Load Cases**		
	Case 1		Case 2	Case 3	
Actual Shear Stress (f_v)	6.3	ksi	4.6	4.6	ksi
Factored Shear Stress (Φ x f_v)	10.1	ksi	7.3	7.3	ksi

Bollard shear strength exceeds AISC design requirements

Normal Stress (f_N)	0.6	ksi	2.3	2.3	ksi
Moment in Section (M_x)	657.5	kip-in	824.5	824.5	kip-in
Bending Stress (f_B)	11.9	ksi	14.9	14.9	ksi
Actual Total Tensile Stress (f_T)	12.4	ksi	17.2	17.2	ksi
Factored Total Tensile Stress (Φ x f_T)	19.9	ksi	27.5	27.5	ksi

Bollard tensile strength exceeds AISC design requirements

Factors of Safety

$$FOS_{yield} = \frac{f}{F_y}$$

$$FOS_{Breaking} = \frac{f}{F_u}$$

	Case 1	Case 2	Case 3
Factor of Safety on Yield	**2.8**	**2.0**	**2.0**
Factor of Safety on Breaking	**5.2**	**3.8**	**3.8**

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
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Delivery Berth

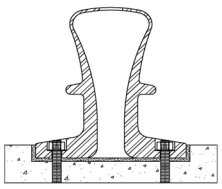
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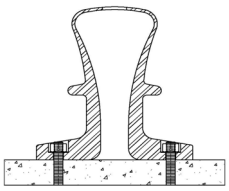
Anchor Properties

Anchor Size	1 3/8	**in**
Anchor Material	F1554 Gr 105	
Yield Strength (f_y)	105	ksi
Tensile Strength (f_u)	125	ksi
Bollard Keyed Into Concrete?	No	

Keyed-In



Not Keyed-In

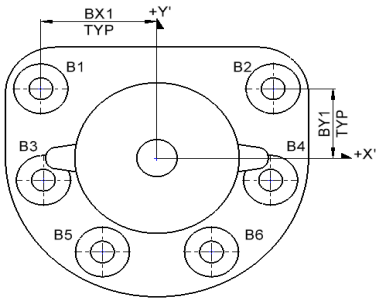


NOTE: The anchor calculations are detailed for Case 1 only. The results for all three cases are displayed following the calculations. Please contact Trelleborg if calculation details for Cases 2 & 3 are required.

Bollard Anchor Location

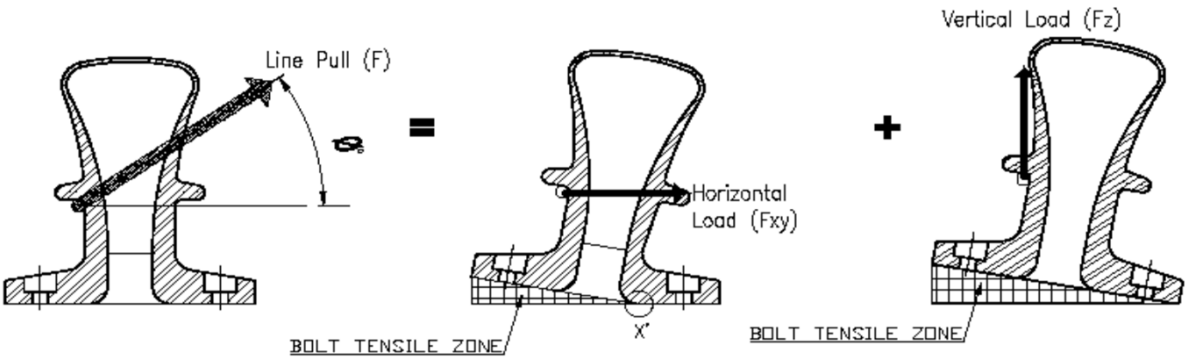
Number of Anchors: 6

BX1	-8.0	in	BY1	5.3	in
BX2	8.0	in	BY2	5.3	in
BX3	-7.9	in	BY3	-1.6	in
BX4	7.9	in	BY4	-1.6	in
BX5	-3.8	in	BY5	-7.1	in
BX6	3.8	in	BY6	-7.1	in
BX7	0.0	in	BY7	0.0	in
BX8	0.0	in	BY8	0.0	in
BX9	0.0	in	BY9	0.0	in
BX10	0.0	in	BY10	0.0	in
BX11	0.0	in	BY11	0.0	in
BX12	0.0	in	BY12	0.0	in



NOTE: Typical eight bolt bollard shown, number and location of bolt holes will vary for each type of bollard

Anchor Loading Scenario



Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135

Project Name: Connecticut Port Authority - State Pier

Delivery Berth

NOTES:

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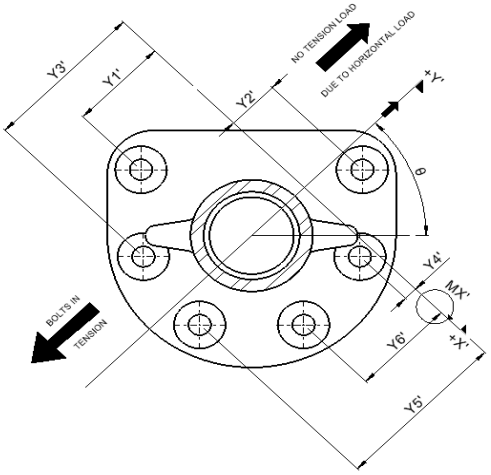
Horizontal Load Component

Horizontal load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- The axis of rotation is offset 1" from the horn base.
3- All anchors on the positive side of the axis see no load.
4- All anchors on the negative side of the axis go into tension such that the load case is in static equilibrium.
5- The tensile load on the anchors magnitude is proportional to the distance they are from the axis of rotation.

Relative anchor location to pivot axis at base of Horn

Y1'	-7.4	in
Y2'	3.9	in
Y3'	-12.2	in
Y4'	-1.1	in
Y5'	-13.2	in
Y6'	-7.9	in
Y7'	NA	in
Y8'	NA	in
Y9'	NA	in
Y10'	NA	in
Y11'	NA	in
Y12'	NA	in



Governing Equations

Static Equilibrium;

$$\sum m_{x'} = 0$$

$$\sum m_{x'} = \sum (Byi' * Fbi') - M_{x'}$$

Tensile load to location proportionality;

$$\frac{Fb_1'}{Y_1'} = \frac{Fb_2'}{Y_2'} = \frac{Fb_3'}{Y_3'} = \frac{Fb_n'}{Y_n'} \ldots$$

Calculations

External Moment ($M_{X'}$) 1310.8 kip-in

$$Mx' = Fxy * H'$$

Induced Moment 1310.8 kip-in

$$\sum (Yi' * Fbi')$$

	Anchor Tensile Load		Moment Contribution	
Fb1'	22.1	kip	164.3	kip-in
Fb2'	0.0	kip	0.0	kip-in
Fb3'	36.2	kip	442.6	kip-in
Fb4'	3.2	kip	3.5	kip-in
Fb5'	39.1	kip	515.9	kip-in
Fb6'	23.4	kip	184.4	kip-in
Fb7'	NA	kip	NA	kip-in
Fb8'	NA	kip	NA	kip-in
Fb9'	NA	kip	NA	kip-in
Fb10'	NA	kip	NA	kip-in
Fb11'	NA	kip	NA	kip-in
Fb12'	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Delivery Berth

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Vertical Load Component

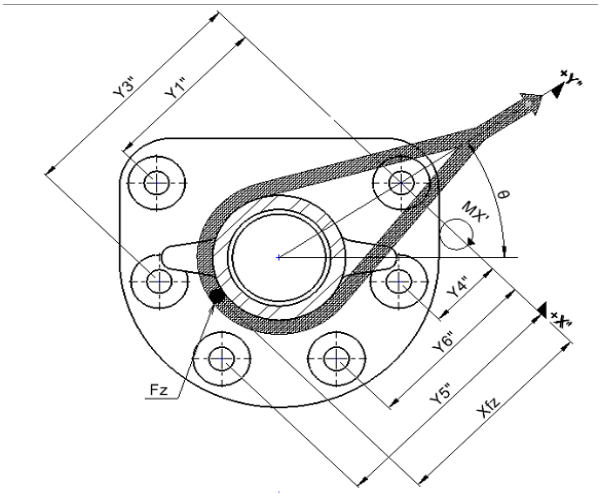
Vertical load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- Axis of rotation is self determined by reaching equilibrium.
3- The magnitude of the anchor tensile load is proportional to the distance from the axis of rotation.
4- Moment will be calculated about an axis parallel to the axis of rotation but set at the centroid of the farthest anchor away from the vertical load component in the direction of the horizontal load component.

Relative Load Location (Xfz)	14.9	in

Relative Anchor Location

Y1''	11.3	in
Y2''	0.0	in
Y3''	16.1	in
Y4''	4.9	in
Y5''	17.1	in
Y6''	11.8	in
Y7''	NA	in
Y8''	NA	in
Y9''	NA	in
Y10''	NA	in
Y11''	NA	in
Y12''	NA	in



Governing Equations

Static Equilibruim: $\sum m_{x''} = 0$

$$\sum m_{x''} = \sum_{2}^{n} (Yi'' * Fbi'') - M_{x''}$$

Tensile load to location proportionality;

$$\frac{Fb_{1}''}{Y_{1}''} = \frac{Fb_{2}''}{Y_{2}''} = \frac{Fb_{n}''}{Y_{n}''} \ldots$$

Calculations

External Moment ($M_{X''}$)	284.0	kip-in

$$M_{x''} = F_z * X_{fz}$$

Induced Moment	284.0	kip-in

$$\sum (Yi'' * Fbi'')$$

	Anchor Tensile Load		Moment Contribution	
Fb1''	3.8	kip	43.3	kip-in
Fb2''	0.0	kip	0.0	kip-in
Fb3''	5.4	kip	87.4	kip-in
Fb4''	1.7	kip	8.3	kip-in
Fb5''	5.8	kip	98.3	kip-in
Fb6''	4.0	kip	46.7	kip-in
Fb7''	NA	kip	NA	kip-in
Fb8''	NA	kip	NA	kip-in
Fb9''	NA	kip	NA	kip-in
Fb10''	NA	kip	NA	kip-in
Fb11''	NA	kip	NA	kip-in
Fb12''	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Delivery Berth

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Anchor Stresses

Anchor Size	1 3/8	in
Nominal Stress Area	1.48	in^2
Tensile Stress Area	1.15	in^2
Load Factor	1.6	
Reduction Factor (Φ)	0.75	

Nominal Tensile Strength (F_{nt}=0.75 x F_u)	93.8	ksi
Design Tension Strength (ΦF_{nt})	70.3	ksi
Nominal Shear Strength (F_{nv}=0.45 x F_u)	56.3	ksi
Design Shear Strength (ΦF_{nv})	42.2	ksi

	Tensile Load				Tensile Stress			
	Case 1	**Case 2**	**Case 3**		**Case 1**	**Case 2**	**Case 3**	
Bolt 1	41.4	85.7	0.0	kip	27.9	57.7	0.0	ksi
Bolt 2	0.0	0.0	85.7	kip	0.0	0.0	57.7	ksi
Bolt 3	66.7	84.9	0.3	kip	44.9	57.2	0.2	ksi
Bolt 4	7.8	0.3	84.9	kip	5.3	0.2	57.2	ksi
Bolt 5	71.8	60.7	16.6	kip	48.4	40.9	11.2	ksi
Bolt 6	43.8	16.6	60.7	kip	29.5	11.2	40.9	ksi
Bolt 7	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 8	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 9	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 10	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 11	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 12	NA	NA	NA	kip	NA	NA	NA	ksi

Maximum Tensile Stress			
48.4	**57.7**	**57.7**	**ksi**
Passes	Passes	Passes	

AISC 15th Eq. (J3-2)

$$R_n = F_{nt}' A_b$$

AISC 15th Eq. (J3-3a)

$$F_{nt}' = 1.3F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_v \leq F_{nt}$$

	Allowable Shear Stress (f_v)				Allowable Shear (V)			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	23.8	12.6	34.3	ksi	35.4	18.8	50.9	kip
Bolt 2	34.3	34.3	12.6	ksi	50.9	50.9	18.8	kip
Bolt 3	17.4	12.8	34.2	ksi	25.9	19.0	50.8	kip
Bolt 4	32.3	34.2	12.8	ksi	48.0	50.8	19.0	kip
Bolt 5	16.1	18.9	30.1	ksi	24.0	28.1	44.7	kip
Bolt 6	23.2	30.1	18.9	ksi	34.5	44.7	28.1	kip
Bolt 7	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 8	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 9	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 10	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 11	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 12	NA	NA	NA	ksi	NA	NA	NA	kip

Max Allowable Shear (V_{max})				
218.6	**212.3**	**212.3**	**kip**
Passes	Passes	Passes	

Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-50
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation
Document Number	25135-3E01
Revision C	Load Data & Anchor Embedment depth Updated

ANCHOR CALCULATIONS PER ACI 318-19

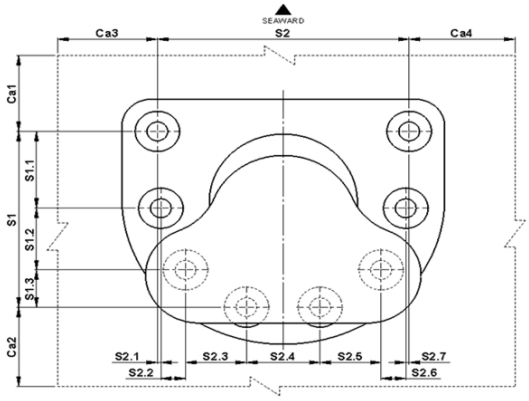
Concrete Parameters:

Concrete Condition:		Uncracked		
Concrete Strength:	f'_c =	5000	psi	(As per Specification)
Critical Edge Distance:	C_{ac} =	28.90	inch	
Modification Factor:	λ =	1		

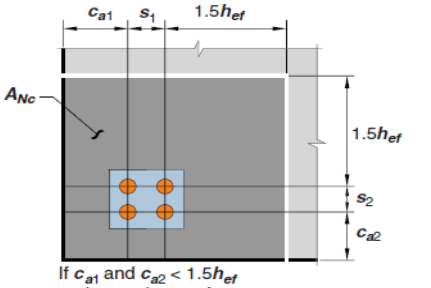
Anchor Parameters:

Type:		Cast in anchor		
Material:		ASTM F1554		
Yield Strength:	F_{ya} =	105	ksi	
Tensile Strength:	F_{uta} =	125	ksi	
Anchor Size:	d_a =	1 3/8 - 6	in	
Basic Pitch Dia :	d_a =	1.27	in	
Tensile Area:	$A_{se,N}$ =	1.155	in²	
Bearing Area:	A_{brg} =	25	in²	(5" x 5" Bearing Plate)
Effective EmbedmentDepth:	h_{ef} =	36.0	in	
	1.5 * h_{ef} =	54.0	in	
Anchor Factor:	k_c =	24		(17.6.2.2.2)

Anchor Layout Design:



Total Design Tension Load:	T =	269.7	kips	From 30° Vertical Angle and 45° Horizontal Angle
Total Design Shear Load:	S =	173.28	kips	From 10° Vertical Angle and 45° Horizontal Angle Factored With Live Load Factor of 1.6
Max. Tensile Load on Single Anchor:		85.7	kips	From 45° Vertical Angle and 180° Horizontal Angle
Number of Anchors :	n =	6		
Vertical Distance between anchors in set:	$S_{1.1}$ =	6.9	in	
	$S_{1.2}$ =	5.4	in	
	$S_{1.3}$ =	0.0		
Horizontal Distance between anchors in set:	$S_{2.1}$ =	0.2	in	
	$S_{2.2}$ =	4.1	in	
	$S_{2.3}$ =	7.6	in	
	$S_{2.4}$ =	4.1	in	
	$S_{2.5}$ =	0.2	in	
Vertical Distance between anchors in set:	S1 =	12.4	in	
Horizontal Distance between anchors in set:	S2 =	16.3	in	
Left dist from anchor to concrete edge	Ca3 =	54.0	in	
Right dist from anchor to concrete edge	Ca4 =	54.0	in	
Upper dist from anchor to concrete edge	Ca1 =	30.7	in	
Lower dist from anchor to concrete edge	Ca2 =	28.9	in	
Effective Embedment Depth:	h_{ef} =	36.0	in	
	$C_{a1,min}$	54.0	in	
	$C_{a2,min}$	28.9	in	



If c_{a1} and $c_{a2} < 1.5h_{ef}$
and s_1 and $s_2 < 3h_{ef}$
$A_{Nc} = (c_{a1} + s_1 + 1.5h_{ef}) \times (c_{a2} + s_2 + 1.5h_{ef})$

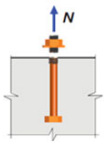
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Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-50
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation

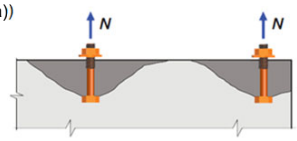
Steel Strength in Tension (ACI 318-19 Section 17.6.1)

Tensile strength:		F_{uta} =	125.00	ksi	
Effective area of anchor:		$A_{se,N}$ =	1.16	in²	
Nominal strength in tension:	$N_{sa} = A_{se,N} f_{uta}$	N_{sa} =	144	kips	(17.6.1.2)
Reduction factor:		$Ø_T$ =	0.75		
Design strength in tension:		**$øN_{sa}$ =**	**108**	kips	



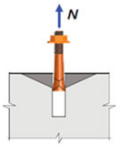
Concrete Breakout Strength in Tension (ACI 318-19 Section 17.6.2)

Projected failure area of anchor group :	$A_{Nc} = (\Sigma X+S_2) * (\Sigma Y+S_1)$	A_{nc} =	8947.73	in²	
Projected failure area of single anchor :	$A_{Nco} = 9 * h_{ef}^2$	A_{nco} =	11664.00	in²	(R17.6.2.1 - (a))
Eccentricity factor:		$\Psi_{ec,N}$ =	1.00		(17.6.2.3)
Edge effects factor:		$\Psi_{ed,N}$ =	0.86		(17.6.2.4)
Cracking factor:		$\Psi_{c,N}$ =	1.25		(17.6.2.5)
Splitting factor:		$\Psi_{cp,N}$ =	1.00		(17.6.2.6)
Basic concrete breakout strength:	$N_b = K_c * \lambda_a * \sqrt{f'_c} * h_{ef}^{1.5}$	N_b =	367	kips	(17.6.2.2.1)
Nominal concrete breakout strength:	$N_{cbg} = {}^{A_{Nc}}/_{A_{Nco}} \Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$	N_{cbg} =	302	kips	(17.6.2.1b)
Reduction factor:		$Ø_T$ =	0.75		
Design concrete breakout strength:		**$øN_{cbg}$ =**	**226.9**	kips	



Concrete Pullout Strength in Tension (ACI 318-19 Section. 17.4.3)

Bearing area:	USER INPUT	A_{brg} =	25	in²	
Concrete modification factor:	Uncracked	Ψ_{cp} =	1.4		(17.4.3.6)
Concrete strength:	USER INPUT	f'_c =	5000	psi	
Single anchor strength:	$N_p = 8 * A_{brg} * f'_c$	Np =	1000	kips	(17.4.3.4)
Nominal pullout strength:	$N_{pn} = \Psi_{c,P} * N_p$	N_{pn} =	1400	kips	(17.4.3.1)
Reduction factor:		$Ø_T$ =	0.75		
Design pullout strength:		**$ØN_{pn}$ =**	**1050**	kips	



Unity Check in Tension

	Actual	Allowable		
Steel strength (kips):	85.70	108	0.79	OK
Concrete breakout	269.70	227	1.19	NOT OK
Concrete pullout (kips):	85.70	1050	0.08	OK

Provide anchor reinforcements per ACI 318-19 recommendations

Steel Strength in Shear (ACI 318-19 Section 17.7.1)

Material tensile strength:		F_{uta} =	125	ksi	
Effective area of anchor:		$A_{se,N=}$	1.155	in²	
Bolts in shear:		n=	6		
Nominal strength:	$V_{sa} = A_{se,N} F_{uta}$	$V_{sa=}$	144	kips	(17.7.1.2a)
Reduction factor:			0.75		
Design strength in shear:		**$øV_{sa}$=**	649.7	kips	

Concrete Breakout Strength in Shear (ACI 318-19 Section 17.7.2)

Height of concrete:		Ha =	41	in	
Projected failure area:		$A_{vc=}$	4745	in²	(R17.7.2.1b)
Nominal failure area:	$Avco = 4.5*(C_{a1})^2$	$A_{Vco=}$	3403	in²	(R17.7.2.1a)
Eccentricity:		e'v =	0.00	in	
Eccentricity factor:		$\Psi_{ec,v}$=	1		(17.7.2.3)
Edge effects factor:		$\Psi_{ed,v}$=	1		(17.7.2.4)
Breakout concrete factor:		$\Psi_{c,v}$=	1.4		(17.7.2.5)
Breakout thickness factor:		$\Psi h_{,v}$=	1		(17.7.2.6)
Basic concrete breakout strength:	$V_b = 9 * \lambda_a * \sqrt{f'_c} * (C_{a1})^{1.5}$	V_b=	92	kips	(17.7.2.2.1 b)
Nominal Concrete Breakout Strength:	$V_{cbg} = {}^{A_{vc}}/_{A_{vco}} \Psi_{ec,v}\psi_{ed,v}\Psi_{c,v}\Psi h_{,v} V_b$	V_{cbg}=	1075	kips	(17.7.2.1b)
Reduction factor:		$Ø_S$=	1		
Design concrete breakout strength:		**$øV_{cbg}$**	806	kips	

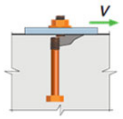
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Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-50
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation

Concrete Pryout Strength in Shear (ACI 318-19 Section 17.7.3)

For hef < 2.5 in		K_{cp}=	1		
For hef ≥ 2.5 in		K_{cp}=	2		
Nominal concrete breakout strength:		N_{cbg}=	302	kips	
Nominal concrete pryout strength:	$V_{cpg} = k_{cp}N_{cbg}$	V_{cpg}=	605	kips	(17.7.3.1b)
Reduction factor:		$Ø_S$=	0.75		
Design concrete pryout strength:		$øV_{cpg}$ =	454	kips	



(i) Steel failure preceded by concrete spall

Unity Check in Shear

	Actual	Allowable	
Steel strength in shear (kips):	173.28	650	0.267
Concrete Pryout (kips):	173.28	454	0.382

Combined Tension and Shear Check (ACI 318-19 Section 17.8)

$$(Nua / ØNn)^{5/3} + (Vua / ØVn)^{5/3} = \left(\frac{269.7}{226.9}\right)^{5/3} + \left(\frac{173.3}{453.7}\right)^{5/3} = 1.54 > 1.0 \quad \text{(R17.8)}$$

Anchor reinforcement shall be designed and installed to increase concrete breakout in tension per ACI 318-19. TMS is not responsible for design of reinforcement.

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Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Main Platform

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Bollard Callout

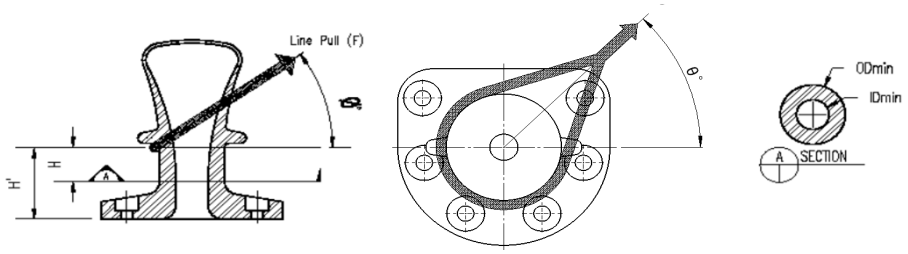
Bollard Name MSB-75 **Bollard Type** Single Bit

Material Properties

Bollard Material ASTM A27 65-35 **Cast Steel**

Yield Strength (F_y)	35	ksi
Tensile Strength (F_u)	65	ksi

Loading Scenario



Line Pull per Bit (P) 75 **Tonnes** 165.0 **kips**

	Primary Load Case	Alternate Load Cases		
	Case 1	Case 2	Case 3	
Vertical Angle (ø)	45	45	45	deg
Horizontal Angle (θ)	90	45	0	deg

	Case 1	Case 2	Case 3	
Force Parallel to Dock (P_x)	0.0	82.5	116.7	kip
Force Perpendicular to Dock (P_y)	116.7	82.5	0.0	kip
Vertical Component of Force (P_z)	116.7	116.7	116.7	kip
Horizontal Component of Force (P_H)	116.7	116.7	116.7	kip

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Main Platform

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4) All units and calculations are detailed in US Customary units.

Section Properties

Min Throat Height (H)	6.3	in	Section Modulus at Cross Section (S)	102.4	in^3
Base Height (H')	15.4	in	Section Area (A)	50.9	in^2
Minimum Horn OD	11.0	in	Moment of Area of Half Section (Q)	75.8	in^3
Minimum Horn ID	7.5	in	Moment of Inertia at min X-section (I_x')	563.4	in^4
Rope Diameter (R_d)	2	in			

Design Stresses

The bollard is designed to meet or exceed AISC 15th. Ed. Part 16, Chapters D & G

Tensile Yielding (Eq. D2-1)

$$P_n = 0.9 F_y A$$

Tensile Rupture (Eq. D2-2)

$$P_n = 0.75 F_u A$$

Shear Yielding (Sec. G1)

$$V_n = 0.9 F_y A$$

Normal Stress

$$f_N = \frac{P_z}{A}$$

Bending Stress

$$f_B = \frac{M_x}{s_{x'}}$$

Shear Stress

$$f_v = \frac{P_H \cdot Q}{I_x' t}$$

AISC Live Load Factor (Φ)	1.6	
AISC Allowable Shear Strength	31.5	ksi
AISC Allowable Yield Strength	31.5	ksi
AISC Allowable Tensile Strength	48.8	ksi

Design Criteria

Factored Stress ≤ Allowable Strength

	Primary Load Case		**Alternate Load Cases**		
	Case 1		Case 2	Case 3	
Actual Shear Stress (f_v)	4.5	ksi	4.5	4.5	ksi
Factored Shear Stress (Φ x f_v)	7.2	ksi	7.2	7.2	ksi

Bollard shear strength exceeds AISC design requirements

Normal Stress (f_N)	2.3	ksi	2.3	2.3	ksi
Moment in Section (M_x)	1493.4	kip-in	1493.4	1493.4	kip-in
Bending Stress (f_B)	14.6	ksi	14.6	14.6	ksi
Actual Total Tensile Stress (f_T)	16.9	ksi	16.9	16.9	ksi
Factored Total Tensile Stress (Φ x f_T)	27.0	ksi	27.0	27.0	ksi

Bollard tensile strength exceeds AISC design requirements

Factors of Safety

$$FOS_{yield} = \frac{f}{F_y}$$

$$FOS_{Breaking} = \frac{f}{F_u}$$

	Case 1	Case 2	Case 3
Factor of Safety on Yield	**2.1**	**2.1**	**2.1**
Factor of Safety on Breaking	**3.9**	**3.9**	**3.9**

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Main Platform

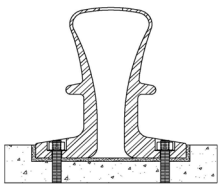
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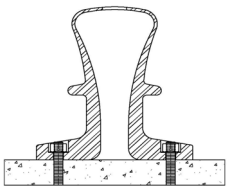
Anchor Properties

Anchor Size	1 3/4	**in**
Anchor Material	F1554 Gr 105	
Yield Strength (f_y)	105	ksi
Tensile Strength (f_u)	125	ksi
Bollard Keyed Into Concrete?	No	

Keyed-In



Not Keyed-In

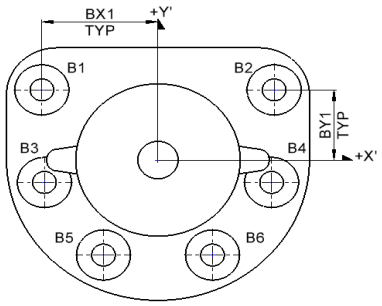


NOTE: The anchor calculations are detailed for Case 1 only. The results for all three cases are displayed following the calculations. Please contact Trelleborg if calculation details for Cases 2 & 3 are required.

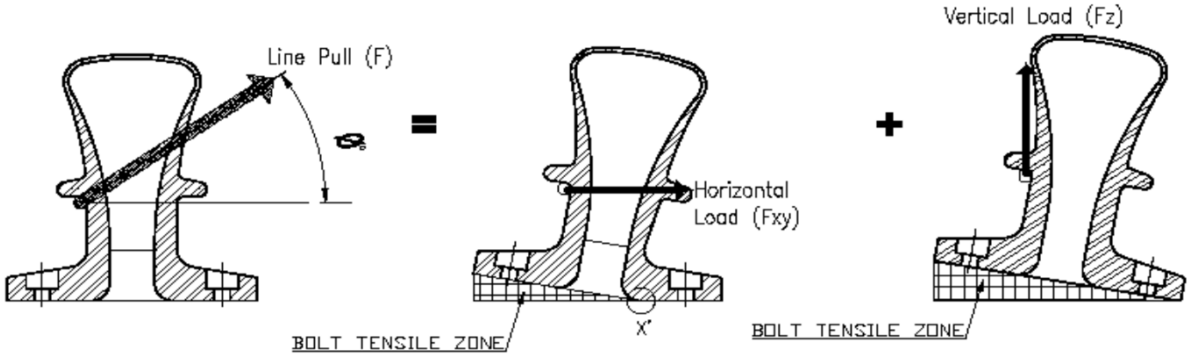
Bollard Anchor Location

Number of Anchors: 6

BX1	-9.8	in	BY1	6.4	in
BX2	9.8	in	BY2	6.4	in
BX3	-9.5	in	BY3	-2.0	in
BX4	9.5	in	BY4	-2.0	in
BX5	-4.6	in	BY5	-8.6	in
BX6	4.6	in	BY6	-8.6	in
BX7	0.0	in	BY7	0.0	in
BX8	0.0	in	BY8	0.0	in
BX9	0.0	in	BY9	0.0	in
BX10	0.0	in	BY10	0.0	in
BX11	0.0	in	BY11	0.0	in
BX12	0.0	in	BY12	0.0	in



Anchor Loading Scenario



Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135

Project Name: Connecticut Port Authority - State Pier

Main Platform

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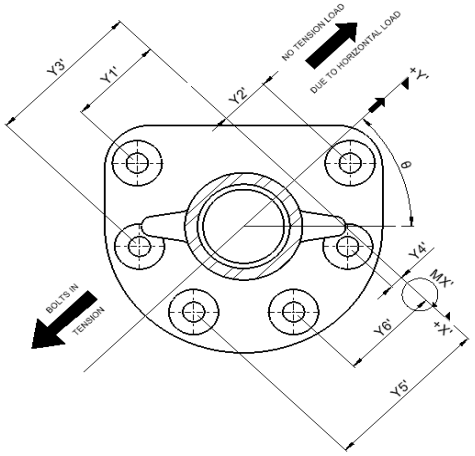
Horizontal Load Component

Horizontal load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- The axis of rotation is offset 1" from the horn base.
3- All anchors on the positive side of the axis see no load.
4- All anchors on the negative side of the axis go into tension such that the load case is in static equilibrium.
5- The tensile load on the anchors magnitude is proportional to the distance they are from the axis of rotation.

Relative anchor location to pivot axis at base of Horn

Y1'	-0.1	in
Y2'	-0.1	in
Y3'	-8.5	in
Y4'	-8.5	in
Y5'	-15.1	in
Y6'	-15.1	in
Y7'	NA	in
Y8'	NA	in
Y9'	NA	in
Y10'	NA	in
Y11'	NA	in
Y12'	NA	in



Governing Equations

Static Equilibrium;

$$\sum m_{x'} = 0$$

$$\sum m_{x'} = \sum (Byi' * Fbi') - M_{x'}$$

Tensile load to location proportionality;

$$\frac{Fb_1'}{Y_1'} = \frac{Fb_2'}{Y_2'} = \frac{Fb_3'}{Y_3'} = \frac{Fb_n'}{Y_n'} \ldots$$

Calculations

External Moment ($M_{X'}$) 1796.8 kip-in

$$Mx' = Fxy * H'$$

Induced Moment 1796.8 kip-in

$$\sum (Yi' * Fbi')$$

	Anchor Tensile Load		Moment Contribution	
Fb1'	0.4	kip	0.0	kip-in
Fb2'	0.4	kip	0.0	kip-in
Fb3'	25.4	kip	215.6	kip-in
Fb4'	25.4	kip	215.6	kip-in
Fb5'	45.1	kip	682.7	kip-in
Fb6'	45.1	kip	682.7	kip-in
Fb7'	NA	kip	NA	kip-in
Fb8'	NA	kip	NA	kip-in
Fb9'	NA	kip	NA	kip-in
Fb10'	NA	kip	NA	kip-in
Fb11'	NA	kip	NA	kip-in
Fb12'	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Main Platform

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Vertical Load Component

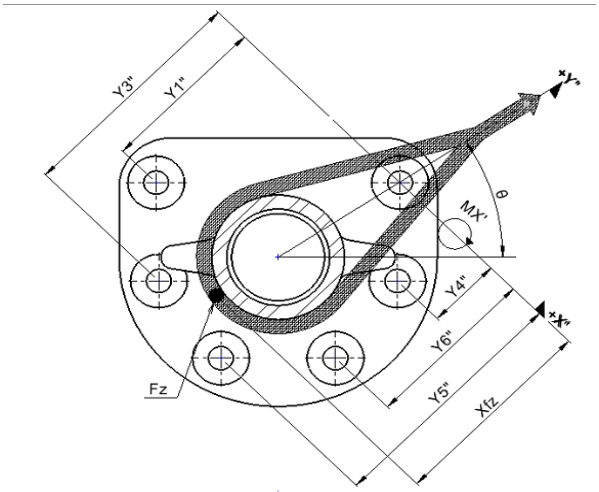
Vertical load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- Axis of rotation is self determined by reaching equilibrium.
3- The magnitude of the anchor tensile load is proportional to the distance from the axis of rotation.
4- Moment will be calculated about an axis parallel to the axis of rotation but set at the centroid of the farthest anchor away from the vertical load component in the direction of the horizontal load component.

Relative Load Location (Xfz)	12.9	in

Relative Anchor Location

Y1''	0.0	in
Y2''	0.0	in
Y3''	8.4	in
Y4''	8.4	in
Y5''	15.0	in
Y6''	15.0	in
Y7''	NA	in
Y8''	NA	in
Y9''	NA	in
Y10''	NA	in
Y11''	NA	in
Y12''	NA	in



Governing Equations

Static Equilibruim: $\sum m_{x''} = 0$

$$\sum m_{x''} = \sum_{2}^{n} (Yi'' * Fbi'') - M_{x''}$$

Tensile load to location proportionality;

$$\frac{Fb_{1}''}{Y_{1}''} = \frac{Fb_{2}''}{Y_{2}''} = \frac{Fb_{n}''}{Y_{n}''} \ldots$$

Calculations

External Moment ($M_{x''}$)	1502.2	kip-in

$$M_{x''} = F_z * X_{fz}$$

Induced Moment	1502.2	kip-in

$$\sum (Yi'' * Fbi'')$$

	Anchor Tensile Load		Moment Contribution	
Fb1''	0.0	kip	0.0	kip-in
Fb2''	0.0	kip	0.0	kip-in
Fb3''	21.3	kip	178.5	kip-in
Fb4''	21.3	kip	178.5	kip-in
Fb5''	38.2	kip	572.6	kip-in
Fb6''	38.2	kip	572.6	kip-in
Fb7''	NA	kip	NA	kip-in
Fb8''	NA	kip	NA	kip-in
Fb9''	NA	kip	NA	kip-in
Fb10''	NA	kip	NA	kip-in
Fb11''	NA	kip	NA	kip-in
Fb12''	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Main Platform

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Anchor Stresses

Anchor Size	1 3/4	in
Nominal Stress Area	2.41	in^2
Tensile Stress Area	1.90	in^2
Load Factor	1.6	
Reduction Factor (Φ)	0.75	

Nominal Tensile Strength (F_{nt}=0.75 x F_u)	93.8	ksi
Design Tension Strength (ΦF_{nt})	70.3	ksi
Nominal Shear Strength (F_{nv}=0.45 x F_u)	56.3	ksi
Design Shear Strength (ΦF_{nv})	42.2	ksi

	Tensile Load				Tensile Stress			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	0.6	77.4	132.3	kip	0.2	32.2	55.0	ksi
Bolt 2	0.6	0.0	0.0	kip	0.2	0.0	0.0	ksi
Bolt 3	74.7	118.9	130.4	kip	31.1	49.4	54.2	ksi
Bolt 4	74.7	21.8	0.8	kip	31.1	9.1	0.3	ksi
Bolt 5	133.3	127.9	93.7	kip	55.4	53.2	39.0	ksi
Bolt 6	133.3	80.6	24.1	kip	55.4	33.5	10.0	ksi
Bolt 7	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 8	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 9	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 10	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 11	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 12	NA	NA	NA	kip	NA	NA	NA	ksi

Maximum Tensile Stress			
55.4	**53.2**	**55.0**	**ksi**
Passes	Passes	Passes	

AISC 15th Eq. (J3-2)

$$R_n = F_{nt}' A_b$$

AISC 15th Eq. (J3-3a)

$$F_{nt}' = 1.3F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_v \leq F_{nt}$$

	Allowable Shear Stress (f_v)				Allowable Shear (V)			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	34.2	22.2	13.7	ksi	82.2	53.4	32.8	kip
Bolt 2	34.2	34.3	34.3	ksi	82.2	82.4	82.4	kip
Bolt 3	22.6	15.7	13.9	ksi	54.4	37.8	33.5	kip
Bolt 4	22.6	30.9	34.2	ksi	54.4	74.3	82.2	kip
Bolt 5	13.5	14.3	19.7	ksi	32.5	34.5	47.3	kip
Bolt 6	13.5	21.7	30.5	ksi	32.5	52.2	73.4	kip
Bolt 7	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 8	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 9	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 10	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 11	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 12	NA	NA	NA	ksi	NA	NA	NA	kip

Max Allowable Shear (V_{max})				
	338.2	**334.7**	**351.7**	**kip**
	Passes	Passes	Passes	

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Main Platform

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Bollard Callout

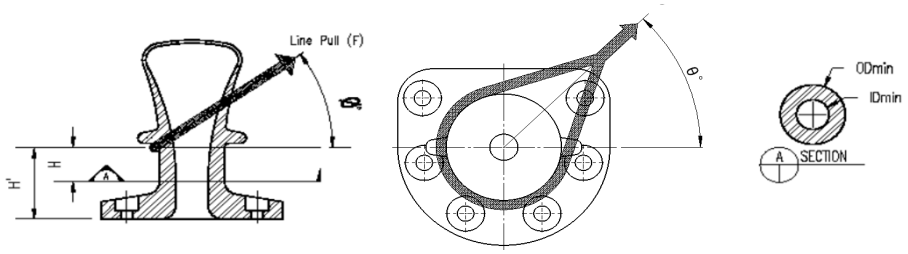
Bollard Name MSB-75 **Bollard Type** Single Bit

Material Properties

Bollard Material ASTM A27 65-35 **Cast Steel**

Yield Strength (F_y)	35	ksi
Tensile Strength (F_u)	65	ksi

Loading Scenario



Line Pull per Bit (P) 75 **Tonnes** 165.0 **kips**

	Primary Load Case	Alternate Load Cases		
	Case 1	Case 2	Case 3	
Vertical Angle (ø)	45	-25	-25	deg
Horizontal Angle (θ)	90	0	180	deg

	Case 1	Case 2	Case 3	
Force Parallel to Dock (P_x)	0.0	149.5	-149.5	kip
Force Perpendicular to Dock (P_y)	116.7	0.0	0.0	kip
Vertical Component of Force (P_z)	116.7	-69.7	-69.7	kip
Horizontal Component of Force (P_H)	116.7	149.5	149.5	kip

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Main Platform

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Section Properties

Min Throat Height (H)	6.3	in	Section Modulus at Cross Section (S)	102.4	in^3
Base Height (H')	15.4	in	Section Area (A)	50.9	in^2
Minimum Horn OD	11.0	in	Moment of Area of Half Section (Q)	75.8	in^3
Minimum Horn ID	7.5	in	Moment of Inertia at min X-section (I_x')	563.4	in^4
Rope Diameter (R_d)	2	in			

Design Stresses

The bollard is designed to meet or exceed AISC 15th. Ed. Part 16, Chapters D & G

Tensile Yielding (Eq. D2-1)

$$P_n = 0.9 F_y A$$

Tensile Rupture (Eq. D2-2)

$$P_n = 0.75 F_u A$$

Shear Yielding (Sec. G1)

$$V_n = 0.9 F_y A$$

Normal Stress

$$f_N = \frac{P_z}{A}$$

Bending Stress

$$f_B = \frac{M_x}{s_{x'}}$$

Shear Stress

$$f_v = \frac{P_H \cdot Q}{I_x' t}$$

AISC Live Load Factor (Φ)	1.6	
AISC Allowable Shear Strength	31.5	ksi
AISC Allowable Yield Strength	31.5	ksi
AISC Allowable Tensile Strength	48.8	ksi

Design Criteria

Factored Stress ≤ Allowable Strength

	Primary Load Case		**Alternate Load Cases**		
	Case 1		Case 2	Case 3	
Actual Shear Stress (f_v)	4.5	ksi	5.7	5.7	ksi
Factored Shear Stress (Φ x f_v)	7.2	ksi	9.2	9.2	ksi

Bollard shear strength exceeds AISC design requirements

Normal Stress (f_N)	2.3	ksi	-1.4	-1.4	ksi
Moment in Section (M_x)	1493.4	kip-in	488.8	488.8	kip-in
Bending Stress (f_B)	14.6	ksi	4.8	4.8	ksi
Actual Total Tensile Stress (f_T)	16.9	ksi	3.4	3.4	ksi
Factored Total Tensile Stress (Φ x f_T)	27.0	ksi	5.4	5.4	ksi

Bollard tensile strength exceeds AISC design requirements

Factors of Safety

$$FOS_{yield} = \frac{f}{F_y}$$

$$FOS_{Breaking} = \frac{f}{F_u}$$

	Case 1	Case 2	Case 3
Factor of Safety on Yield	**2.1**	**10.3**	**10.3**
Factor of Safety on Breaking	**3.9**	**19.1**	**19.1**

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Main Platform

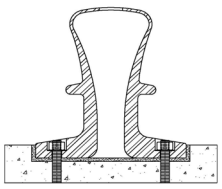
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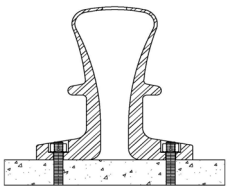
Anchor Properties

Anchor Size	1 3/4	**in**
Anchor Material	F1554 Gr 105	
Yield Strength (f_y)	105	ksi
Tensile Strength (f_u)	125	ksi
Bollard Keyed Into Concrete?	No	

Keyed-In



Not Keyed-In

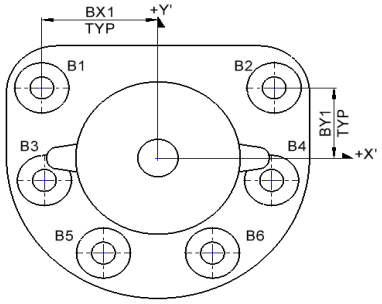


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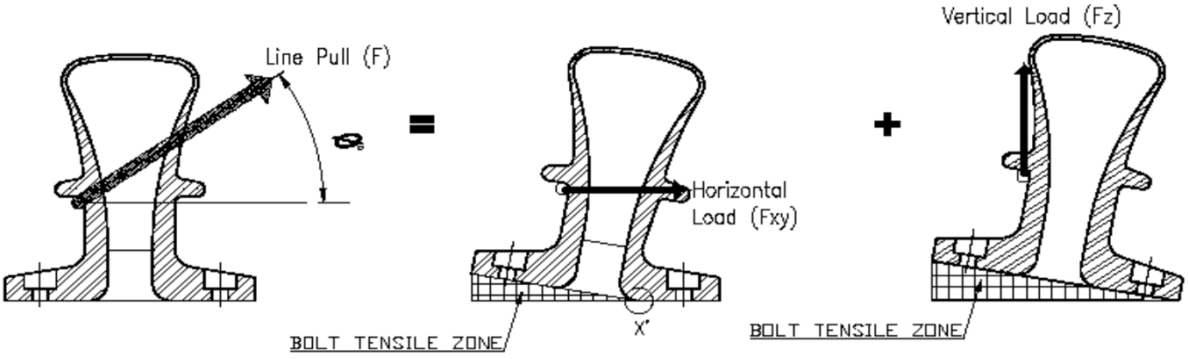
Bollard Anchor Location

Number of Anchors: 6

BX1	-9.8	in	BY1	6.4	in
BX2	9.8	in	BY2	6.4	in
BX3	-9.5	in	BY3	-2.0	in
BX4	9.5	in	BY4	-2.0	in
BX5	-4.6	in	BY5	-8.6	in
BX6	4.6	in	BY6	-8.6	in
BX7	0.0	in	BY7	0.0	in
BX8	0.0	in	BY8	0.0	in
BX9	0.0	in	BY9	0.0	in
BX10	0.0	in	BY10	0.0	in
BX11	0.0	in	BY11	0.0	in
BX12	0.0	in	BY12	0.0	in



Anchor Loading Scenario



Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135

Project Name: Connecticut Port Authority - State Pier

Main Platform

NOTES:

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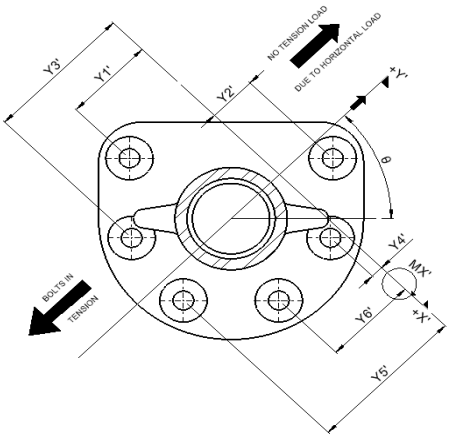
Horizontal Load Component

Horizontal load case assumptions:

1- Bollard horn pivots around an axis perpendicular to the horizontal load component.
2- The axis of rotation is offset 1" from the horn base.
3- All anchors on the positive side of the axis see no load.
4- All anchors on the negative side of the axis go into tension such that the load case is in static equilibrium.
5- The tensile load on the anchors magnitude is proportional to the distance they are from the axis of rotation.

Relative anchor location to pivot axis at base of Horn

Y1'	-0.1	in
Y2'	-0.1	in
Y3'	-8.5	in
Y4'	-8.5	in
Y5'	-15.1	in
Y6'	-15.1	in
Y7'	NA	in
Y8'	NA	in
Y9'	NA	in
Y10'	NA	in
Y11'	NA	in
Y12'	NA	in



Governing Equations

Static Equilibrium;

$$\sum m_{x'} = 0$$

$$\sum m_{x'} = \sum (Byi' * Fbi') - M_{x'}$$

Tensile load to location proportionality;

$$\frac{Fb_1'}{Y_1'} = \frac{Fb_2'}{Y_2'} = \frac{Fb_3'}{Y_3'} = \frac{Fb_n'}{Y_n'} \ldots$$

Calculations

External Moment ($M_{X'}$) 1796.8 kip-in

$$Mx' = Fxy * H'$$

Induced Moment 1796.8 kip-in

$$\sum (Yi' * Fbi')$$

	Anchor Tensile Load		Moment Contribution	
Fb1'	0.4	kip	0.0	kip-in
Fb2'	0.4	kip	0.0	kip-in
Fb3'	25.4	kip	215.6	kip-in
Fb4'	25.4	kip	215.6	kip-in
Fb5'	45.1	kip	682.7	kip-in
Fb6'	45.1	kip	682.7	kip-in
Fb7'	NA	kip	NA	kip-in
Fb8'	NA	kip	NA	kip-in
Fb9'	NA	kip	NA	kip-in
Fb10'	NA	kip	NA	kip-in
Fb11'	NA	kip	NA	kip-in
Fb12'	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
Project Name: Connecticut Port Authority - State Pier
Main Platform

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Vertical Load Component

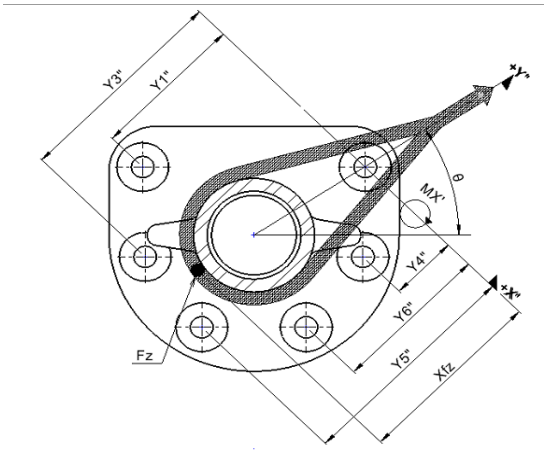
Vertical load case assumptions:

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2- Axis of rotation is self determined by reaching equilibrium.
3- The magnitude of the anchor tensile load is proportional to the distance from the axis of rotation.
4- Moment will be calculated about an axis parallel to the axis of rotation but set at the centroid of the farthest anchor away from the vertical load component in the direction of the horizontal load component.

Relative Load Location (Xfz)	12.9	in

Relative Anchor Location

Y1"	0.0	in
Y2"	0.0	in
Y3"	8.4	in
Y4"	8.4	in
Y5"	15.0	in
Y6"	15.0	in
Y7"	NA	in
Y8"	NA	in
Y9"	NA	in
Y10"	NA	in
Y11"	NA	in
Y12"	NA	in



Governing Equations

Static Equilibruim: $\sum m_{x''} = 0$

$$\sum m_{x''} = \sum_{2}^{n} (Yi'' * Fbi'') - M_{x''}$$

Tensile load to location proportionality;

$$\frac{Fb_{1}''}{Y_{1}''} = \frac{Fb_{2}''}{Y_{2}''} = \frac{Fb_{n}''}{Y_{n}''} \ldots$$

Calculations

External Moment ($M_{x''}$)	1502.2	kip-in

$$M_{x''} = F_z * X_{fz}$$

Induced Moment	1502.2	kip-in

$$\sum (Yi'' * Fbi'')$$

	Anchor Tensile Load		Moment Contribution	
Fb1"	0.0	kip	0.0	kip-in
Fb2"	0.0	kip	0.0	kip-in
Fb3"	21.3	kip	178.5	kip-in
Fb4"	21.3	kip	178.5	kip-in
Fb5"	38.2	kip	572.6	kip-in
Fb6"	38.2	kip	572.6	kip-in
Fb7"	NA	kip	NA	kip-in
Fb8"	NA	kip	NA	kip-in
Fb9"	NA	kip	NA	kip-in
Fb10"	NA	kip	NA	kip-in
Fb11"	NA	kip	NA	kip-in
Fb12"	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
Project Name:	Connecticut Port Authority - State Pier
	Main Platform

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Anchor Stresses

Anchor Size	1 3/4	in
Nominal Stress Area	2.41	in^2
Tensile Stress Area	1.90	in^2
Load Factor	1.6	
Reduction Factor (Φ)	0.75	

Nominal Tensile Strength (F_{nt}=0.75 x F_u)	93.8	ksi
Design Tension Strength (ΦF_{nt})	70.3	ksi
Nominal Shear Strength (F_{nv}=0.45 x F_u)	56.3	ksi
Design Shear Strength (ΦF_{nv})	42.2	ksi

	Tensile Load				Tensile Stress			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	0.6	56.6	0.0	kip	0.2	23.5	0.0	ksi
Bolt 2	0.6	0.0	56.6	kip	0.2	0.0	23.5	ksi
Bolt 3	74.7	55.6	-0.5	kip	31.1	23.1	-0.2	ksi
Bolt 4	74.7	-0.5	55.6	kip	31.1	-0.2	23.1	ksi
Bolt 5	133.3	36.8	1.2	kip	55.4	15.3	0.5	ksi
Bolt 6	133.3	1.2	36.8	kip	55.4	0.5	15.3	ksi
Bolt 7	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 8	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 9	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 10	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 11	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 12	NA	NA	NA	kip	NA	NA	NA	ksi

Maximum Tensile Stress			
55.4	**23.5**	**23.5**	**ksi**
Passes	Passes	Passes	

AISC 15th Eq. (J3-2)

$$R_n = F_{nt}' A_b$$

AISC 15th Eq. (J3-3a)

$$F_{nt}' = 1.3F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_v \leq F_{nt}$$

	Allowable Shear Stress (f_v)				Allowable Shear (V)			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	34.2	25.5	34.3	ksi	82.2	61.2	82.4	kip
Bolt 2	34.2	34.3	25.5	ksi	82.2	82.4	61.2	kip
Bolt 3	22.6	25.6	34.3	ksi	54.4	61.6	82.6	kip
Bolt 4	22.6	34.3	25.6	ksi	54.4	82.6	61.6	kip
Bolt 5	13.5	28.5	34.1	ksi	32.5	68.6	82.0	kip
Bolt 6	13.5	34.1	28.5	ksi	32.5	82.0	68.6	kip
Bolt 7	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 8	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 9	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 10	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 11	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 12	NA	NA	NA	ksi	NA	NA	NA	kip

Max Allowable Shear (V_{max})	**338.2**	**438.5**	**438.5**	**kip**
	Passes	Passes	Passes	

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

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Bollard Callout

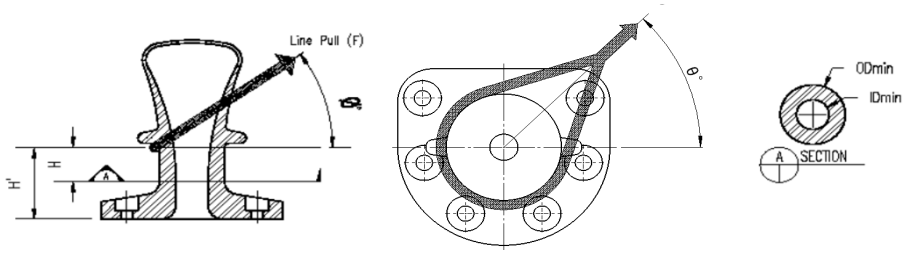
Bollard Name MSB-75 **Bollard Type** Single Bit

Material Properties

Bollard Material ASTM A27 65-35 **Cast Steel**

Yield Strength (F_y)	35	ksi
Tensile Strength (F_u)	65	ksi

Loading Scenario



Line Pull per Bit (P) 75 **Tonnes** 165.0 **kips**

	Primary Load Case	Alternate Load Cases		
	Case 1	Case 2	Case 3	
Vertical Angle (ø)	45	45	45	deg
Horizontal Angle (θ)	90	0	180	deg

	Case 1	Case 2	Case 3	
Force Parallel to Dock (P_x)	0.0	116.7	-116.7	kip
Force Perpendicular to Dock (P_y)	116.7	0.0	0.0	kip
Vertical Component of Force (P_z)	116.7	116.7	116.7	kip
Horizontal Component of Force (P_H)	116.7	116.7	116.7	kip

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number: 25135
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Main Platform

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Section Properties

Min Throat Height (H)	6.3	in	Section Modulus at Cross Section (S)	102.4	in^3
Base Height (H')	15.4	in	Section Area (A)	50.9	in^2
Minimum Horn OD	11.0	in	Moment of Area of Half Section (Q)	75.8	in^3
Minimum Horn ID	7.5	in	Moment of Inertia at min X-section (I_x')	563.4	in^4
Rope Diameter (R_d)	2	in			

Design Stresses

The bollard is designed to meet or exceed AISC 15th. Ed. Part 16, Chapters D & G

Tensile Yielding (Eq. D2-1)

$$P_n = 0.9 F_y A$$

Tensile Rupture (Eq. D2-2)

$$P_n = 0.75 F_u A$$

Shear Yielding (Sec. G1)

$$V_n = 0.9 F_y A$$

Normal Stress

$$f_N = \frac{P_z}{A}$$

Bending Stress

$$f_B = \frac{M_x}{s_{x'}}$$

Shear Stress

$$f_v = \frac{P_H \cdot Q}{I_x' t}$$

AISC Live Load Factor (Φ)	1.6	
AISC Allowable Shear Strength	31.5	ksi
AISC Allowable Yield Strength	31.5	ksi
AISC Allowable Tensile Strength	48.8	ksi

Design Criteria

Factored Stress ≤ Allowable Strength

	Primary Load Case		**Alternate Load Cases**		
	Case 1		Case 2	Case 3	
Actual Shear Stress (f_v)	4.5	ksi	4.5	4.5	ksi
Factored Shear Stress (Φ x f_v)	7.2	ksi	7.2	7.2	ksi

Bollard shear strength exceeds AISC design requirements

Normal Stress (f_N)	2.3	ksi	2.3	2.3	ksi
Moment in Section (M_x)	1493.4	kip-in	1493.4	1493.4	kip-in
Bending Stress (f_B)	14.6	ksi	14.6	14.6	ksi
Actual Total Tensile Stress (f_T)	16.9	ksi	16.9	16.9	ksi
Factored Total Tensile Stress (Φ x f_T)	27.0	ksi	27.0	27.0	ksi

Bollard tensile strength exceeds AISC design requirements

Factors of Safety

$$FOS_{yield} = \frac{f}{F_y}$$

$$FOS_{Breaking} = \frac{f}{F_u}$$

	Case 1	Case 2	Case 3
Factor of Safety on Yield	**2.1**	**2.1**	**2.1**
Factor of Safety on Breaking	**3.9**	**3.9**	**3.9**

Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

Project Information

Project Number:	25135
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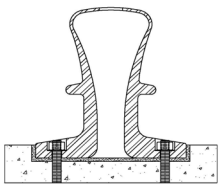
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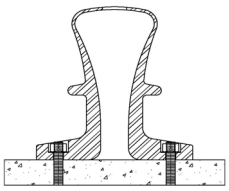
Anchor Properties

Anchor Size	1 3/4	**in**
Anchor Material	F1554 Gr 105	
Yield Strength (f_y)	105	ksi
Tensile Strength (f_u)	125	ksi
Bollard Keyed Into Concrete?	No	

Keyed-In



Not Keyed-In

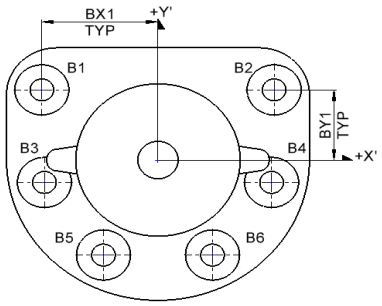


NOTE: The anchor calculations are detailed for Case 1 only. The results for all three cases are displayed following the calculations. Please contact Trelleborg if calculation details for Cases 2 & 3 are required.

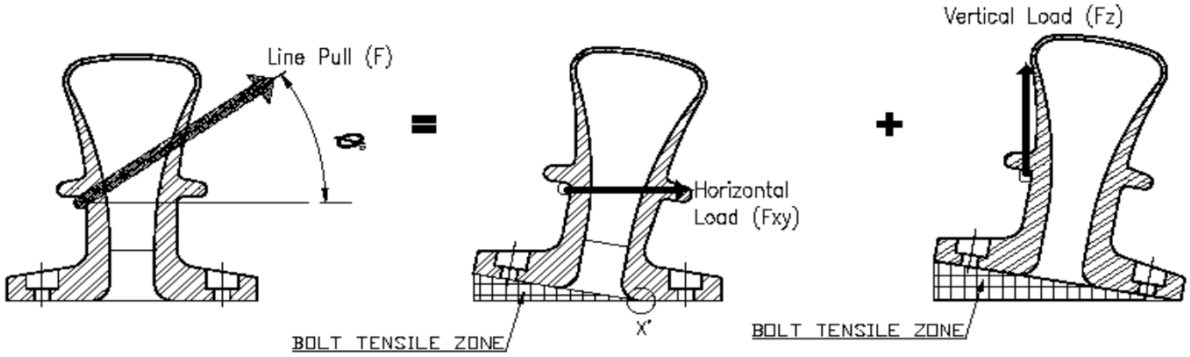
Bollard Anchor Location

Number of Anchors: 6

BX1	-9.8	in	BY1	6.4	in
BX2	9.8	in	BY2	6.4	in
BX3	-9.5	in	BY3	-2.0	in
BX4	9.5	in	BY4	-2.0	in
BX5	-4.6	in	BY5	-8.6	in
BX6	4.6	in	BY6	-8.6	in
BX7	0.0	in	BY7	0.0	in
BX8	0.0	in	BY8	0.0	in
BX9	0.0	in	BY9	0.0	in
BX10	0.0	in	BY10	0.0	in
BX11	0.0	in	BY11	0.0	in
BX12	0.0	in	BY12	0.0	in



Anchor Loading Scenario



Bollard and Anchor Stress Calculator

Detailed Calculations to Determine Bollard and Anchor Loading Capacities

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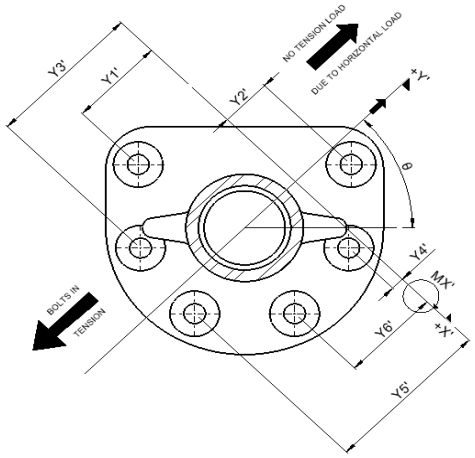
Horizontal Load Component

Horizontal load case assumptions:

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5- The tensile load on the anchors magnitude is proportional to the distance they are from the axis of rotation.

Relative anchor location to pivot axis at base of Horn

Y1'	-0.1	in
Y2'	-0.1	in
Y3'	-8.5	in
Y4'	-8.5	in
Y5'	-15.1	in
Y6'	-15.1	in
Y7'	NA	in
Y8'	NA	in
Y9'	NA	in
Y10'	NA	in
Y11'	NA	in
Y12'	NA	in



Governing Equations

Static Equilibrium;

$$\sum m_{x'} = 0$$

$$\sum m_{x'} = \sum (Byi' * Fbi') - M_{x'}$$

Tensile load to location proportionality;

$$\frac{Fb_1'}{Y_1'} = \frac{Fb_2'}{Y_2'} = \frac{Fb_3'}{Y_3'} = \frac{Fb_n'}{Y_n'} \ldots$$

Calculations

External Moment ($M_{X'}$) 1796.8 kip-in

$$Mx' = Fxy * H'$$

Induced Moment 1796.8 kip-in

$$\sum (Yi' * Fbi')$$

	Anchor Tensile Load		Moment Contribution	
Fb1'	0.4	kip	0.0	kip-in
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Fb6'	45.1	kip	682.7	kip-in
Fb7'	NA	kip	NA	kip-in
Fb8'	NA	kip	NA	kip-in
Fb9'	NA	kip	NA	kip-in
Fb10'	NA	kip	NA	kip-in
Fb11'	NA	kip	NA	kip-in
Fb12'	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

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Vertical Load Component

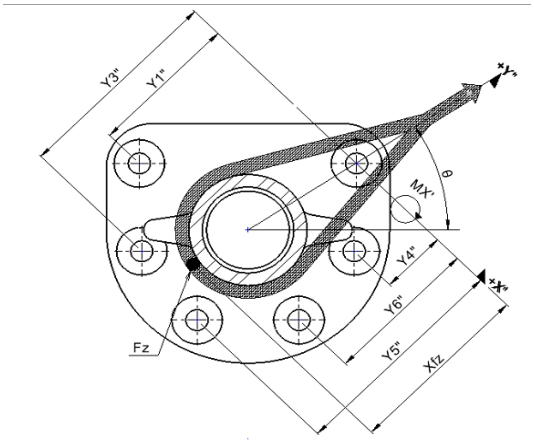
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Relative Load Location (Xfz)	12.9	in

Relative Anchor Location

Y1"	0.0	in
Y2"	0.0	in
Y3"	8.4	in
Y4"	8.4	in
Y5"	15.0	in
Y6"	15.0	in
Y7"	NA	in
Y8"	NA	in
Y9"	NA	in
Y10"	NA	in
Y11"	NA	in
Y12"	NA	in



Governing Equations

Static Equilibruim: $\sum m_{x''} = 0$

$$\sum m_{x''} = \sum_{2}^{n} (Yi'' * Fbi'') - M_{x''}$$

Tensile load to location proportionality;

$$\frac{Fb_{1}''}{Y_{1}''} = \frac{Fb_{2}''}{Y_{2}''} = \frac{Fb_{n}''}{Y_{n}''} \ldots$$

Calculations

External Moment ($M_{x''}$)	1502.2	kip-in

$$M_{x''} = F_z * X_{fz}$$

Induced Moment	1502.2	kip-in

$$\sum (Yi'' * Fbi'')$$

	Anchor Tensile Load		Moment Contribution	
Fb1"	0.0	kip	0.0	kip-in
Fb2"	0.0	kip	0.0	kip-in
Fb3"	21.3	kip	178.5	kip-in
Fb4"	21.3	kip	178.5	kip-in
Fb5"	38.2	kip	572.6	kip-in
Fb6"	38.2	kip	572.6	kip-in
Fb7"	NA	kip	NA	kip-in
Fb8"	NA	kip	NA	kip-in
Fb9"	NA	kip	NA	kip-in
Fb10"	NA	kip	NA	kip-in
Fb11"	NA	kip	NA	kip-in
Fb12"	NA	kip	NA	kip-in

Bollard and Anchor Stress Calculator

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Anchor Stresses

Anchor Size	1 3/4	in
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Load Factor	1.6	
Reduction Factor (Φ)	0.75	

Nominal Tensile Strength (F_{nt}=0.75 x F_u)	93.8	ksi
Design Tension Strength (ΦF_{nt})	70.3	ksi
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Design Shear Strength (ΦF_{nv})	42.2	ksi

	Tensile Load				Tensile Stress			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
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Bolt 2	0.6	0.0	132.3	kip	0.2	0.0	55.0	ksi
Bolt 3	74.7	130.4	0.8	kip	31.1	54.2	0.3	ksi
Bolt 4	74.7	0.8	130.4	kip	31.1	0.3	54.2	ksi
Bolt 5	133.3	93.7	24.1	kip	55.4	39.0	10.0	ksi
Bolt 6	133.3	24.1	93.7	kip	55.4	10.0	39.0	ksi
Bolt 7	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 8	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 9	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 10	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 11	NA	NA	NA	kip	NA	NA	NA	ksi
Bolt 12	NA	NA	NA	kip	NA	NA	NA	ksi

Maximum Tensile Stress			
55.4	**55.0**	**55.0**	**ksi**
Passes	Passes	Passes	

AISC 15th Eq. (J3-2)

$$R_n = F_{nt}' A_b$$

AISC 15th Eq. (J3-3a)

$$F_{nt}' = 1.3F_{nt} - \frac{F_{nt}}{\phi F_{nv}} f_v \leq F_{nt}$$

	Allowable Shear Stress (f_v)				Allowable Shear (V)			
	Case 1	Case 2	Case 3		Case 1	Case 2	Case 3	
Bolt 1	34.2	13.7	34.3	ksi	82.2	32.8	82.4	kip
Bolt 2	34.2	34.3	13.7	ksi	82.2	82.4	32.8	kip
Bolt 3	22.6	13.9	34.2	ksi	54.4	33.5	82.2	kip
Bolt 4	22.6	34.2	13.9	ksi	54.4	82.2	33.5	kip
Bolt 5	13.5	19.7	30.5	ksi	32.5	47.3	73.4	kip
Bolt 6	13.5	30.5	19.7	ksi	32.5	73.4	47.3	kip
Bolt 7	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 8	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 9	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 10	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 11	NA	NA	NA	ksi	NA	NA	NA	kip
Bolt 12	NA	NA	NA	ksi	NA	NA	NA	kip

Max Allowable Shear (V_{max})	**338.2**	**351.7**	**351.7**	**kip**
	Passes	Passes	Passes	

Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-75
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation For Heavy Lift Area
Document Number	25135-7E01
Revision C	Bolt Loads & Embedment depth updated

ANCHOR CALCULATIONS PER ACI 318-19

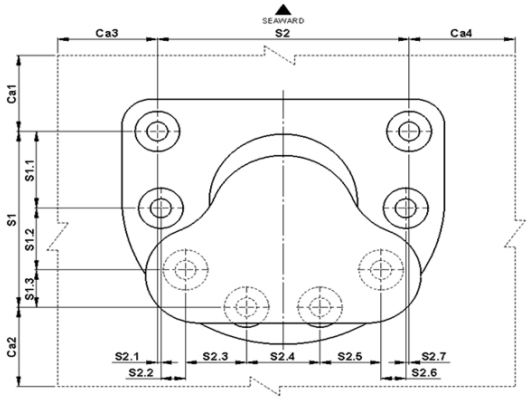
Concrete Parameters:

Concrete Condition:		Uncracked		
Concrete Strength:	f'_c =	5000	psi	(As per Specification)
Critical Edge Distance:	C_{ac} =	28.89	inch	
Modification Factor:	λ =	1		

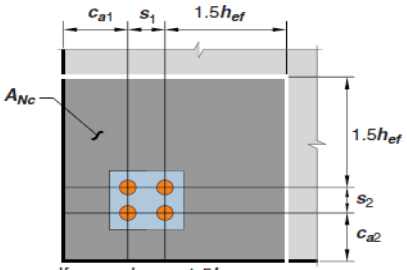
Anchor Parameters:

Type:		Cast in anchor		
Material:		ASTM F1554		
Yield Strength:	F_{ya} =	105	ksi	
Tensile Strength:	F_{uta} =	125	ksi	
Anchor Size:	d_a =	1¾ - 5	in	
Basic Pitch Dia :	d_a =	1.62	in	
Tensile Area:	$A_{se,N}$ =	1.9	in²	
Bearing Area:	A_{brg} =	36	in²	(6" x 6" Bearing Plate)
Effective EmbedmentDepth:	h_{ef} =	36.0	in	
	1.5 * h_{ef} =	54.0	in	
Anchor Factor:	k_c =	24		(17.6.2.2.2)

Anchor Layout Design:



Total Design Tension Load:	T =	426.7	kips	From 45° Vertical Angle and 45° Horizontal Angle
Total Design Shear Load:	S =	239.2	kips	From -25° Vertical Angle and 0° Horizontal Angle Factored With Live Load Factor of 1.6
Max. Tensile Load on Single Anchor:		133.3	kips	From 45° Vertical Angle and 90° Horizontal Angle
Number of Anchors :	n =	6		
Vertical Distance between anchors in set:	$S_{1.1}$ =	8.4	in	
	$S_{1.2}$ =	6.6	in	
	$S_{1.3}$ =	0.0		
Horizontal Distance between anchors in set:	$S_{2.1}$ =	0.2	in	
	$S_{2.2}$ =	5.0	in	
	$S_{2.3}$ =	9.2	in	
	$S_{2.4}$ =	5.0	in	
	$S_{2.5}$ =	0.2	in	
Vertical Distance between anchors in set:	S1 =	15.0	in	
Horizontal Distance between anchors in set:	S2 =	19.7	in	
Left dist from anchor to concrete edge	Ca3 =	54.0	in	
Right dist from anchor to concrete edge	Ca4 =	54.0	in	
Upper dist from anchor to concrete edge	Ca1 =	28.9	in	
Lower dist from anchor to concrete edge	Ca2 =	30.8	in	
Effective Embedment Depth:	h_{ef} =	36.0	in	
	$C_{a1,min}$	54.0	in	
	$C_{a2,min}$	28.9	in	



If c_{a1} and $c_{a2} < 1.5h_{ef}$
and s_1 and $s_2 < 3h_{ef}$
$A_{Nc} = (c_{a1} + s_1 + 1.5h_{ef})$ x $(c_{a2} + s_2 + 1.5h_{ef})$

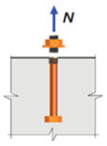
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Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-75
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation For Heavy Lift Area

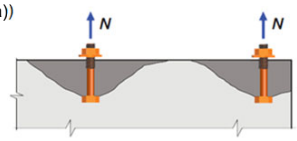
Steel Strength in Tension (ACI 318-19 Section 17.6.1)

Tensile strength:		F_{uta} =	125.00	ksi	
Effective area of anchor:		$A_{se,N}$ =	1.90	in²	
Nominal strength in tension:	$N_{sa} = A_{se,N} f_{uta}$	N_{sa} =	238	kips	(17.6.1.2)
Reduction factor:		$Ø_T$ =	0.75		
Design strength in tension:		**$øN_{sa}$ =**	**178**	kips	



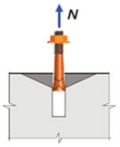
Concrete Breakout Strength in Tension (ACI 318-19 Section 17.6.2)

Projected failure area of anchor group :	$A_{Nc} = (\Sigma X+S_2) * (\Sigma Y+S_1)$	A_{nc} =	9538.43	in²	
Projected failure area of single anchor :	$A_{Nco} = 9 * h_{ef}^2$	A_{nco} =	11664.00	in²	(R17.6.2.1 - (a))
Eccentricity factor:		$\Psi_{ec,N}$ =	1.00		(17.6.2.3)
Edge effects factor:		$\Psi_{ed,N}$ =	0.86		(17.6.2.4)
Cracking factor:		$\Psi_{c,N}$ =	1.25		(17.6.2.5)
Splitting factor:		$\Psi_{cp,N}$ =	1.00		(17.6.2.6)
Basic concrete breakout strength:	$N_b = K_c * \lambda_a * \sqrt{f'_c} * h_{ef}^{1.5}$	N_b =	367	kips	(17.6.2.2.1)
Nominal concrete breakout strength:	$N_{cbg} = {}^{A_{Nc}}/_{A_{Nco}} \Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$	N_{cbg} =	322	kips	(17.6.2.1b)
Reduction factor:		$Ø_T$ =	0.75		
Design concrete breakout strength:		**$øN_{cbg}$ =**	**241.8**	kips	



Concrete Pullout Strength in Tension (ACI 318-19 Section. 17.4.3)

Bearing area:	USER INPUT	A_{brg} =	36	in²	
Concrete modification factor:	Uncracked	Ψ_{cp} =	1.4		(17.4.3.6)
Concrete strength:	USER INPUT	f'_c =	5000	psi	
Single anchor strength:	$N_p = 8 * A_{brg} * f'_c$	Np =	1440	kips	(17.4.3.4)
Nominal pullout strength:	$N_{pn} = \Psi_{c,P} * N_p$	N_{pn} =	2016	kips	(17.4.3.1)
Reduction factor:		$Ø_T$ =	0.75		
Design pullout strength:		**$ØN_{pn}$ =**	**1512**	kips	



Unity Check in Tension

	Actual	Allowable		
Steel strength (kips):	133.30	178	0.75	OK
Concrete breakout	426.70	242	1.76	NOT OK
Concrete pullout (kips):	133.30	1512	0.09	OK

Provide anchor reinforcements per ACI 318-19 recommendations

Steel Strength in Shear (ACI 318-19 Section 17.7.1)

Material tensile strength:		F_{uta} =	125	ksi	
Effective area of anchor:		$A_{se,N=}$	1.900	in²	
Bolts in shear:		n=	6		
Nominal strength:	$V_{sa} = A_{se,N} F_{uta}$	$V_{sa=}$	238	kips	(17.7.1.2a)
Reduction factor:			0.75		
Design strength in shear:		**$øV_{sa}$=**	1068.8	kips	

Concrete Breakout Strength in Shear (ACI 318-19 Section 17.7.2)

Height of concrete:		Ha =	41	in	
Projected failure area:		$A_{vc=}$	5030	in²	(R17.7.2.1b)
Nominal failure area:	$Avco = 4.5*(C_{a1})^2$	$A_{Vco=}$	3403	in²	(R17.7.2.1a)
Eccentricity:		e'v =	0.00	in	
Eccentricity factor:		$\Psi_{ec,v}$=	1		(17.7.2.3)
Edge effects factor:		$\Psi_{ed,v}$=	1		(17.7.2.4)
Breakout concrete factor:		$\Psi_{c,v}$=	1.4		(17.7.2.5)
Breakout thickness factor:		$\Psi h_{,v}$=	1		(17.7.2.6)
Basic concrete breakout strength:	$V_b = 9 * \lambda_a * \sqrt{f'_c} * (C_{a1})^{1.5}$	V_b=	92	kips	(17.7.2.2.1 b)
Nominal Concrete Breakout Strength:	$V_{cbg} = {}^{A_{vc}}/_{A_{vco}} \Psi_{ec,v}\psi_{ed,v}\Psi_{c,v}\Psi h_{,v} V_b$	V_{cbg}=	1140	kips	(17.7.2.1b)
Reduction factor:		$Ø_S$=	1		
Design concrete breakout strength:		**$øV_{cbg}$**	855	kips	

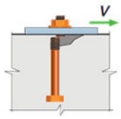
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Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-75
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation For Heavy Lift Area

Concrete Pryout Strength in Shear (ACI 318-19 Section 17.7.3)

For hef < 2.5 in		K_{cp}=	1		
For hef ≥ 2.5 in		K_{cp}=	2		
Nominal concrete breakout strength:		N_{cbg}=	322	kips	
Nominal concrete pryout strength:	$V_{cpg} = k_{cp}N_{cbg}$	V_{cpg}=	645	kips	(17.7.3.1b)
Reduction factor:		$Ø_S$=	0.75		
Design concrete pryout strength:		$øV_{cpg}$ =	484	kips	



(i) Steel failure preceded by concrete spall

Unity Check in Shear

	Actual	Allowable	
Steel strength in shear (kips):	239.20	1069	0.224
Concrete Pryout (kips):	239.20	484	0.495

Combined Tension and Shear Check (ACI 318-19 Section 17.8)

$$(Nua / ØNn)^{5/3} + (Vua / ØVn)^{5/3} = \left(\frac{426.7}{241.8}\right)^{5/3} + \left(\frac{239.2}{483.7}\right)^{5/3} = 2.89 > 1.0 \quad \text{(R17.8)}$$

Anchor reinforcement shall be designed and installed to increase concrete breakout in tension per ACI 318-19. TMS is not responsible for design of reinforcement.

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Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-75
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation For Existing state pier
Document Number	25135-7E02
Revision A	Issued for approval

ANCHOR CALCULATIONS PER ACI 318-19

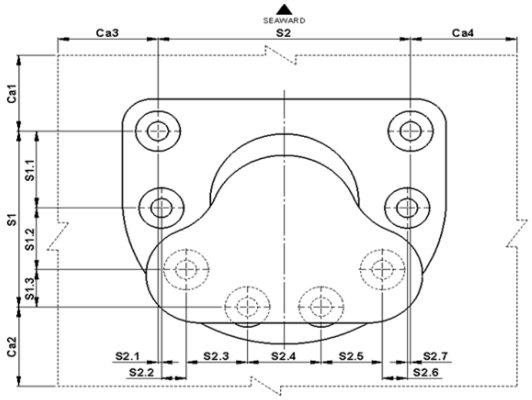
Concrete Parameters:

Concrete Condition:		Uncracked		
Concrete Strength:	f'_c =	5000	psi	(As per Specification)
Critical Edge Distance:	C_{ac} =	38.23	inch	
Modification Factor:	λ =	1		

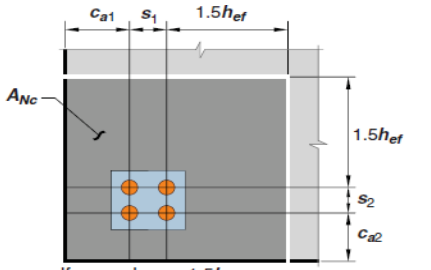
Anchor Parameters:

Type:		Cast in anchor		
Material:		ASTM F1554		
Yield Strength:	F_{ya} =	105	ksi	
Tensile Strength:	F_{uta} =	125	ksi	
Anchor Size:	d_a =	1¾ - 5	in	
Basic Pitch Dia :	d_a =	1.62	in	
Tensile Area:	$A_{se,N}$ =	1.9	in²	
Bearing Area:	A_{brg} =	36	in²	(6" x 6" Bearing Plate)
Anchor Factor:	k_c =	24		(17.6.2.2.2)

Anchor Layout Design:



Total Design Tension Load:	T =	426.7	kips	From 45° Vertical Angle and 45° Horizontal Angle
Total Design Shear Load:	S =	239.2	kips	From -25° Vertical Angle and 0° Horizontal Angle Factored With Live Load Factor of 1.6
Max. Tensile Load on Single Anchor:		133.3	kips	From 45° Vertical Angle and 90° Horizontal Angle
Number of Anchors :	n =	6		
Vertical Distance between anchors in set:	$S_{1.1}$ =	8.4	in	
	$S_{1.2}$ =	6.6	in	
	$S_{1.3}$ =	0.0		
Horizontal Distance between anchors in set:	$S_{2.1}$ =	0.2	in	
	$S_{2.2}$ =	5.0	in	
	$S_{2.3}$ =	9.2	in	
	$S_{2.4}$ =	5.0	in	
	$S_{2.5}$ =	0.2	in	
Vertical Distance between anchors in set:	S1 =	15.0	in	
Horizontal Distance between anchors in set:	S2 =	19.7	in	
Left dist from anchor to concrete edge	Ca3 =	38.2	in	
Right dist from anchor to concrete edge	Ca4 =	38.2	in	
Upper dist from anchor to concrete edge	Ca1 =	41.6	in	
Lower dist from anchor to concrete edge	Ca2 =	39.4	in	
Effective Embedment Depth:	h_{ef} =	18.0	in	
	$C_{a1,min}$	38.2	in	
	$C_{a2,min}$	39.4	in	



If c_{a1} and $c_{a2} < 1.5h_{ef}$
and s_1 and $s_2 < 3h_{ef}$
$A_{Nc} = (c_{a1} + s_1 + 1.5h_{ef}) \times (c_{a2} + s_2 + 1.5h_{ef})$

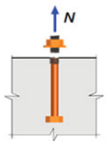
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Trelleborg Marine Systems

Project Name	Connecticut Port Authority - State Pier
Bollard Type	MSB-75
Trelleborg Project Number	25135
Description	Bollard Anchor Calculation For Existing state pier

Steel Strength in Tension (ACI 318-19 Section 17.6.1)

Tensile strength:		F_{uta} =	125.00	ksi	
Effective area of anchor:		$A_{se,N}$ =	1.90	in²	
Nominal strength in tension:	$N_{sa} = A_{se,N} f_{uta}$	N_{sa} =	238	kips	(17.6.1.2)
Reduction factor:		$Ø_T$ =	0.75		
Design strength in tension:		øN_{sa} =	**178**	kips	



Unity Check in Tension

	Actual	Allowable		
Steel strength (kips):	133.30	178	0.75	OK

Steel Strength in Shear (ACI 318-19 Section 17.7.1)

Material tensile strength:		F_{uta} =	125	ksi	
Effective area of anchor:		$A_{se,N=}$	1.900	in²	
Bolts in shear:		n=	6		
Nominal strength:	$V_{sa} = A_{se,N} F_{uta}$	$V_{sa=}$	238	kips	(17.7.1.2a)
Reduction factor:			0.75		
Design strength in shear:		øV_{sa}=	1068.8	kips	

Unity Check in Shear

	Actual	Allowable		
Steel strength in shear (kips):	239.20	1069	0.224	OK

Combined Tension and Shear Check (ACI 318-19 Section 17.8)

$$(Nua / øNsa)^{5/3} + (Vua / øVsa)^{5/3} = \left(\frac{133.3}{178.1}\right)^{5/3} + \left(\frac{239.2}{769.8}\right)^{5/3} = 0.76 < 1.0 \quad \text{(R17.8)}$$

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4. Paint Specification

Trelleborg Marine Systems North America Inc.
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Carbozinc® 859

PRODUCT DATA SHEET

SELECTION & SPECIFICATION DATA

Generic Type	Organic Zinc-Rich Epoxy
Description	Low VOC organic zinc epoxy steel primer with extremely fast cure-to-topcoat characteristics for in-shop applications and quick turnaround requirements in the field. Carbozinc 859 has less than 3 lbs/gallon (359.5 g/l) VOC (thinned) and is used extensively in virtually all industrial markets.
Features	• Meets Class B slip co-efficient and creep testing criteria for use on faying surfaces • Rapid cure. Dry to recoat in 30 minutes at 75°F (24°C) and 50% relative humidity. • Complies with SSPC Paint 20 (Type II) • Low temperature cure down to 35°F (2°C) • Excellent adhesion • Protects against undercutting corrosion • Field proven primer that applies well by spray methods • Excellent touch-up primer by brush or roll for small areas. • VOC compliant to current AIM regulations
Color	Green (0300); Gray (0700)
Finish	Flat
Primer	Self Priming
Dry Film Thickness	3 - 5 mils (76 - 127 microns) per coat Dry film thickness in excess of 10.0 mils (250 microns) per coat is not recommended.
Total Zinc Dust in Dry Film	By Weight: 81%
Solids Content	By Volume 66% +/- 2% Tested in accordance with ASTM D2697.
Theoretical Coverage Rate	1059 ft²/gal at 1.0 mils (26.0 m²/l at 25 microns) 353 ft²/gal at 3.0 mils (8.7 m²/l at 75 microns) 212 ft²/gal at 5.0 mils (5.2 m²/l at 125 microns) Allow for loss in mixing and application.
VOC Values	**As Supplied** : 2.72 lbs./gal (326 g/l) Thinner 2 : 13 oz/gal: 3.12 lbs./gal (374 g/l) Thinner 236 E : 13 oz/gal: 2.72 lbs/gal (326 g/l) Thinner 33 : 13 oz/gal: 3.15 lbs./gal (378 g/l) These are nominal values. *Use Thinner 76 for projects requiring non-photochemically reactive solvents.
Dry Temp. Resistance	Continuous: 400°F (204°C) Non-Continuous: 425°F (218°C)
Topcoats	Acrylics, epoxies, polyurethanes and others as recommended by your Carboline sales representative. Under certain conditions, a mist coat is required to minimize topcoat bubbling.

SUBSTRATES & SURFACE PREPARATION

General

Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Steel

SSPC-SP6 with a 1.0-3.0 mil (25-75 micron) surface profile.
SSPC-SP2 or SP3 with a roughened surface for touch-up.

When using under fireproofing products, defer to the primer surface preparation requirements in the product data sheet of the fireproofing product.

PERFORMANCE DATA

All test data was generated under laboratory conditions. Field testing results may vary.

Test Method	System	Results
ASTM D2794 Impact	A. 859 B. 859/ Polyurethane Gardner Impact Tester, Direct (Intrusion), inch-pounds, over 1/8" (0.32 cm) steel	A. 160 B. 100 min.
ASTM D4541 Adhesion	A. Carbozinc 859 B. 859 / Polyurethane C. 859 / Epoxy/Polyurethane	A. 841 psi Pneumatic B. 1,100 min. psi Pneumatic C. 602 psi Elcometer
ASTM D522 Flexibility	A. 859 B. 859/Polyurethane	A. >6% B. >5%
ASTM D870 Immersion	A. Carbozinc 859/Epoxy/Polyurethane Salt Water (5% sodium chloride) at 75°F (24°C), 30 days B. 859 / Epoxy/ Polyurethane; Fresh Water @75°F for 30 d	A & B had no rusting in the scribe; and no blistering, softening or discoloration with either environment
Slip Co-efficient	Carbozinc 859 A-490 bolt spec; 6 mils dry film maximum 10% max thinning	Meets requirements for class B rating

Test reports and additional data available upon written request.

MIXING & THINNING

Mixing

Power mix Part A completely. Then slowly sift in the zinc filler under agitation. Power mix Part B separately and add slowly to the mixture. Pour mixture through a 30 mesh screen. DO NOT MIX PARTIAL KITS.
Tip: Sifting zinc through a window screen will aid in mixing process by breaking up or catching dry zinc lumps.

Thinning

Normally not required but may be thinned up to 13 oz/gal (106.8 g/l) (10%) with Thinner 2, Thinner 76 or Thinner 236E. In hot or windy conditions, may be thinned up to 13 oz/gal (106.8 g/l) with Thinner 33. Use of thinners other than those supplied by Carboline may adversely affect product performance and void product warranty, whether expressed or implied. Use of Carboline Thinner 236E to thin this product will minimize HAP and VOC emissions. Consult Carboline Technical Service for guidance

Ratio

0.80 Gal. Kit (3.03 Liters)
Part A: 0.35 gallons (1.32 L)
Part B: 0.20 gallons (0.76 L)
Zinc Filler: 14.6 lbs (6.62 kg)
4.00 Gal. Kit (15.1 Liters)
Part A: 1.77 gallons (6.7 L)
Part B: 1 gallon (3.78 L)
Zinc Filler: 73 lbs. (33.1 kg)

MIXING & THINNING

Pot Life	4 Hours at 75°F (24°C) and less at higher temperatures. Pot life ends when coating loses body and begins to sag.

APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Spray Application (General)	The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco. Keep material under mild agitation during application.
Conventional Spray	Agitated pressure pot equipped with dual regulators, 3/8” (0.95 cm) I.D. minimum material hose, 0.070” (0.18 cm) I.D. fluid tip and appropriate air cap.
Airless Spray	Pump Ratio: 30:1 (min.) with pail agitator* GPM Output: 3.0 (min.) Material Hose: 3/8” I.D. (0.95 cm) (min.) Tip Size: 0.017-0.023” (0.04-0.06 cm) Output PSI: 2000-2200 Filter Size: 60 mesh *PTFE packings are recommended and available from the pump manufacturer
Brush & Roller (General)	For small areas and touch-up only. Preferred method for large areas is spray application.

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	40°F (4°C)	35°F (2°C)	35°F (2°C)	0%
Maximum	90°F (32°C)	120°F (49°C)	110°F (43°C)	95%

Industry standards are for the substrate temperatures to be 5°F (3°C) above the dew point. This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions which are as follows: material 60-85°F (16-29°C), surface & ambient 60-90°F (16-32°C) and humidity 0% - 90%.

CURING SCHEDULE

Surface Temp.	Dry to Handle	Dry to Recoat & Topcoat w/ other finishes
35°F (2°C)	8 Hours	6 Hours
50°F (10°C)	5 Hours	2 Hours
75°F (24°C)	2 Hours	30 Minutes
100°F (38°C)	1 Hour	30 Minutes

These times are based on a 3.0 mil (75 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure.
The general requirement is a 24 hour cure for Carboline epoxy intumescent applications. Maximum recoat time is unlimited. Recoat intervals may vary from those listed above when using under intumescent fireproofing products. Consult Carboline Technical Service for recommended cure times before applying Carboline intumescent products.
Must have a clean, dry surface free of chalk, zinc salts, etc. per typical good painting practices. Consult Carboline Technical Service for specific information.

CLEANUP & SAFETY

Cleanup	Use Thinner 2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.
Safety	Read and follow all caution statements on this product data sheet and on the SDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.
Ventilation	When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. In addition to ensuring proper ventilation, appropriate respirators must be used by all application personnel. This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

PACKAGING, HANDLING & STORAGE

Shelf Life	Part A: 36 months at 75°F (24°C) Part B: 24 months at 75°F (24°C) Part C: 24 months at 75°F (24°C) *Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.
Storage Temperature & Humidity	40-120°F (4-49°C) Store indoors Can be stored down to 20°F (-7°C) for no longer than 30 days 0-100% Relative Humidity
Storage	Store Indoors
Shipping Weight (Approximate)	0.80 Gallon (3.02 L) Kit - 22 lbs (10 kg) 4.00 Gallon (15.1 L) Kit - 105 lbs (48 kg)
Flash Point (Setaflash)	Part A: 49°F (9°C) Part B: 38°F (3°C) Zinc Filler: NA

WARRANTY

To the best of our knowledge the technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance, injuries or damages resulting from use. Carbolines sole obligation, if any, is to replace or refund the purchase price of the Carboline product(s) proven to be defective, at Carbolines option. Carboline shall not be liable for any loss or damage. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. All of the trademarks referenced above are the property of Carboline International Corporation unless otherwise indicated.

Carboguard® 890

PRODUCT DATA SHEET

SELECTION & SPECIFICATION DATA

Generic Type	Cycloaliphatic Amine Epoxy
Description	Highly chemical resistant epoxy mastic coating with exceptionally versatile uses in all industrial markets. Self-priming and suitable for application over most existing coatings, and tightly adherent rust. Serves as stand-alone system for a variety of chemical environments and is also designed for various immersion conditions. An optional micaceous iron oxide additive (MIO Filler) can be purchased separately and may be used per the Product Data Sheet to enhance corrosion protection and film strength for more aggressive service such as severe marine or heavy industrial uses.
Features	• Excellent chemical resistance • Surface tolerant characteristics • Conventional and low-temperature versions • Self-priming and primer/finish capabilities • Very good abrasion resistance • VOC compliant to current AIM regulations • Suitable for use in USDA inspected facilities • Intermediate coat for AWWA D102 Outside System #6 and #7 For specific performance data, please contact your Carboline sales representative.
Color	Refer to Carboline Color Guide. Certain colors may require multiple coats for hiding. Note: The low temperature formulation will cause most colors to yellow or discolor more than normal in a short period of time.
Finish	Gloss
Primer	Self-priming.
Dry Film Thickness	4 - 6 mils (102 - 152 microns) per coat 6.0-8.0 mils (150-200 microns) over light rust and for uniform gloss over inorganic zincs. Don't exceed 10 mils (250 microns) in a single coat. Excessive film thickness over inorganic zincs may increase damage during shipping or erection.
Solids Content	By Volume 75% +/- 2%
Theoretical Coverage Rate	1203 ft²/gal at 1.0 mils (29.5 m²/l at 25 microns) 301 ft²/gal at 4.0 mils (7.4 m²/l at 100 microns) 200 ft²/gal at 6.0 mils (4.9 m²/l at 150 microns) Allow for loss in mixing and application.
VOC Values	**As Supplied** : 1.81 lbs/gal (217 g/l) Thinner 2 : 13 oz/gal (106.8 mg/ml) = 2.30 lbs/gal (276 g/l) Thinner 2 : 7 oz/gal (57.5 mg/ml) = 2.08 lbs/gal (250 g/l) Thinner 33 : 16 oz/gal (131.5 mg/ml) = 2.43 lbs/gal (291 g/l) Thinner 33 : 7 oz/gal (57.5 mg/ml) = 2.08 lbs/gal (250 g/l) Use Thinner 76 up to 8 oz/gal for 890 and 16 oz/gal for 890 LT where non-photochemically reactive solvents are required. These are nominal values and may vary with color.

SELECTION & SPECIFICATION DATA

Dry Temp. Resistance	Continuous: 300°F (149°C) Non-Continuous: 350°F (177°C) Discoloration and loss of gloss occurs above 200°F (93°C) but does not affect performance.
Under Insulation Resistance	Continuous: 300°F (149°C) Discoloration and loss of gloss occurs above 200 F (93 °C) but does not affect performance.
Limitations	Do not apply over latex coatings. For immersion projects use only factory made material in special colors. Consult Technical Service for specifics.
Topcoats	• Acrylics • Epoxies • Polyurethanes

SUBSTRATES & SURFACE PREPARATION

General	Surfaces must be clean and dry. Remove all dirt, dust, oil and all other contaminant.
Steel	**Immersion:** SSPC-SP10 **Non-immersion:** SSPC-SP6 1.5-3.0 mils (38-75 microns) *SSPC-SP2 or SP3 are suitable cleaning methods for mild environments.* When using under fireproofing products, defer to the primer surface preparation requirements in the product data sheet of the fireproofing product.
Galvanized Steel	SSPC-SP 16: for immersion service create 1.5 to 3 mils, (37.5-75 microns), anchor profile. When using under fireproofing products, defer to the primer surface preparation requirements in the product data sheet of the fireproofing product.
Concrete or CMU	Concrete shall be designed, placed, cured, and prepared per NACE No. 6/SSPC-SP 13, latest edition. This includes abrading to remove all laitance, loose concrete, etc. and to create the surface profile required for the coating system to be used. The concrete shall be considered cured sufficiently for coating when it passes the moisture tests.
Drywall & Plaster	Joint compound and plaster should be fully cured prior to coating application.
Previously Painted Surfaces	Lightly sand or abrade to roughen surface and degloss the surface. Existing paint must attain a minimum 3A rating in accordance with ASTM D3359 “X-Cut” adhesion test.
Stainless Steel	SSPC-SP 16: for immersion service create 1.5 to 3 mils, (37.5 to 75) microns, anchor profile.

PERFORMANCE DATA

All test data was generated under laboratory conditions. Field testing results may vary.

Test Method	System	Results
ASTM B 117 Salt Fog	Blasted Steel 2 cts. 890	No effect on plane, rust in scribe. 1/16" (0.16 cm) undercutting at scribe after 2000 hours
ASTM B117 Salt Fog	Blasted Steel 1 ct. IOZ 1 ct 890	No effect on plane, no rust in scribe and no undercutting after 4000 hours
ASTM D 4060 Abrasion	Blasted Steel 1 ct Epoxy Pr. 1 ct 890	85 mg. loss after 1000 cycles, CS17 wheel 1000 gm. load
ASTM D1735 Water Fog	Blasted Steel 1 ct. Epoxy Pr. 1 ct. 890	No blistering, rusting or delamination after 2800 hours
ASTM D2486 Scrub Resistance	Blasted Steel 1 ct. 890	93% gloss retained after 10,000 cycles w/liquid scrub medium
ASTM D3359 Adhesion	Blasted Steel 1 ct 890	5A
ASTM D3363 Pencil Hardness	Blasted Steel 2 cts 890	Greater than 8H
ASTM E84 Flame and Smoke	2 ct 890	5 Flame 5 Smoke Class A

Test reports and additional data available upon written request.

MIXING & THINNING

Mixing
Power mix separately, then combine and power mix. DO NOT MIX PARTIAL KITS.

Thinning
Spray: Up to 13 oz/gal (10%) w/ #2
Brush: Up to 16 oz/gal (12%) w/ #33
Roller: Up to 16 oz/gal (12%) w/ #33
Thinner #33 can be used for spray in hot/windy conditions. Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.
*See VOC values for thinning limits.

Ratio
1:1 Ratio (A to B)

Pot Life
3 Hours at 75°F (24°C)

Pot life ends when coating loses body and begins to sag. Pot life times will be less at higher temperatures.

APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Spray Application (General)
This is a high solids coating and may require adjustments in spray techniques. Wet film thickness is easily and quickly achieved. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray
Pressure pot equipped with dual regulators, 3/8” (0.95 cm) I.D. minimum material hose, 0.070” (0.18 cm) I.D. fluid tip and appropriate air cap.

APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Airless Spray	Pump Ratio: 30:1 (min.)* GPM Output: 3.0 (min.) Material Hose: 3/8” I.D. (0.95 cm)(min.) Tip Size: 0.017-0.021” (0.04-0.05 cm) Output PSI: 2100-2300 Filter Size: 60 mesh *PTFE packings are recommended and available from the pump manufacturer.
Brush & Roller (General)	Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive re-brushing or rerolling. For best results, tie-in within 10 minutes at 75°F (24°C).
Brush	Use a medium bristle brush.
Roller	Use a short-nap solvent resistant roller cover.

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	50°F (10°C)	50°F (10°C)	50°F (10°C)	0%
Maximum	90°F (32°C)	125°F (52°C)	110°F (43°C)	90%

This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions.

CURING SCHEDULE

Surface Temp.	Dry to Recoat	Dry to Topcoat w/ Other Finishes	Final Cure General	Final Cure Immersion
50°F (10°C)	12 Hours	24 Hours	3 Days	NR
60°F (16°C)	8 Hours	16 Hours	2 Days	10 Days
75°F (24°C)	4 Hours	8 Hours	1 Day	5 Days
90°F (32°C)	2 Hours	4 Hours	16 Hours	3 Days

Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface haze. Any haze or blush must be removed by water washing before recoating. During high humidity conditions, it is recommended that the application be done while temperatures are increasing. Recoat intervals may vary from those listed above when using under intumescent fireproofing products. Consult Carboline Technical Service for recommended cure times before applying Carboline intumescent products. **Maximum recoat/topcoat times are 30 days for epoxies and 90 days for polyurethanes at 75°F (24°C).** If the maximum recoat times have been exceeded, the surface must be abraded by sweep blasting or sanding prior to the application of additional coats.

CLEANUP & SAFETY

Cleanup	Use Thinner 2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.
Safety	Read and follow all caution statements on this product data sheet and on the SDS. Employ normal workmanlike safety precautions. Keep container closed when not in use.

CLEANUP & SAFETY

Ventilation	When used as a tank lining or in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. User should test and monitor exposure levels to insure all personnel are below guidelines.

PACKAGING, HANDLING & STORAGE

Shelf Life	Part A: 36 months at 75°F (24°C) Part B: 15 months at 75°F (24°C) *When kept at recommended storage conditions and in original unopened containers.
Storage Temperature & Humidity	40-120 °F (4-49 °C) Store indoors Can be stored down to 20 °F (-7 °C) for no longer than 30 days 0-100% Relative Humidity
Storage	Store Indoors
Shipping Weight (Approximate)	2 Gallon Kit - 29 lbs (13 kg) 10 Gallon Kit - 145 lbs (66 kg)
Flash Point (Setaflash)	89 °F (32 °C) for Part A 73 °F (23 °C) for Part B

WARRANTY

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Carbothane® 134 HG

PRODUCT DATA SHEET

SELECTION & SPECIFICATION DATA

Generic Type	Aliphatic Acrylic Polyurethane
Description	Thin film, high gloss finish with exceptional weathering performance characteristics. Used extensively in virtually all industrial markets, 134 HG provides a smooth, durable finish that has superior resistance to corrosion, abrasion and chemical exposure.
Features	• High solids, low VOC content • Excellent weatherability • Exceeds SSPC Paint 36 specification for a Level 3 urethane • Available in all Carboline colors including metallic-pigmented colors • Excellent flow characteristics allow for application by spray or roller • Superior impact and abrasion resistance • Indefinite recoatability • VOC compliant to current AIM regulations • Topcoat for AWWA D102 Outside System #6 and #7 • Suitable for use in USDA inspected facilities • Meets the performance requirements of MIL-PRF-85285E Type II, Class H Polyurethane • Meets the performance requirements of UFGS 09 97 13.27 Polyurethane Topcoat
Color	A broad range of colors are available using the rapid tint system.
Finish	Gloss
Primer	Refer to Substrates & Surface Preparation.
Dry Film Thickness	2 - 3 mils (51 - 76 microns) per coat
Solids Content	By Volume 70% +/- 2%
Theoretical Coverage Rate	1123 ft²/gal at 1.0 mils (27.6 m²/l at 25 microns) 561 ft²/gal at 2.0 mils (13.8 m²/l at 50 microns) 374 ft²/gal at 3.0 mils (9.2 m²/l at 75 microns) Allow for loss in mixing and application.
VOC Values	**As Supplied** : 2.2 lbs./gal (264 g/l) Thinner 214 : 25 oz/gal 2.9 lbs./gal (348 g/l) Thinner 215 : 25 oz/gal 3.0 lbs./gal (362 g/l) Thinner 25 : 25 oz/gal 3.06 lbs./gal (366 g/l) Thinner 72 : 25 oz/gal 3.05 lbs./gal. (366 g/l) These are nominal values and may vary slightly with color.
Dry Temp. Resistance	Continuous: 300°F (149°C) Some discoloration and loss of gloss may be experienced at elevated temperatures.
Limitations	*The alignment of aluminum flakes in aluminum-filled finishes is very dependent on application conditions and techniques. Care must be taken to keep conditions as constant as possible to reduce variations in final appearance. It is also advisable to work from a single batch of material since variations can occur from batch to batch. For more information consult Carboline Technical Service Department.
Topcoats	Carbothane® 134 Clear Coat if required.

SUBSTRATES & SURFACE PREPARATION

General	All surfaces must be clean, dry and free of oil, grease, dirt, dust or other materials which would impair the bond of the product to the substrate in accordance with SSPC-SP 1. For all surfaces prime with specific Carboline primer as recommended by your Carboline Sales Representative. Refer to the specific primer's Product Data Sheet for detailed requirements.
Galvanized Steel	Prime with specific Carboline primer as recommended by your Carboline Sales Representative. Refer to the specific primer's Product Data Sheet for substrate preparation requirements.
Previously Painted Surfaces	All surfaces must be clean, dry and free of oil, grease, dirt, dust or other materials which would impair the bond of the product to the substrate in accordance with SSPC-SP 1. It is recommended to lightly abrade the existing coating to roughen and degloss the coating. Existing coatings must attain a minimum 3A rating in accordance with ASTM D3359 Measuring Adhesion by Tape Test.

MIXING & THINNING

Mixing	Power mix Part A separately, then combine with Part B and power mix. DO NOT MIX PARTIAL KITS.
Thinning	Spray: Up to 25 oz/gal (20%) w/ Thinner 214, Thinner 25 or Thinner 72 Brush: Up to 25 oz/gal (20%) w/ Thinner 215 Roller: Up to 25 oz/gal (20%) w/ Thinner 215 Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied. Carboline Thinner 236E may also be used to minimize HAP and VOC emissions.
Ratio	4:1 Ratio (A to B)
Pot Life	4 Hours at 75°F (24°C) and less at higher temps. Pot life ends when coating becomes too viscous to use. MOISTURE CONTAMINATION WILL SHORTEN POT LIFE AND CAUSE GELLATION.

APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Spray Application (General)	This is a high solids coating and may require adjustments in spray techniques. Wet film thickness is easily and quickly achieved. Spray equipment is available from manufacturers such as Binks, DeVilbiss and Graco.
Conventional Spray	Pressure pot equipped with dual regulators, 3/8" (0.95 cm) I.D. minimum material hose, 0.070" (0.18 cm) I.D. fluid tip and appropriate air cap.
Airless Spray	*Pump Ratio: 30:1 (min.) GPM Output: 3.0 (min.) Material Hose: 3/8" I.D. (0.95 cm) (min.) Tip Size: 0.015-0.017" (0.038-0.043 cm) Output PSI: 2100-2400 Filter Size: 60 mesh *PTFE packings are recommended and available from the pump manufacturer.

APPLICATION EQUIPMENT GUIDELINES

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Brush & Roller (General) | Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive brushing or rolling. For best results, tie-in within 10 minutes at 75°F (24°C).

Brush | It is recommended to use a natural bristle brush.

Roller | Use a short-nap roller with solvent resistant core.

APPLICATION CONDITIONS

Condition	Material	Surface	Ambient	Humidity
Minimum	50°F (10°C)	35°F (2°C)	35°F (2°C)	0%
Maximum	100°F (38°C)	120°F (49°C)	95°F (35°C)	80%

Industry standards are for substrate temperatures to be above 5°F (3°C) the dew point. Caution: This product is moisture sensitive in the liquid stage and until fully cured. Protect from high humidity, dew and moisture contact until fully cured. Application and/or curing in humidities above maximum, or exposure to moisture from rain or dew may result in a loss of gloss and/or microbubbling of the product.

CURING SCHEDULE

Surface Temp.	Dry to Handle	Dry to Recoat & Topcoat w/ other finishes	Final Cure General
35°F (2°C)	36 Hours	36 Hours	14 Days
50°F (10°C)	16 Hours	16 Hours	10 Days
75°F (24°C)	8 Hours	8 Hours	7 Days
90°F (32°C)	4 Hours	4 Hours	5 Days

These times are based on a 2.0 mil (50 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure.
***Maximum recoat times are indefinite.** Surface must be clean and dry. As part of good painting practice it is recommended to test for adhesion by wiping the surface with Thinner 214 or 215. If the film shows a slight “tack” the surface is suitable for recoating without extensive surface preparation such as abrading.
Carboline Additive 101 can be used to accelerate the film forming process in this product for conditions outside of the parameters of this data sheet. Carboline Additive 101 is added at a rate of 1.0-2.0 oz per mixed gallon or a maximum of 6 oz per mixed five gallons. At this addition rate, Additive 101 will accelerate the cure rate of the urethane product between 25-40% depending on the substrate temperature range and reduce the pot life of the product by approximately 40-50% of that stated on the product data sheet. With the use of Additive 101, this product will continue to cure at temperatures as low as 20°F (-7°C).

CLEANUP & SAFETY

Cleanup | Use Thinner 2 or Acetone. In case of spillage, dispose of in accordance with local applicable regulations.

Safety | Read and follow all caution statements on this product data sheet and on the SDS for this product. Employ normal workmanlike safety precautions. Use adequate ventilation. Keep container closed when not in use.

Ventilation | When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor

CLEANUP & SAFETY

concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to ensure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

PACKAGING, HANDLING & STORAGE

Shelf Life	Part A: Min. 36 months at 75°F (24°C) Part B Urethane Converter 811: Min. 24 months at 75°F (24°C) *Shelf Life: when kept at recommended storage conditions and in original unopened containers.
Storage Temperature & Humidity	40° -110°F (4°-43°C) 0-80% Relative Humidity
Storage	Store Indoors. This product is solvent based and not affected by excursions below these published storage temperatures, down to 10°F, for a duration of no more than 14 days. Always inspect the product prior to use to make sure it is smooth and homogeneous when properly mixed.
Shipping Weight (Approximate)	1 Gallon Kit - 13 lbs (5kg) 5 Gallon Kit - 57 lbs (26 kg)
Flash Point (Setaflash)	Carbothane 134 HG Part A: 50°F (10°C) Urethane Converter 811 Part B: 127°F (53°C)

WARRANTY

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5. Bollard Handling, Storage, Installation & Maintenance Manual

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure



Bollard

INSTALLATION AND MAINTENANCE MANUAL

The Smarter Approach







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Better connected systems mean faster turnaround and increased throughput, improved safety and lower operating costs.

Connecting decades of experience with a new, smarter approach to port and terminal equipment optimization, Trelleborg's marine systems operation helps ports and terminals deploy smart, engineered solutions for port approach, berthing, docking and mooring. This enables better informed real-time and strategic decision making, both onshore and on board the vessel.

From port owners and operators to consulting engineers, Trelleborg works with customers to determine best fit solutions for specific applications, and supply a fully integrated solution. End-to-end service and a comprehensive product portfolio meet and exceed customer needs, enhancing safety and improving efficiency in all marine environments, from conception to completion and beyond.

Bollard Installation and Maintenance Manual

Trelleborg has a range of seven bollard styles to ensure the ideal solution for your application.

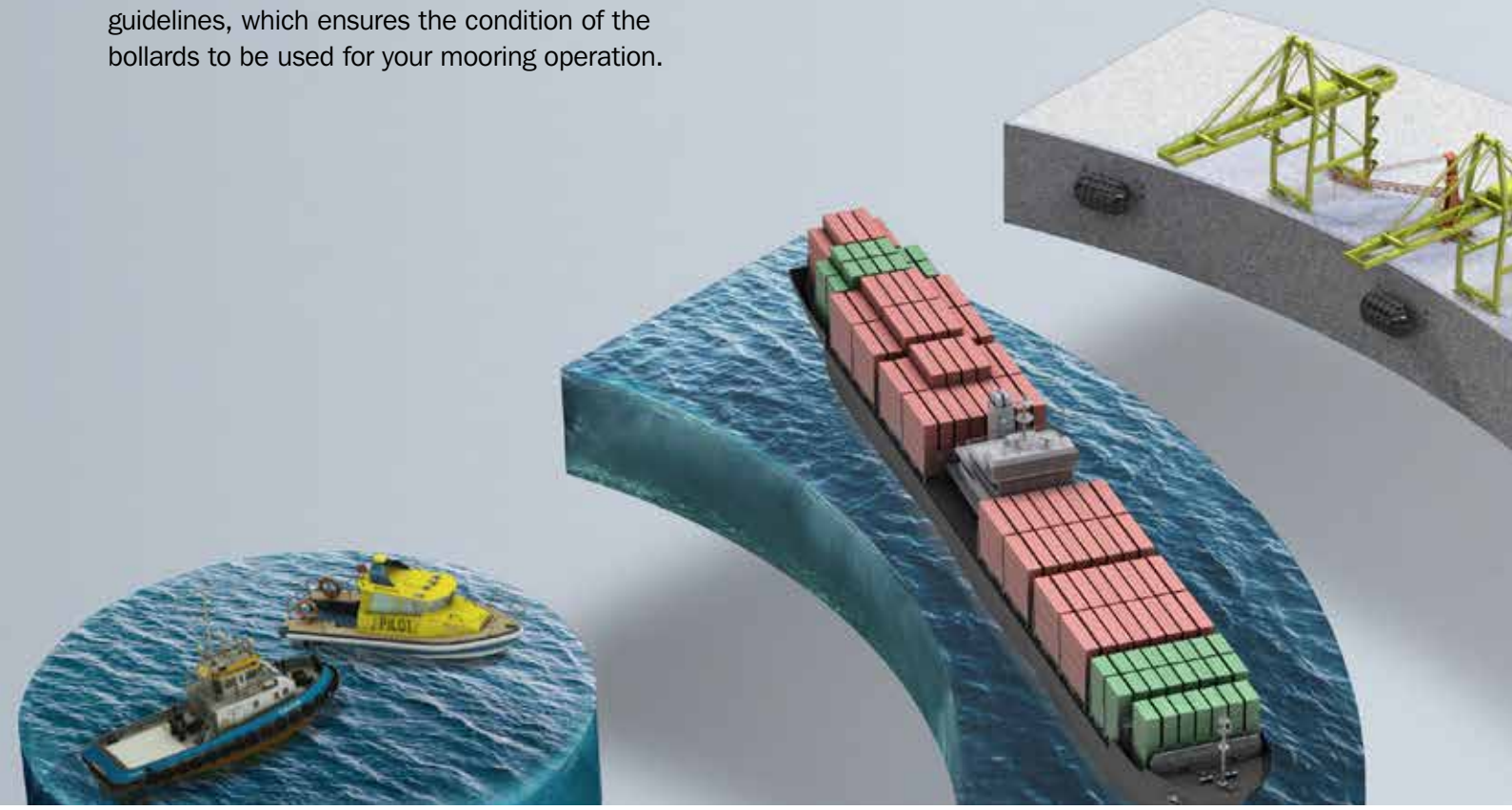
All Trelleborg bollards are precision-engineered and manufactured in a variety of metals, including premium-grade spheroidal graphite ductile iron and cast steel to offer unprecedented levels of service life, as well as resistance to corrosion and impact.

We understand that safety is your number one priority, and provide bespoke safety-critical bollards, anchoring and fixing solutions to your exact specifications. This guide provides detailed and specific information about the installation process. It also includes maintenance and inspection guidelines, which ensures the condition of the bollards to be used for your mooring operation.

Contents

BOLLARD INSTALLATION AND MAINTENANCE MANUAL

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A Smarter Approach at every stage

A smarter approach to…

CONSULTATION

Consultation from the earliest project phase to ensure the optimum fender, mooring, navigation and transfer solutions are specified, with full technical support from our global offices.

CONCEPTS

Conceptual design in your local office – with full knowledge of local standards and regulations, delivered in your language – for optimized port and vessel solutions.

DESIGN

Concepts are taken to our Engineering Centers of Excellence where our team generates 3D CAD designs, application-engineering drawings, a bill of materials, finite engineering analyses and calculations for both our fender systems and marine technology solutions.

MANUFACTURE

Our entire product range is manufactured in-house, meaning we have full control over the design and quality of everything we produce. Our strategically located, state-of-the-art facilities ensure our global, industry leading manufacturing capability.



TESTING

Across our entire product range, stringent testing comes as standard at every step in our in-house manufacturing process. We ensure that life-cycle and performance of our entire product range meets your specifications, and more.

INSTALLATION

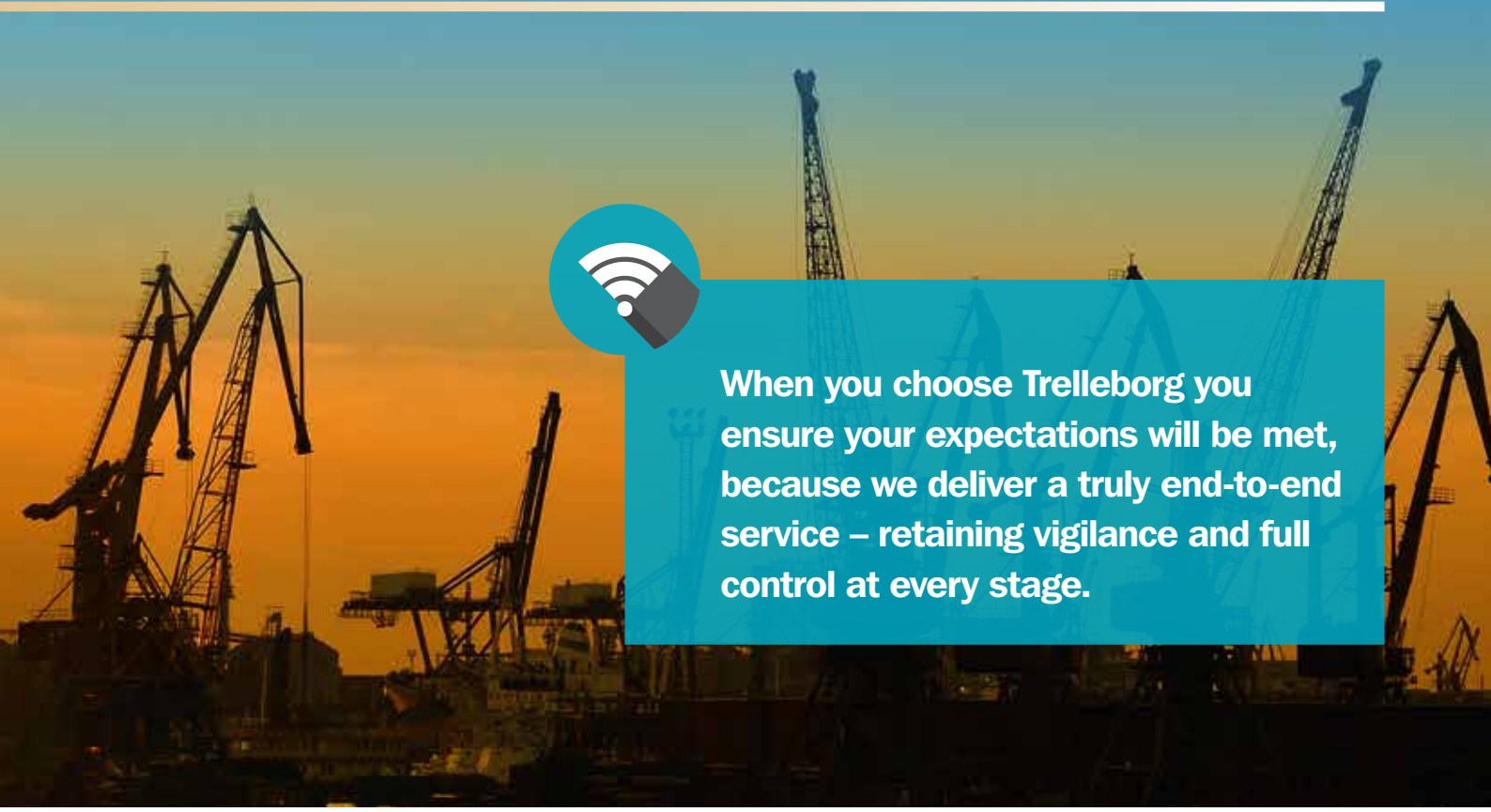
Dedicated project management, from solution design right the way through to on-site installation support. We design products and solutions that always consider ease of installation and future maintenance requirements.

SUPPORT

Local support on a truly global scale, with customer support teams all over the world. And this service doesn't stop after a product is installed. You have our full support throughout the entire lifetime of your project, including customized training programs, maintenance and on-site service and support.

THE FUTURE

Deploying the latest in smart technologies to enable fully automated, data-driven decision making that optimizes port and terminal efficiency. At Trelleborg, we're constantly evolving to provide the digital infrastructure our industry increasingly needs.



When you choose Trelleborg you ensure your expectations will be met, because we deliver a truly end-to-end service – retaining vigilance and full control at every stage.

Loading, Unloading and Handling



Loading, Unloading and Handling

MATERIALS/CONSUMABLES REQUIRED	INFORMATION
Timber / rubber blocks	Bollards should be placed on a timber bolster to avoid damage.
Tarpaulin	Should be heavy-duty waterproof plastic (Refer Storage section)
Crane and rigging equipment	Refer to Appendix – 1.1 & 1.2: Bollard weight and total packing (gross) weight

- Lift a bollard from its neck for ease of placement on its base.
- Do not open or dismantle the packing of the bollards until ready for installation.
- To avoid paint damage, do not handle the bollards with unprotected lift forks or hooks.
- Never drag the bollards along the ground.
- All bollards should be laid on the ground only. If they must be stacked, secure them to avoid tipping them over.
- Always handle bollards at ground level.
- All the tabove points are also applicable to bollard anchors.

CAUTION

- Never lift a bollard with direct steel contact.
- Bollards should be handled carefully to avoid injuries.
- Do not handle bollards in areas with insufficient lighting to avoid damage to the bollards and the surrounding premises.

RECOMMENDATIONS

- Before unloading the shipment, visually inspect the container for signs of any damage incurred during transportation. If significant damage is found, take a photograph as evidence and send it to Trelleborg Marine Systems.
- Bollards must be handled with protective lifting equipment to avoid damage.
- Always lay components carefully on dry firm ground supported by dunnage.
- Never drop the components or lay them directly onto rocky or waterlogged ground.

Storage



Storage

2.1 STORAGE TIMELINE FOR BOLLARD

- Store bollards in a safe area where they will not be exposed to damage.
- Place them carefully on dry ground over wood blocks to avoid paint damage.
- Do not stack bollards on top of each other if this can be avoided. If they must be stacked due to space constraint, use appropriate racks.
- The above points are also applicable to bollard anchors.
- If you come across any fault or problem, report the matter to your regional Trelleborg office immediately for further corrective action.

Caution

- Get recommendations from Trelleborg if the bollards are to be stored in temperatures below 10°C.
- Before moving the packaging at any time, check first for any signs of damage.
- Bollards should be recoated after 15 years of storage.
- Bollards should be inspected every five years if they are stored as per the above guidelines.

Recommendation

- Inspect stored bollards and their packaging at least once a month for damage.
- Every package should be clearly and visibly labeled.

2.2 PACKAGING AND LABELLING

2.2.1 Packaging

Bollards are usually packed in a closed box or fixed with wooden blocks.

- The bollards should be covered with non-transparent PE (polyethylene, double wrapping).
- Avoid any direct contact between two bollards.
- All bollards should be properly fastened in the packaging.
- Check the weight of the package before lifting.
- All bollards must be packed in an upright position.
- Ensure the packaging is labeled with an orientation arrow.
- The lifting provision should be indicated clearly on the packaging with a symbol.
- The packaging should include a caution label against fire.

Caution

If bollards are removed from the packaging for inspection, testing or any other purpose and are subsequently to be returned to storage for a further period, they must be repackaged and labeled in accordance with section 2.2.2 and the date of the repackaging must be recorded on the container.

Storage

2.2 PACKAGING AND LABELING

2.2.2 LABELING

Every package or container should be labelled on at least three sides with the below requisite information and should be visible from the outside of the package without the need to break the seal.

Bollard type / Size	
Bollard weight	
Quantity / Package	
In-box content	
Total weight of package	

2.3 INSPECTION AND RECORDING

Visual inspection must be made and recorded for the following once a year.

- Surface penetration and / or scratches
- Cracked, chipped or peeling paint rust or corrosion
- Image on following page is for reference only.



Installation

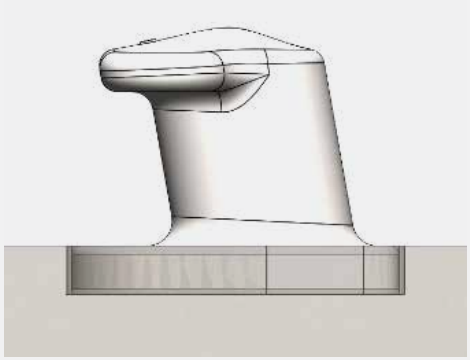


Bollards must be installed correctly for a long and trouble-free service life. The type of installation depends on the type of anchor used to fix the bollards as well as the type of structure on which the bollards are to be installed. Bollards are mostly either recess mounted or surface mounted. The anchors required for each type of installation are listed in the following page. If the type of installation you are planning is not listed, please consult your regional Trelleborg office.

Installation

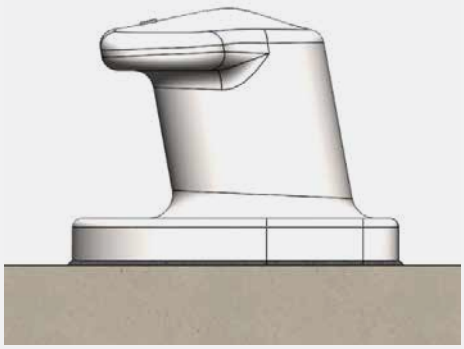
RECESS MOUNTED

The recess should be prepared in the required dimensions. These dimensions are based on the size of the base of the bollard. The base of the bollard should be set in the recess with the required grout thickness around the base, and the bollard should be fixed with anchors. These can be either cast-in anchors or epoxy / resin anchors.



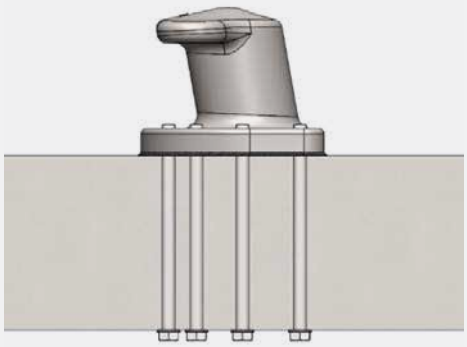
SURFACE MOUNTED

Unlike recess-mounted installations, no preparation is required for surface-mounted installations. Grouting should be prepared depending on the length, width and thickness. Grout should be used to install the bollard with proper alignment so as to utilize the maximum capacity of the bollard for a long and trouble-free service life. The anchors can be installed either with cast-in anchors or with epoxy / resin anchors.



CUSTOM MOUNTED

The bollard is surface-mounted on a steel structure. The steel structure is designed by a jetty designer to cater to the load of the designated capacity of the bollard. Anchors for this type of application vary depending on the structure of the steel on which the bollard is to be installed. Trelleborg must review the design and drawings of the structure on which the bollard is to be installed.



Installation

3.1 ANCHOR INSTALLATION

Refer to the general guidelines for anchor installation.

- Anchor installation should be carried out by qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Anchor installation should be in accordance with the manufacturer's specifications and drawings.
- Use anchors which are supplied by the manufacturer or as per the approved drawings.
- Check the strength class of the concrete in which the anchor is to be installed.
- The concrete base must not have any significant voids.
- The anchorage depth must be marked.
- The edge distance and spacing should not be less than the specified values as per the bollard manufacturer's calculations.
- The anchor hole should be hammer-drilled with a diamond core drill bit.
- If the drill hole is aborted, the hole should be filled with mortar.
- For an overhead installation, piston plugs must be used. Embedded metal parts must be fixed during the curing time, e.g. with wedges.
- For injection of the mortar in bore holes ≤250 mm, piston plugs must be used.

3.1.1 CAST-IN ANCHOR INSTALLATION

Anchors need to be installed at their designated position before the concrete is poured. Steel reinforcements have to be provided to the anchors.

MATERIALS/CONSUMABLES REQUIRED	INFORMATION
Reinforced concrete block	With adequate compressive strength
Steel reinforcement bar	Used to anchor template/Cage Hold Down Bolts
EQUIPMENT REQUIRED	**INFORMATION**
Anchors	Supplied by Trelleborg
Anchor bolt template	Supplied by Trelleborg/Others
Spanner	Suitable to the supplied anchor size
RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT	**INFORMATION**
General PPE	As per site/plant requirements

Installation

3.1 ANCHOR INSTALLATION

3.1.1 CAST-IN ANCHOR INSTALLATION

Step 1. Mark embedment length on all anchors used for each bollard.

Step 2. Use two anchor templates to locate and align the anchors vertically straight. (Ref. Fig. 5)

- As shown in the image, place one anchor template on the head of the anchor and fix another template below the marking of the embedment length.
- Restrain the top template temporarily to avoid any movement.
- Reinforce the anchors with steel bars as per ACI318.11. The reinforcement design can be carried out by a jetty designer.

Step 3. Start pouring the concrete as per the instruction of the supervisor.

Caution :

In the case of a recess mounted bollard, use a cover boundary to stop the concrete being poured on the required recess for the bollard.

Step 4. Provide enough time to cure the concrete.

Caution :

- Do not touch the anchors until the desired curing time required for the concrete has passed.
- Check the required protrusion height of each anchor.

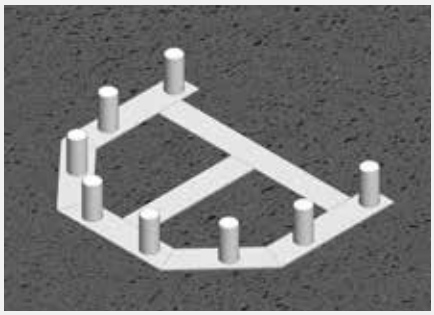
Step 5. After pouring, use the template to check the final anchor locations as per the relevant drawings.



STEP 1



STEP 2



STEP 5

Installation

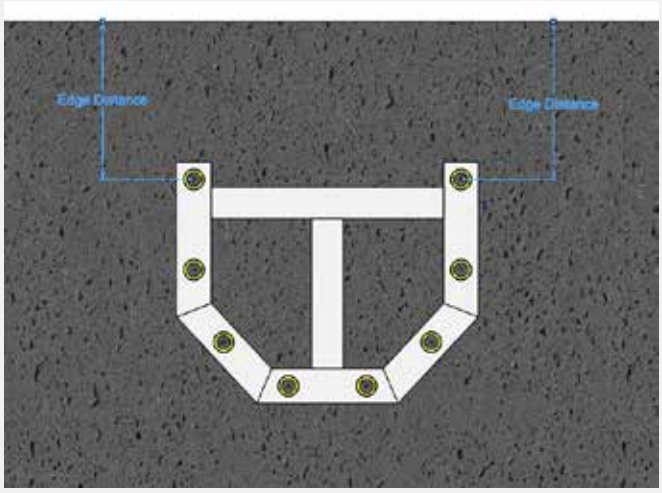
3.1 ANCHOR INSTALLATION

3.1.2 EPOXY/RESIN ANCHOR INSTALLATION

Fully threaded anchors are used with resin/epoxy bond materials to achieve a bond between the anchors and the existing concrete. The detailed procedure is as follows:

Step 1. Marking

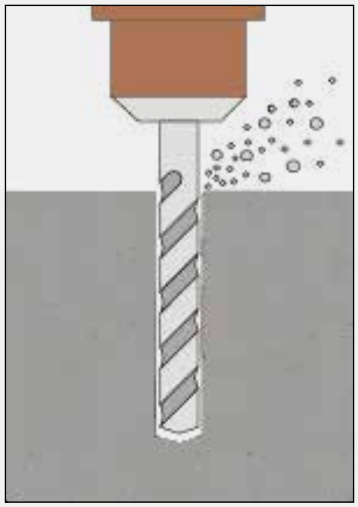
- Clean the area first and use an anchor template to mark the positions of the holes on the jetty surface. Use a marker pen to highlight the marked holes.
- Measure the distance from the jetty edge to the first anchor as per the drawings.
- Clean the area again and measure each distance to be verified with the bollard drawing.



STEP 1

Step 2. Drilling / Coring

- Set the drilling machine in such a way that the drill bit axis and the center of the marking hole are aligned.
- Use a bubble gauge meter to verify that the drill bit is perfectly vertical.
- Use a continuous flow of water to reduce heat generation between the drill bit and the concrete.
- Slowly drill the hole up to the required depth.



STEP 2

Caution :

- Marking on the drill bit helps to determine the depth of the hole. Diamond coring is permissible when a diamond core drilling machine and the corresponding core bit are used.
- Verify that the depth and diameter of the holes are within the tolerance ranges mentioned in the relevant anchor layout drawing.

Installation

3.1 ANCHOR INSTALLATION

3.1.2 EPOXY/RESIN ANCHOR INSTALLATION

Step 2. Drilling / Coring

- Once the hole has been cored to the desired depth and diameter, roughen the surface of the core hole using a rotary hammer drill bit.

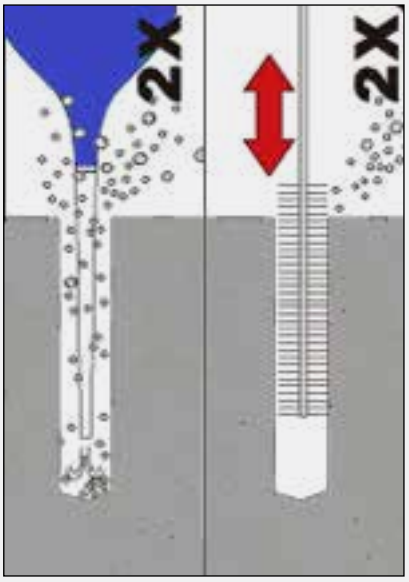
  (Roughing the surface of the hole is a recommendation and not a requirement.)

Recommendation:

Proper core bit setting must be done so that the base concrete can be secured.

Step 3. Cleaning

- Starting from the bottom surface of each hole, use a pressurised water flow to clean the holes.
- Run a flow of water continuously into the holes until the water runs out clear.
- Brush two times with the specified brush size (brush Ø ≥ bore hole Ø, see Table 7 in Hilti manual) by inserting the steel brush (Hilti HIT-RB or equivalent) to the back of the hole (use an extension if needed) in a twisting motion and removing it.
- The brush must produce natural resistance as it enters the bore hole.
- Blow oil-free compressed air (with min. 6bar / 90 psi pressure) two times inside the drilled hole, starting from the bottom surface of the hole (use a nozzle extension if needed) over the hole length until the return air stream is free of noticeable dust and water.
- Alternate the cleaning by water and air two more times.



STEP 3

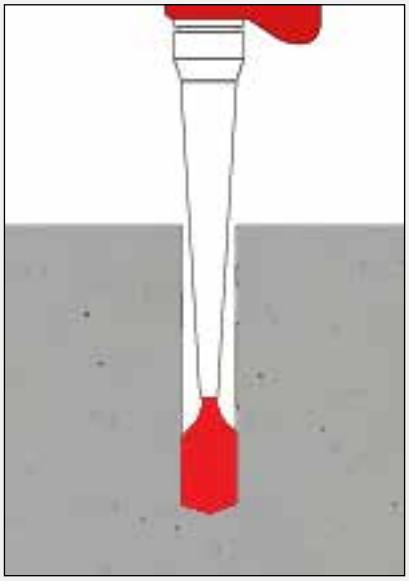
Installation

3.1 ANCHOR INSTALLATION

3.1.2 EPOXY/RESIN ANCHOR INSTALLATION

Step 4. Injection

- Insert foil pack in foil pack holder. Do not use damaged foil packs and/or damaged or unclean foil pack holders. Attach new mixer prior to dispensing a new foil pack (snug fit).
- Tightly attach Hilti(HIT-RE-M) or equivalent mixer to foil pack manifold. Do not modify the mixer in any way. Make sure the mixing element is in the mixer. Use only the mixer supplied with the adhesive.
- Insert foil pack holder with foil pack into HIT-dispenser. Push release trigger, retract plunger and insert foil pack holder into the appropriate Hilti dispenser.
- Discard initial adhesive. The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive must be discarded.
- Discard quantities are 3 strokes for 330 ml foil pack, 4 strokes for 500 ml foil pack and 65 ml for 1400 ml foil pack.
- Inject adhesive start from the bottom of the bore hole without forming air voids. Slowly withdraw the mixer with each trigger pull.
- Continue filling the bore hole either up to recommended amount of adhesive or until hole fills 2/3 full.
- It is required to ensure that the annular gap between the anchor and the concrete is filled with adhesive along the embedment length.



STEP 4

Installation

3.1 ANCHOR INSTALLATION

3.1.2 EPOXY / RESIN ANCHOR INSTALLATION

Step 5. Setting anchors

- Before use, clean each anchor with water and dry them completely with oil-free air. Verify that the element is dry and free of oil and other contaminants.
- Anchors must be twisted slowly and inserted into the core, which is filled with epoxy / resin.
- Mark and set the element to the required embedment depth until working time TWORK has elapsed. The working time TWORK is given in the table below.
- After installing an anchor, the annular gap must be filled with epoxy / resin adhesive. If the borehole is not filled along the embedment depth, the installation should be rejected.
- Use an anchor template to stop the movement of anchors right after installation.
- Leave anchors to cure for the curing time (TCURE) mentioned in Table 2.

Caution : Do not touch the anchors during curing time.

TEMPERATURE IN ANCHORAGE BASE [°C]	MAXIMUM WORKING TIME(TWORK) [MINUTES]	MINIMUM CURING TIME (TCURE) [HOURS]
5 to 9	120	72
10 to 14	90	48
15 to 19	30	24
20 to 29	20	12
30 to 39	12	8
40	12	4

Note :

- Cover anchors with a suitable cap to avoid damage.
- Check that the protrusion length is outside of the concrete structure.
- Cover the area, marking with the word “Caution”.
- Ensure all anchors are straight and level.

Installation

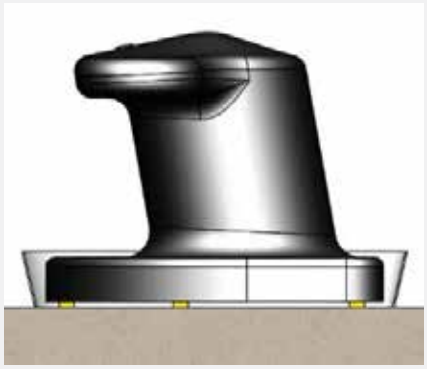
3.2 GROUTING AND BOLLARD PLACEMENT

Grouting is needed to provide a flat surface on a deck to align the bollard horizontally. Cement-based grout is made of water and cement in a ratio recommended by the grout manufacturers. Use the grout manufacturer's data sheet for each stage of grouting. Grout should be non-shrink grout with a minimum strength of 60 MPa.

- Adequately roughen the surface of the concrete deck.
- Use pressurized air flow to remove all debris.
- The base flange of the bollard should be aligned, shimmed and cleaned of all grease, dirt, loose rust and scale.
- Use removable shims to leave a gap between the bollard base flange and the concrete surface.
- Shims must be corrosion free if using non-removable shims.
- Check the alignment of the bollards by using a bubble meter.
- Use boundary forms to isolate the area for grouting.
- It should be sturdy and caulked oiled approximately 15 mm around the edge of the base of the bollard.
- Follow the grout manufacturer's procedure for filling the grout.
- Place the grout at least 5 mm (1/4") above the bottom of the base flange of the bollard to ensure the complete filling of the void.
- Cover immediately with wet rags or curing compound.
- Provide a 45° angle to the grout periphery prior to the curing of the grout.
- All cement-based grouts should be cured according to the guidelines of the grout manufacturer.
- Lift the bollard as per the handling procedure mentioned in Section 1 and place it in its designated position.









Inspection and Maintenance



Bollards supplied are maintenance free. However, inspection is required every three months or when they are subjected to abnormal actions such as being knocked by other equipment or used for other applications. Relevant corrective action should be taken based on the findings to ensure the correct maintenance of the bollards. The table on the right can be used as a guideline for the inspection process.

Bollard Inspection and Maintenance Guidelines

S/NO	INSPECTION TYPE	VISUAL OBSERVATIONS	CORRECTIVE ACTION	REMARKS
1	Examine for visual damage such as surface penetration and / or scratches on the surface of the bollard.	Check the relevant required minimum dimensions as per the manufacturer's drawing.	If less than the minimum requirement is found, check the design calculations with the manufacturer of the bollard.	
2	Examine the condition of the paint on the bollard for cracks, chips and/or peeling.	Inspect for cracks, chipping and / or peeling.	Make the necessary repairs as per the Paint Repair or Touch-up procedure, or contact the manufacturer for guidelines.	
3	Examine for surface rust or corrosion in the paint.	Inspect for surface pitting or cracks.	Make the necessary repairs as per the Paint Repair or Touch-up procedure.	
4	Inspect the barrel thickness as per the bollard product drawing.	Compare the inspected thickness with the manufacturing drawing of the bollard.	If found to be less than the minimum required, check the design calculation with the bollard manufacturer.	
5	Inspect all dimensions as per the product drawing of the bollard.	Compare all dimensions with the manufacturing drawing of the bollard.	Provide an inspection report to the manufacturer of bollard to examine.	
6	Inspect to see if any anchor bolts have loosened.	Check with a torque wrench for the desired value of torque.	If bolts are found to have loosened, tighten the anchor bolt with the required torque value.	
7	Inspect for damage or deformation of anchor bolts.	Visually inspect threads for any wear or damage.	If any damage is found, provide the manufacturer with a detailed explanation of the damage for further examination.	
8	Examine the coating system of the anchor bolts and other fasteners.	Visually inspect the fasteners' HDG coating.	Apply Zinc coating to the desired DFT as per the bollard manufacturer's advice.	

The site operator or owner may carry out general maintenance or repairs to the equipment supplied, as outlined in this manual. For any major repairs, please consult the bollard manufacturers, otherwise the warranty will be void.

DISCLAIMER

Trelleborg AB has made every effort to ensure that the technical specifications and product descriptions in this catalog are correct.

The responsibility or liability for errors and omissions cannot be accepted for any reason whatsoever. Customers are advised to request a detailed specification and certified drawing prior to construction and manufacture. In the interests of improving the quality and performance of our products and systems, we reserve the right to make specification changes without prior notice. All dimensions, material properties and performance values quoted are subject to normal production and testing tolerances. This catalog supersedes the information provided in all previous editions. If in doubt, please check with Trelleborg Marine Systems.

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BC-DAM-v1.0-EN, 2018





For a smarter approach to your next project, get in touch today.

Email: **marinesystems@trelleborg.com**

6. Certificates of Conformance

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

Certificate of Conformance

Date: September 24, 2021

Company: Kiewit Infrastructure Co.

Re: Bollard Certificate of Conformance for Steel (#25135)

To Whom It May Concern,

We, Trelleborg Marine Systems (TMS), certify the material to be used for the project based on specifications is cast steel conforming with:

- ASTM A27 Gr. 65-35

This material is the commonly used choice for bollards in the marine industry due to its longevity in the application conditions.

Gisael Gomez

Regards,

Gisael Gomez
Project Manager
Gisael.Gomez@trelleborg.com

Certificate of Conformance

Date: September 24, 2021

Company: Kiewit Infrastructure Co.

Re: Bollard Certificate of Conformance for Anchor Bolts and Fasteners (#25135)

To Whom It May Concern,

We, Trelleborg Marine Systems (TMS), certify the material to be used for the project based on specifications is:

- Anchor Bolts: ASTM F1554 Gr. 105, HDG per ASTM A153
- Nuts: ASTM A563 DH, HDG per ASTM A153
- Round Washer: ASTM F436, HDG per ASTM A153
- Plate Washer: ASTM Q355B, HDG per ASTM A153

These material grades are the commonly used choice for bollards in the marine industry due to its longevity in the application conditions.

Gisael Gomez
Regards,

Gisael Gomez
Project Manager
Gisael.Gomez@trelleborg.com

Certificate of Conformance

Date: September 24, 2021

Company: Kiewit Infrastructure Co.

Re: Bollard Certificate of Conformance for Coating (#25135)

To Whom It May Concern,

We, Trelleborg Marine Systems (TMS), certify the coating to be used for the project based on specifications is:

- Primer Coat: 3-5 mils Carbozinc 859
- Intermediate Coat: 4-6 mils Carboguard 890
- Top Coat: 2-3 mils Carbothane 134HG
- Total DFT to be 12 mils min.

This coating system is the commonly used choice for bollards in the marine industry due to its longevity in the application conditions.

Gisael Gomez

Regards,

Gisael Gomez
Project Manager
Gisael.Gomez@trelleborg.com

7. Reference Letters

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

Announcement *June 1, 2016*

Maritime International, Inc. announces official name change to 'Trelleborg Marine Systems North America, Inc.' effective June 1, 2016

Maritime International, Inc. has officially changed its legal name to **Trelleborg Marine Systems North America, Inc.** We will continue to conduct business as usual with our office location, phone/fax numbers, and Tax ID number remaining the same. We kindly ask that you update your records accordingly and address all future business correspondence with our new company name.

Accounts Payable invoices should be directed to our new AP email address, LFT.AP@trelleborg.com. Should your company require, W-9 requests can also be forwarded to this email address.

Accounts Receivable transactions should be made payable to **Trelleborg Marine Systems North America, Inc.** Wire transfer and ACH payments should be initiated using our banking details below. Payment confirmations should be emailed to LFT.AR@trelleborg.com.

Bank Name: Nordea Bank Finland Plc – New York Branch
1211 Avenue of the Americas, 23rd Floor
New York, NY 10036
USA
ABA/Routing: 026010786
Swift Code: NDEAUS3N
Acct Name: Trelleborg Marine Systems North America, Inc.
Acct No: 4065613001

We look forward to continuing our business relationship with your company. Should you have any questions regarding this change, please feel free to contact our office at 337-321-4240.

Regards,

David LeBlanc
President

BOH BROS. CONSTRUCTION CO., L.L.C.

GENERAL CONTRACTORS
SINCE 1909
LA. LICENSE NO. 2179

730 S. TONTI STREET
P.O. DRAWER 53266
NEW ORLEANS, LA 70153
PHONE 504/821-2400
FAX 504/821-0714

Maritime International, Inc.
1186 Petroleum Pkwy
Broussard, LA 70518

RE: Letter of recommendation, Maritime International

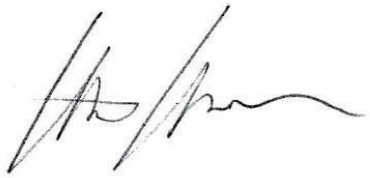
To Whom it May concern:

Boh Bros. Construction Co. L.L.C. is a leading marine construction firm on the Gulf Coast of the United States and has worked with Maritime International for many years. They have supplied on various projects for Boh including some of the largest fender systems in the United States.

Maritime has always performed above and beyond and is considered to be one of our key vendors. They are extremely professional in the manner in which they conduct their business and are an honest, common sense type company.

Maritime International consistently delivers quality fenders and bollards in addition to providing creative solutions. We would highly recommend Maritime International for any marine contractor to use for projects requiring marine fenders, bollards and other special marine equipment.

Sincerely,
BOH BROS



Unified Port of San Diego

3165 Pacific Highway, San Diego, CA 92101
P.O. Box 120488, San Diego, CA 92112-0488
619.686.6200 • www.portofsandiego.org

Maritime International, Inc.
1186 Petroleum Pkwy
Broussard, LA 70518

RE: Letter of recommendation, Maritime International

To Whom it May concern:

Maritime International, Inc. has provided fender systems for National City Marine as well as mooring bollards. Maritime has proven to be a trusted vendor and we appreciate their support and attention to detail over the years.

It's extremely important to us that all of the equipment on our docks adheres to the highest in industry standards which includes marine fenders and bollards. We are intent on providing the most efficient and safe operation for our clients, and thus try to work with vendors such as Maritime International, Inc. who equally share these values.

We would highly recommend Maritime International

Sincerely,

Rita Smith-Pomatto
Marine Terminal Supervisor
Port of San Diego

BO-MAC CONTRACTORS, LTD
Marine Division

1020 Lindbergh Drive (77707)
P.O. Box 5386 (77726)
Beaumont, Texas
Tel: (409) 842-2125
Fax: (409) 840-4754

February 11, 2011

Maritime International, Inc.
1186 Petroleum Pkwy
Broussard, LA 70518

RE: Letter of Recommendation – Maritime International

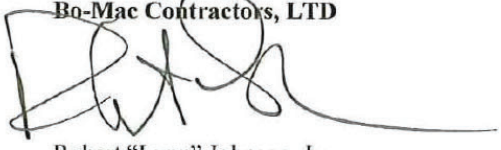
To Whom it May Concern:

Bo-Mac is a leading Gulf Coast marine construction firm located in Beaumont, Texas. Maritime International has been a valued and trusted vendor of ours for many years, and we have counted on their professionalism, attention to detail and support many times over the years.

Our previous experiences with Maritime have allowed us to extend them a great deal of trust on projects that require marine fenders and bollards. When we place orders with Maritime, we have a very high level of confidence that there will not be any production, quality or delivery issues, which makes our job that much easier.

We would highly recommend Maritime International to anyone considering doing business with them. We appreciate the opportunity to submit this. Should additional information or assistance be required, please do not hesitate to call.

Very Truly Yours,
Bo-Mac Contractors, LTD



Robert "Lynn" Johnson, Jr.
V.P. / General Manager, Piling Operations
Email: ljohnson@bo-mac.com

PORT OF OAKLAND

To whom it may concern,

The Port of Oakland is a leading port located on the West Coast of the United States. We own manage and market seaport facilities on the San Francisco Bay and Oakland Estuary, and rank amongst the top 4 ports in the USA and top 20 in the world in terms of container traffic. The Port works to invest our resources in quality facilities and services which include things like marine fenders and mooring bollards.

Over the years, Maritime International has provided products to the Port of Oakland and we have been very happy with their quality and performance. Additionally Maritime provides a nice service, and have been back to the port several times over the years to check on their products. We appreciate their efforts.

The Port of Oakland would recommend Maritime International.

Sincerely,

William Morrison Acting Harbor Facilities Maintenance Manager

Port of Oakland

530 Water Street ■ Jack London Square ■ P.O. Box 2064 ■ Oakland, California 94604-2064
Telephone: (510) 627-1100 ■ Facsimile: (510) 627-1826 ■ Web Page: www.portofoakland.com

ORION CONSTRUCTION LP
ORION MARINE GROUP

Maritime International, Inc.
1186 Petroleum Pkwy
Broussard, LA 70518

RE: Letter of recommendation, Maritime International

To Whom It May Concern:

Orion Construction is a leading US marine construction firm headquartered in Houston, Texas. We have completed many projects over the years utilizing Maritime International fenders and bollards and have always been very satisfied with their products and their professional service.

Maritime is a trusted vendor that regularly supports Orion construction on special projects with demanding delivery schedules and special engineering requirements, and they have not let us down. We have a great deal of confidence that they stand behind their products with a high level of honesty and integrity.

Orion Construction recommends Maritime International without hesitation or reservation.

Sincerely,

Ben C. McClain

Project Manager
Orion Construction L.P.
Office 713-852-6551
Cell 713-202-7905

CH2M HILL
1000 Towne Center Blvd
Building 800 Suite 806
Pooler, Georgia 31322
Tel 912.330.3000
Fax 912.330.9025

Maritime International Inc.
1186 Petroleum Pkwy
Broussard, LA 70518

To Whom It May Concern:

I have worked with Maritime International for a number of years on the design of various fender projects throughout the Southeastern United States. These fender projects consisted of upgrades to existing fender systems, brand new fender systems, and repair of damaged fenders. Maritime International's expertise on any aspects of fender design and detailing, along with their quick response time to my questions and inquiries, makes them stand out among the top fender designers and manufacturers.

I particularly would like to commend Bobby Beaumont and Matt Braselman for their dedication to customers and their expertise and attention to detail when responding to my inquiries.

Sincerely.

Olli Himbert, PE
Engineer
Structural Department

CH2M HILL
1000 Towne Center Blvd. Suite 806
Pooler, GA 31322-4039
Direct - 912-330-3066 ext. 53066
Cell - 912-661-2842
Fax - 912-330-9025
www.ch2m.com

MOFFATT & NICHOL

1616 East Millbrook Road
Suite 160
Raleigh, North Carolina 27609
(919) 781-4626
Fax (919) 781-4869

January 11, 2008

Maritime International Inc
204 Ida Road
Broussard, Louisiana 70518

Attn: Mr. John Deats
Principal

Re: Recommendation Letter

Dear Mr. Deats;

Moffatt & Nichol (M&N) is a leading consulting engineering firm that specializes in the design of waterfront structures, including piers and wharves. For these types of structures, we are required to design and specify components, such as marine fendering systems, mooring hardware, and other related items. Over the years, Maritime International has provided great assistance with developing concepts, designs, and specifications for rubber fender element type systems and cast marine bollards spanning across a vast array of projects.

We would to take this opportunity to thank you for your outstanding level of support and the quick timing in which it is provided. In the marine fender industry, Maritime International is known for supplying a high quality product that is delivered as scheduled. We hope to have the opportunity to specify and utilize Maritime's line of products in the near future. Based on our past experiences with Maritime International, we offer our highest recommendation. Please contact me if you have any questions or require any additional information.

Sincerely,

MOFFATT & NICHOL

Mike E. Winters, P.E.
Project Manager

Excellence By Design. . .Since 1974

LANIER & ASSOCIATES
CONSULTING ENGINEERS, INC.

February 7, 2008

Re: Maritime International Inc.
Letter of Recommendation

To whom it may concern:

Lanier and Associates is a multi-disciplined firm specializing in industrial, marine and environmental work with civil, structural, mechanical, process, electrical, instrumentation and environmental engineers on staff. We are considered specialists and experts in all facets of marine terminal design and construction including liquids, dry bulk, grain, and general cargo. Our principal clients over the years have been the major oil and chemical companies and liquid and bulk terminaling companies as well as Port Authorities.

We have specified and utilized Maritime International products on projects for our clients for over ten years. Maritime International has consistently provided quality products delivered on schedule and at economical prices. Maritime International personnel have always been available to provide assistance with the technical aspects of their products and have voluntarily proposed alternate concepts to help reach a Client's scheduling or budgetary limitations.

Based on our previous experience with Maritime International, we highly recommend the use of their products and look forward to another ten years of specifying and utilizing Maritime International products.

Feel free to contact me if you have any further questions.

Very Truly Yours.

LANIER AND ASSOCIATES
CONSULTING ENGINEERS, INC.

Jeffry Mazzanti, P.E.
Chief Engineer

NEW ORLEANS 4101 Magazine St., New Orleans, LA 70115 (504) 895-0368 FAX (504) 895-0566
BEAUMONT 3420 Fannin St., Suite 202, Beaumont, TX 77701 (409) 212-1051 FAX (409) 212-1541
GULFPORT (228) 865-9676 FAX (228) 865-9687
WEB SITE www.lanier-engineers.com **GENERAL EMAIL ADDRESS** info@lanier-engineers.com

8. List of Completed Projects

Trelleborg Marine Systems North America Inc.
10375 Richmond Avenue,
Suite 1725 Houston, TX 77042, USA
www.trelleborg.com/en/marine-and-infrastructure

List of Completed Mooring Bollards Projects				
Project #	**Client**	**Project**	**Product**	**Year**
63480	ST Hudson Engineers Inc	Sunoco Marcus Hook II	MT-125 Mooring Bollard x 4	2016
55067	Griffin Engineered Systems	Halifax Shipyard Pier 8 (I)	MT-150 Mooring Bollard x 1 MT-100 Mooring Bollard x 1	2015
55080	Griffin Engineered Systems	Holim Mississauga	MT-50 Mooring Bollard x 1	2015
60235	Jesse Engineering Co	520 Bridge Bollards	MSB-75 Mooring Bollard x 134 MSB-50 Mooring Bollard x 128	2015
40545	Best JV	Wheatstone Project	MT-50 Mooring Bollard x 22	2013
20104	QB Construction Inc.	Bahia Urbana Puerto Rico	DB-30 Mooring Bollard x 5 DB-60 Mooring Bollard x 3	2012
40363	Skanska Norg	Bergen Kai 4-11	MT-100 Mooring Bollard x 6 MT-200 Mooring Bollard x 7	2012
10274	Orion Construction LP	Targa New Ship Dock #1	MSB-50 Mooring Bollard x 2 MT-30 Mooring Bollard x 2 MT-75 Mooring Bollard x 3	2011
10011	ST Hudson Engineers Inc	ST Hudson New Jersey Bollards	SB-20 Mooring Bollard x 10	2010
18319	Skanska Norg	Tromso - Bollard	T Head-250 Mooring Bollard x 3	2010



Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

WWW.TRELLEBORG.COM/MARINE

Fender Systems | Docking & Mooring | Ship-Shore Links | Ship Perfornance Monitoring | Navigation & Piloting



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flickr.com/photos/MarineInsights
linkedin.com/MarineInsights
MarineInsightsBlog.Trelleborg.com

Trelleborg Marine Systems
Email: marinesystems@trelleborg.com

moffatt & nichol

180 Wells Ave, Suite 302
Newton, MA 02459
(617) 299-7330
www.moffattnichol.com

REVIEW OF SUBMITTAL
No. 35 59 13.19-11, 355913.19.362.00 Trelleborg Marine Fender System Rev 6

To: Kiewit Infrastructure Co.

Date: 4/3/2023

Project: Infrastructure Improvements State Pier Complex

Attn: Nick Malatestinic

Phone:

M&N Job No: 10630/02

Ref: Specification/Drawing No.:

WE ARE SENDING YOU VIA:

☐ E-Mail ☐ USPS ☐ FedEx
☐ Messenger ☒ Attached ☐ Other:

Reviewed as follows:

☒ No Exceptions Taken
☐ Revise and Resubmit
☐ Make Corrections Noted
☐ Submit Specified Item
☐ Rejected
☐ For Information Only/No Action

Checking is only for general conformance with the design concept and general compliance with information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications and does not authorize changes involving costs unless covered by change order. This review does not cover assemblies of which items being reviewed are components. Contractor is responsible for: dimensions, quantities and details which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of his work with that of all other trades: safety precautions and the satisfactory performance of his work.

COMMENTS:

Moffatt & Nichol

By: Derek Franzese **Signature:** Derek Franzese

Date: 4/3/2023

TRELLEBORG

Connecticut Port Authority-State Pier

USA25135

SCN Fender-SCN1000 F1.5 (35sets)

MANUFACTURING DATA REPORT (MDR)

Volume 1 of 1

Supplier Details:
Trelleborg Marine Systems
North America Inc..
10375 Richmond Avenue,
Suite 1725 Houston,
TX 77042, USA
Tel: +1 (713) 800-7640
E-mail: tms.USA@trelleborg.com
www.trelleborg.com

Comments Response Sheet

25135 - Comments Response Sheet (CRS)

Date: 03/23/2023
Project: Infrastructure Improvements Connecticut State Pier
Subject: Responses to M&N Comments per Trelleborg Marine Fender Systems Rev. 5
From: Trelleborg Marine System North America
To: Kiewit Infrastructure Co.

Marine Fenders Test Reports

No.	EOR Comments	Trelleborg Responses
1	Please clarify the reports being submitted - two by Trelleborg each with different dates on the cover sheet.	Per ITP and internal procedure we perform rubber material testing for each batch of material used. A total of two different batches of material were used and fender testing at factory was separated by batches. Please see **Page 50** for 1st batch report (Delivery Berth) Please see **Page 54** for 2st batch report (instalation Berth)
2	Provide written certificates from the manufacturer stating that the rubber compound used is the same compound represented in the test reports - re: Spec 35 59 13.19 - sheet 3 and 6 {B 3}. Does the rubber compound include carbon black?	Yes, we confirm the compound used is the same represented in the test reports. We also confirm our compound include carbon black and that we use a NR/SBR blend per ASTM D2000 AA Classification. Please see **Page 48** for the Certificate of Conformance for the rubber compound.
3	It appears there are five (5) different fender serial numbers within the Trelleborg reports and a sixth serial number within the Lehigh report. Please confirm that 6 different fenders were tested.	A total of 8 different fenders were tested for this project. Qty. 5 - tested at factory by TB - Please see **Pages 52, 53, 56, 57, 58.** Qty. 2 - tested at factory with 3rd party inspector - Please see **Pages 59-61.** Qty. 1 - domestic test performed at LeHigh - Please see **Page 111**.
4	Spec 35 59 13.19 sheet 14 requires a minimum of four (4) compression cycles per fender unit, with the last being the actual rated performance. The submitted reports do not indicate the number of tests performed. Please confirm the cycle requirement was met.	All fender were tested in accordance to PIANC Guidelines for Design of Fender Systems. They all were compressed 4 times and values of 4 compression are the ones shown on the reports shown on **Pages 52, 53, 56, 57, 58, 60, 61, 111** .
5	The Contractor should specify that the 10% tolerance is positive for reaction and negative for energy absorption.	The maximum and minimum values shown on the reports for performance test at factory include the tolerance (10%). Notes for +10% tolerance for the reaction and -10% tolerance for the energy was added them. Please see P**ages 52, 53, 56, 57, 58.**
6	All fender units must be compressed through the full range of deflection for two (2) complete cycles prior to shipment. Please provide confirmation. See spec section 355913.19.-3.02.C.4.	Confirmed, all fenders were break-in compressed through the full range of deflection for 2 complete cycles prior shipment.
7	Contractor to furnish certificates of compliance for all loaded elements of fender system including fender, supporting frame, panel, etc per spec sheet 14.	Please see **Page 45** for the Certificate of Conformance for all products supplied by Trelleborg.
8	Confirm that compression testing for two {2) fenders at the manufacturing facility will be provided by an independent third party agency p r 35 59 13.19 Part 3.02 C after manufacturing but prior to shipment. Submit details of agency.	Confirmed, in coordination with Kiewit two fenders were tested at factory with presence of 3rd party agency. Please see **Pages 59-61** for 3rd Party Test Reports.

Bollard Documentation

No.	EOR Comments	Trelleborg Responses
1.a.	a. Per spec 35 59 33 Part 1.04B, submit for review: i. One bollard from each heat must be made with two coupons. One coupon must be tested at the factory, and the results are to be sent to the Engineer prior to shipment of the bollards. The second coupon will remain attached to the bollard until final delivery for testing by Owner. Note page numbers here in the next submittal version.	Please see Page 414 and 430 for material reports for test performed at factory. Photos showing second coupon attached to the bollards can be seen on **Pages 425, 427, 444, & 447.**
1.b.	b. Submit work plan for locating and preventing damage to rebar within existing State Pier. Coordinate with RFI 406	This is not part of Trelleborg's SOW. Plan to be provided by Kiewit.

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SECTION 1: ITP & IFC DRAWING

SECTION 1. ITP & IFC DRAWING

1–A:

ITP

Trelleborg Marine Systems North America

RUBBER FENDER ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Rubber Factory, China
SC2	TMS-NA (Houston, Texas)
SC3	Independent Testing Agency, USA
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Rubber Fender Manufacturer
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

RUBBER FENDER (MOLDED) ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**RUBBER MATERIAL TESTING**																		
2.01	Tensile Strength (Before Aging)	SC1	2	ASTM D412, Die C	16 MPa (min.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.02	Elongation at Break (Before Aging)	SC1	2	ASTM D412, Die C	350% (min.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.03	Hardness (Before Aging)	SC1	2	ASTM D2240, Shore A	78° (max.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.04	Tensile Strength (After Aging)	SC1	2	ASTM D412, Die C (Aged 96 hrs. @ 70°C)	12.8 MPa (min.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.05	Elongation at Break (After Aging)	SC1	2	ASTM D412, Die C (Aged 96 hrs. @ 70°C)	280% (min.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.06	Hardness Increase (After Aging)	SC1	2	ASTM D2240, Shore A (Aged 96 hrs. @ 70°C)	Original Value + 8°	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.07	Compression Set	SC1	2	ASTM D395, Method B (Aged 22 hrs. @ 70°C)	30% (max.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.08	Tear Resistance	SC1	2	ASTM D624, Die B	70 kN/m (min.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.09	Ozone Resistance	SC1	2	ASTM D1149	No cracking, visible by eye	One Sample (Sample to be of the same quality and compound as the material to be provided)	TMSNA-QC-R-MI-01	P	R										
2.10	Abrasion Resistance	SC1	2	BS 903.A9 Method B (1,000 Revolutions)	1.5cc (max.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.11	Adhesion (Rubber to Steel)	SC1	2	ASTM D429	7 N/mm (min.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
2.12	Water Resistance	SC1	2	ASTM D471, Method B (70 hours at 100 °C)	Volume: +10/-5% (max.)	Once Per Batch	TMSNA-QC-R-MI-01	P	R										
3	**PERFORMANCE TESTING**																		
3.01	Break-in Compression	SC1	3	PIANC 2002, Appendix A Section 6.2	2 Compression Cycle(s) To Fenders Rated Deflection	All Fenders	TMSNA-QC-F-TR-01	P	R, H										
3.02	Compression Test (Rubber Factory, China)	SC1	3	PIANC 2002, Appendix A Section 4, Method CV	Min. Energy (Energy incl. Tolerance) Is Met Or Exceeded Prior To Meeting/Exceeding Max. Reaction (Reaction incl. Tolerance)	1 Fender	TMSNA-QC-F-TR-01	P	R, H										
3.03	Compression Test (Rubber Factory, China)	SC1	3	PIANC 2002, Appendix A Section 4, Method CV	Min. Energy (Energy incl. Tolerance) Is Met Or Exceeded Prior To Meeting/Exceeding Max. Reaction (Reaction incl. Tolerance)	2 Fenders	TMSNA-QC-F-TR-01	P	R, H	R		W, R							
3.04	Compression Test (US Domestic)	SC3	3	PIANC 2002, Appendix A Section 4, Method CV	Min. Energy (Energy incl. Tolerance) Is Met Or Exceeded Prior To Meeting/Exceeding Max. Reaction (Reaction incl. Tolerance)	1 Fender	TMSNA-QC-F-COC-01		R, H	R		P							

Trelleborg Marine Systems North America

RUBBER FENDER ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Rubber Factory, China
SC2	TMS-NA (Houston, Texas)
SC3	Independent Testing Agency, USA
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Rubber Fender Manufacturer
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

RUBBER FENDER (MOLDED) ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
4	**FENDER MARKINGS**																		
4.01	Visual Markings	SC1	4	Markings Shall Include: - Manufacturer - Model Number - Serial Number	Markings Clearly Visible on Fender	All Fenders	Photos	P	R										
5	**FINAL INSPECTION**																		
5.01	Dimensional Inspection	SC1	5	Issued Drawing(s)	Within Tolerances Listed On Approved Drawing(s)	All Fenders	TMSNA-QC-F-DI-01	P	R										
5.02	Final Visual Inspection	SC1	4	Visual Check	Free From Defects	All Fenders	Photos	P	R										
6	**PACKING / DELIVERY**																		
6.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
6.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	Description

Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

Trelleborg Marine Systems North America

STEEL PANEL ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Steel Fabricator, (China)
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Steel Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

STEEL FABRICATION ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No. of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**MATERIALS**																		
2.01	Material Authentication	SC1	2	Material per AFC Drawings	Mill Certificates	Once Per Batch	TMSNA-QC-S-MI-01	R	R										
2.02	Material Marking	SC1	2	As Required	Full Traceability of All Materials	All Material	Factory Internal Report	P	R										
3	**PRE-WELDING**																		
3.01	Welding Procedure Specification	SC1	1	AWS D1.1/D1.6	AWS D1.1D1.6	Continuous	WPS	R	R, H										
3.02	Welding Procedure Qualification Record	SC1	1	AWS D1.1/D1.6	AWS D1.1/D1.6	Continuous	PQR	R	R, H										
3.03	Welder Qualifications Record	SC1	1	AWS D1.1/D1.6	AWS D1.1/D1.6	Continuous	WPQ/Welders Certificate	R	R, H										
4	**INTERNAL FRAME FABRICATION**																		
4.01	Part Identification	SC1	1	As Required	Full Traceability of All Materials	100%	Factory Internal Report	P	R										
4.02	Internal Layout Check (Tack weld fit-up)	SC1	4,5	Per Fabrication Drawings	Correct Location, Orientation, Straightness, and Dimensions For All Internal Members	100%	TMSNA-QC-S-DI-01	P	R										
4.03	Internal Weld Inspection (VT)	SC1	5	AWS D1.1 Table 6.1 / AWS D1.6 Table 8.1	AWS D1.1 Table 6.1 / AWS D1.6 Table 8.1	100%	TMSNA-QC-S-DI-01	P	R										
4.04	Internal Visual & Dimensional Inspection	SC1	5	Per Fabrication Drawings	Within Tolerances Specified	100%	TMSNA-QC-S-DI-01	P	R, H										
5	**EXTERNAL FRAME FABRICATION**																		
5.01	Part Identification	SC1	1	As Required	Full Traceability of All Materials	100%	Factory Internal Report	P	R										
5.02	External Weld Inspection (VT)	SC1	5	AWS D1.1 Table 6.1 / AWS D1.6 Table 8.1	AWS D1.1 Table 6.1 / AWS D1.6 Table 8.1	100%	TMSNA-QC-S-DI-01	P	R										
5.03	External Visual & Dimensional Inspection	SC1	5	Per Fabrication Drawings	Within Tolerances Specified	100%	TMSNA-QC-S-DI-01	P	R, H										
6	**STUD WELDING**																		
6.01	Stud Weld Inspection (VT)	SC1	4	AWS D1.1 Table 6.1 / AWS D1.6 Table 8.1	AWS D1.1 Table 6.1/ AWS D1.6 Table 8.1	100%	TMSNA-QC-S-DI-01	P	R										
6.02	Stud Load Test	SC1	3	AWS D1.6 Clause 7	AWS D1.1 Clause 7	5%	TMSNA-QC-P-TR-01	P	R										
7	**PRESSURE TEST**																		
7.01	Pneumatic Pressure Test	SC1	3	TMS-NA Pressure Test Procedure	No Leaks Detected	100%	TMSNA-QC-P-TR-02	P	S, H										
8	**SURFACE PREPARATION (PRIOR TO PAINTING)**																		
8.01	Solvent Cleaning & Surface Preparation	SC1	4	SSPC-SP1 & SSPC-SP2 / SSPC-SP3	Surface Free Of Visible Dirt, Dust, Oil, Grease, Soil, Cutting Compounds, And Other Soluble Contaminants. All Surface Imperfections Such As Loose Mill Scale, Loose Rust, Sharp Edges, Weld Spatter, and Slag Removed	100%	TMSNA-QC-S-CI-01	P	R										
8.02	Surface Cleaning (Blasting)	SC1	4	SSPC-SP10	SSPC-SP10	100%	TMSNA-QC-S-CI-01	P	R										
8.03	Anchor Profile	SC1	4	ASTM D4417	Refer To Paint Manufacturers Data Sheet For Anchor Profile Requirements. If None Specified Use 50-75 µm	100%	TMSNA-QC-S-CI-01	P	R, H										

TRELLEBORG	Trelleborg Marine Systems North America
	STEEL PANEL ITP
	Quality Control and Inspection Test Plan

Location Code	
SC1	Steel Fabricator, (China)
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Steel Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

STEEL FABRICATION ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No. of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
9	**COATING (PAINTED STEEL)**																		
9.01	Environmental Conditions	SC1	1	As Required	Surface Temperature Must Be A Minimum of 3°C Above Dew Point Unless Otherwise Specified In Paint Manufacturers Data Sheet Minimum Surface Temperature As Per Paint Manufacturers Data Sheet Painting of First Coat Should Be Applied Within 4 hours After Blasting or As Per Paint Manufacturers Data Sheet; Whichever Is More Strict	100%	TMSNA-QC-S-CI-02	P	R											
9.02	Coating Dry Film Thickness	SC1	5	SSPC-PA2	Paint System As Indicated Per Coat on TMS Drawings And Within Tolerance	100%	TMSNA-QC-S-CI-02	P	R, H										
9.03	Final Visual Inspection	SC1	4	N/A	No Visual Signs Of Paint Defects Such As Solvent Retention, Surface Defects, Pin Holes, Curing Issues, & Sagging	100%	Photos	P	R										
10	**COATING (HOT DIP GALVANIZED STEEL)**																		
10.01	Galvanized Coating Thickness	SC1	4,5	ASTM A123	Minimum Coating Thickness As Required Per ASTM A123 Table 1. No bare spots, blisters, flux deposits, gross dross inclusions, or heavy deposits of zinc that will interfere with the intended use of the product	As Required Per ASTM A123 Section 7. Sampling	TMSNA-QC-S-CI-03	P	R										
11	**FINAL INSPECTION**																		
11.01	Pre-Assembly and Final Visual Inspection	SC1	5	Per Fabrication Drawings	UHMW Pre-Installed on Panels and Free Of Defects	100%	Photos	P	R										
11.02	Manufacturing Data Record	SC1	1	MDR Index and Template	All Documents Included In MDR	N/A	MDR	P	R										
12	**PACKING / DELIVERY**																		
12.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
12.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	**Description**
1	
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Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

Trelleborg Marine Systems North America

UHMW-PE ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	UHMW Fabricator, (China)
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	UHMW Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

UHMW-PE (VIRGIN) ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**UHMW-PE MATERIAL TESTING**																		
2.01	Average Molecular Weight	SC1	2	--	2,000,000 – 9,000,000	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.02	Density	SC1	2	ISO 1183-1:2012 / DIN53479	0.92-0.96 g/cm^3	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.03	Compression Strength	SC1	2	ISO 604:2002	$\geq$ 30 Mpa	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.04	Tensile Strength	SC1	2	ISO 527-2:2012	$\geq$ 24 Mpa	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.05	Elongation At Break	SC1	2	ISO 527-2:2012	$\geq$ 280%	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.06	Dynamic Friction Coefficient	SC1	2	ASTM D1894 / GB10006-88	$\leq$ 0.20	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.07	Notched Impact Strength (Charpy)	SC1	2	ISO179-1:2010 / GB/T 1043.1-2008	$\geq$ 100 KJ/m^2	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.08	Vicat Softing Point	SC1	2	ISO 306:2004	$\geq$ 80 ^{O}C	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
2.09	Hardness Shore - D	SC1	2	ISO 868:2003	60-65 D	Once Per Batch	TMSNA-QC-U-MI-01	P	R										
3	**FINAL INSPECTION**																		
3.01	Dimensional Check	SC1	5	Supplied Drawing(s)	Tolerances listed on Drawing(s)	All UHMW	Report w/ Photos	P	R										
3.02	Visual Inspection	SC1	4	Appearance	Free from Defects	All UHMW	Report w/ Photos	P	R										
4	**PACKING / DELIVERY**																		
4.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
4.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	Description
1	
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Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

Trelleborg Marine Systems North America

HARDWARE ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Hardware Fabricator
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Hardware Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

HARDWARE ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**HARDWARE MTR**																		
2.01	Review of Material Certificates	SC1	2	As Required	As Required	Once Per Batch	TMSNA-QC-H-MI-01	P	R										
3	**FINAL INSPECTION**																		
3.01	Dimensional & Visual Coating Inspection	SC1	4,5	ASTM A153 Sec. 3	Class C/D	10% of Hardware	Galvanizing Report	P	R										
3.02	Dimensional & Thread Pitch Inspection	SC1	5	As Required	Within Tolerance	10% of Hardware	TMSNA-QC-S-DI-01	P	R										
3.03	Hardware Assembly	SC1	5	Issued Drawings	Nuts Assembled on Bolts	All Hardware	Photos	P	R										
4	**PACKING / DELIVERY**																		
4.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
4.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	Description
1	
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Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

Trelleborg Marine Systems North America

CHAIN ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Chain Fabricator
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Chain Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-ITP
Consultant Document Number:	N/A

CHAIN ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**CHAIN MTR**																		
2.01	Review of Material Certificates	SC1	2	As Required	As Required	Once Per Batch	TMSNA-QC-C-MI-01	P	R										
3	**CHAIN ASSEMBLY LOAD TEST**																		
3.01	Review of Test Report	SC1	3	Proof Load Testing	No Breaks, Fractures, Or Permanent Deformations In Components	One (1) Specimen Of Each Chain, Shackle & Tensioner Size	TMSNA-QC-C-CI-01	P	R										
4	**FINAL INSPECTION**																		
4.01	Dimensional & Visual Coating Inspection	SC1	4,5	ASTM A123	If No Surface Profile Thickness Is Specified In The Project Drawings, Minimum Required Coating Thickness Shall Be 3.9 mils (100 Microns).	20% Of All Links For Each Chain Assembly; One (1) Shackle On Each Chain Assembly; Each Tensioner On Each Chain Assembly	TMSNA-QC-C-CI-01	P	R										
4.02	Chain Assemblies	SC1	5	As Required	Chains Pre-Assembled As Per The Issued Drawings	All Chain Assemblies	Photos	P	R										
5	**PACKING / DELIVERY**																		
5.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
5.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	Description
1	
2	
3	
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Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

Trelleborg Marine Systems North America

BOLLARD ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Bollard Fabricator (CHINA)
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Bollard Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-BITP
Consultant Document Number:	N/A

BOLLARD ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**BOLLARD MTR**																		
2.01	Review of Material Certificates	SC1	2	As Required	As Required	Once Per Batch	TMSNA-QC-B-MI-01	P	R										
3	**BOLLARD TESTING**																		
3.01	Physical Testing from Coupon	SC1	3	ASTM A27	ASTM A27	Once per Heat	Test Report	P	R										
3.02	Chemical Testing	SC1	3	ASTM A27	ASTM A27	Once per Heat	Test Report	P	R										
4	**BOLLARD COATING INSPECTION**																		
4.01	Review of Surface Blasting Report	SC1	1	NACE No.3	SSPC-SP6	All Bollards	TMSNA-QC-S-CI-01	P	R										
4.02	Review of Coating Dry Film Thickness Report	SC1	1	SSPC-PA2	Paint System As Indicated On TMS Issued Drawings	All Bollards	TMSNA-QC-S-CI-02	P	R										
5	**FINAL INSPECTION**																		
5.01	Dimensional Inspection	SC1	5	Issued Drawings	Within Tolerance	All Bollards	TMSNA-QC-B-DI-01	P	R										
5.02	Go-No-Go- Test	SC1	5	As Required	As Required	All Bollards	Photos	P	R										
5.03	Bollard Markings	SC1	4	As Required	Each Bollard Shall Be Clearly Identified By Serial Numbers Cast Or Stamped Into The Surface Of The Bollards.	All Bollards	Photos	P	R										
5.04	Unpacked Completed Bollards	SC1	4	N/A	N/A	All Bollards	Photos	P	R										
5.05	Certificate of Conformance - Line Pull	SC2	1	N/A	Conformance to Specification	N/A	COC		P										
6	**PACKING / DELIVERY**																		
6.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
6.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	**Description**
3	One bollard from each heat must be made with two (2) coupons. One coupon must be tested at the factory, and the results are to be sent to the customer prior to shipment of the bollard(s). The second coupon will remain attached to the bollard until final delivery for testing by the bollard owner.

Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

Trelleborg Marine Systems North America

HARDWARE ITP

Quality Control and Inspection Test Plan

Location Code	
SC1	Hardware Fabricator
SC2	TMS-NA (Houston, Texas)
SC3	
SC4	
SC5	

Inspection Code	
1	Document Review
2	Material Verification
3	Mechanical Testing
4	Visual Inspection
5	Dimensional Inspection

Activity Key	
W	Witness Activity
P	Perform Activity
H	Hold Point
R	Document Review
S	Surveillance

Inspection Authority	
A	Hardware Fabricator
B	Trelleborg Marine Systems Representative
C	Client Designated Representative
D	Client Designated Inspector
E	Third Party Services (where needed)

Project Information	
Client:	Kiewit Infrastructure Co.
TMSNA Project Name:	Connecticut Port Authority - State Pier
TMSNA Project Number:	25135
Document Number:	25135-BITP
Consultant Document Number:	N/A

HARDWARE ITP

Item No.	Description	Location Code	Insp. Code	Standard / Method	Acceptance Criteria	Frequency / No of Samples	Verifying Document	Inspection Authority					Inspection Remark	Procedure No.	Inspector Sign-off & Date				
								A	B	C	D	E			A	B	C	D	E
1	**DOCUMENT REVIEW**																		
1.01	Drawing Verification	SC1	1	Issued Drawings	N/A	Continuous	Approved Drawings	P											
2	**HARDWARE MTR**																		
2.01	Review of Material Certificates	SC1	2	As Required	As Required	Once Per Batch	TMSNA-QC-H-MI-01	P	R										
3	**FINAL INSPECTION**																		
3.01	Dimensional & Visual Coating Inspection	SC1	4,5	ASTM A153 Sec. 3	Class C/D	10% of Hardware	Galvanizing Report	P	R										
3.02	Coating Inspection	SC1	3,4	A153 or A123	85 microns, min	10% of Hardware	Inspection report	P	R										
3.03	Dimensional & Thread Pitch Inspection	SC1	5	As Required	Within Tolerance	10% of Hardware	TMSNA-QC-S-DI-01	P	R										
3.04	Hardware Assembly	SC1	5	Issued Drawings	Nuts Assembled on Bolts	All Hardware	Photos	P	R										
3.05	Certificate of Comformance	SC2	1	N/A	Conformance to Specification	N/A	COC		P										
4	**PACKING / DELIVERY**																		
4.01	Packing and Tagging	SC1	1	TMS Standard Packing Procedure	All Goods Accounted for, Labeled & Adequately Packed To Prevent Damage During Shipping	All Items	Photos	P	R, H										
4.02	Shipping	SC1	1	N/A	N/A	All Items	Shipping Documents	P	R, H										

NOTES	
Item #	Description
1	
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Activity Definitions	
Witness Activity (W)	The activity may not begin until the designated authority is present to witness the inspection or test.
Perform Activity (P)	The designated authority shall perform the inspection or test. Work shall proceed as intended and the results of the inspection or test to be sent to the designated authorities.
Hold Point (H)	Work cannot proceed without approval of the inspection or test by the designated authority.
Document Review (R)	Inspection reports, test reports and documents to be reviewed and approved of upon competition of the activity.
Surveillance (S)	The designated authority may monitor the activity if desired. Work shall proceed as intended without interruption to the activity.

SECTION 1. ITP & IFC DRAWING

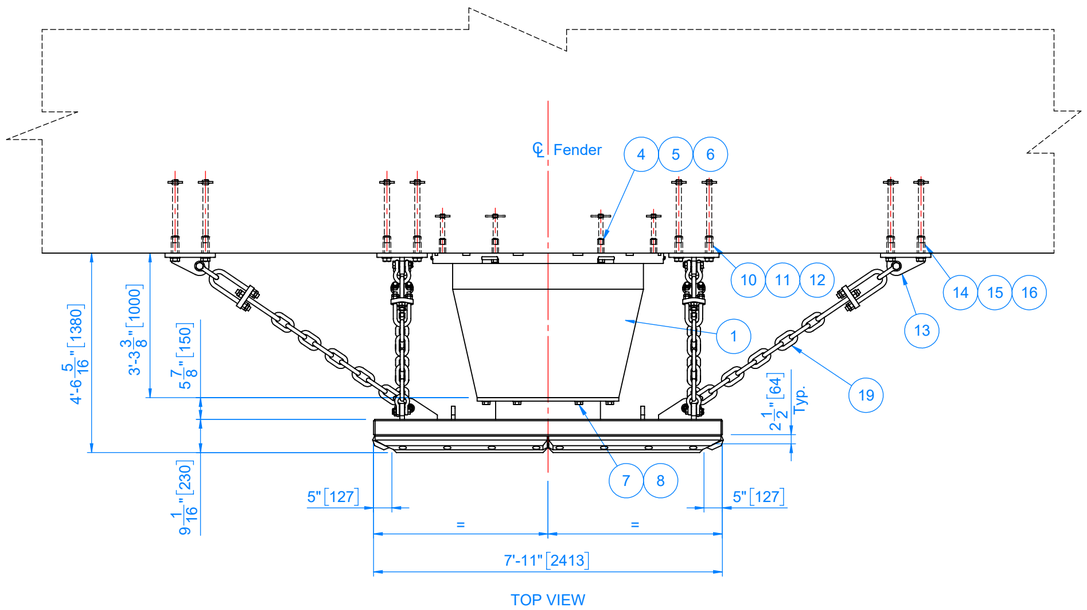
1–B:

IFC Drawing

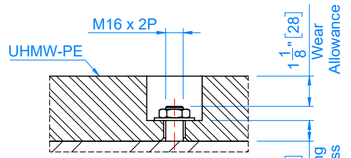
Performance Table (CV)	
Fender Type	SCN 1000 F1.5
Fender Rated Deflection	72 %
Energy	313.5 ft-kips (425 kNm)
Reaction	160.3 kips (713 kN)
Performance Tolerance	Energy -10%
	Reaction +10%
Dimensional Tolerance	±3% or ±2 mm (whichever is the greater)

Total Number of Systems:- 12 Nos.

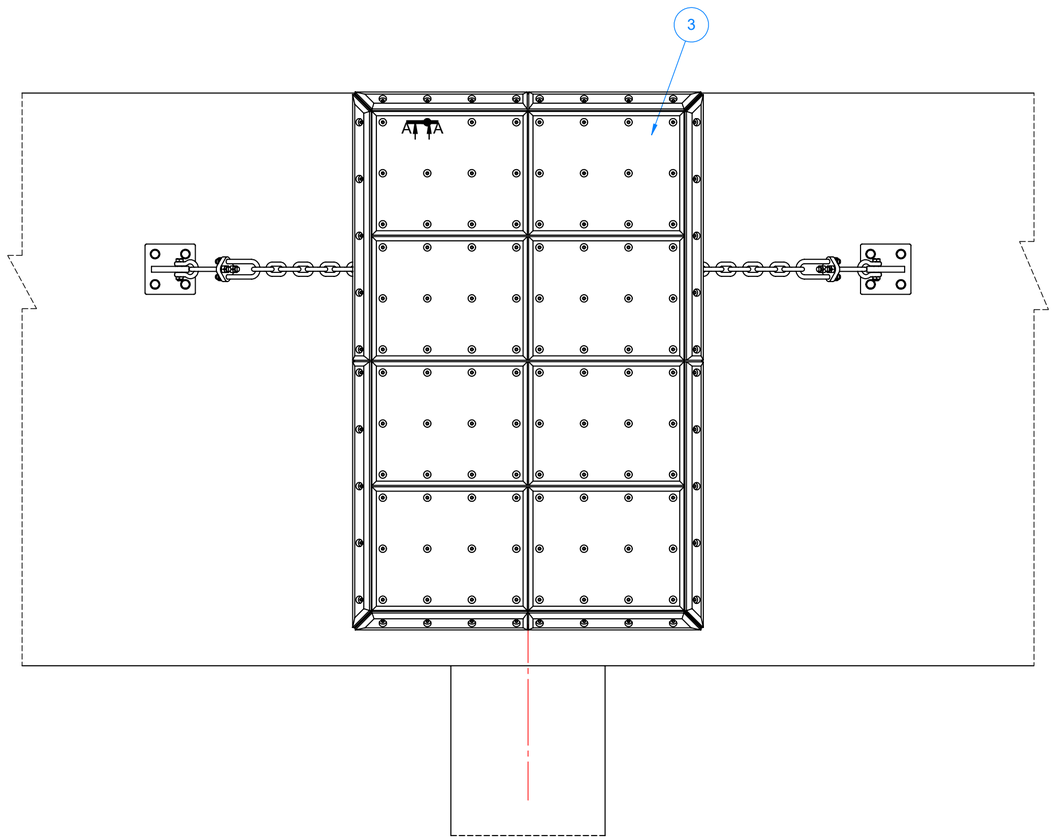
Part No.	Description	Dimension	Qty / System	Material
1	SCN Fender	SCN1000 F1.5	1	Rubber + Steel
2	Frontal Frame (Colour - Black)	12'-2" x 7'-11" x 6 11/16"	1	Q355B/Equiv. (Painted)
3	Facing Pad (Colour - Blue)	2 3/8" Thk	1	UHMW-PE (Virgin)
4	NC3 Anchor	M30 x 3.5P	6	AISI Type 316+#45+Q235B/Equiv. (HDG)
5	Hex Bolt	M30 x 3.5P x 100mm L (Fully Threaded)	6	AISI Type 316/Equiv.
6	Suitable 'L' Washer (For SCN 1000 F1.5)	As per Drawing No. 25135-1M05	6	AISI Type 316/Equiv.
7	Hex Bolt	M30 x 3.5P x 90mm L (Fully Threaded)	6	AISI Type 316/Equiv.
8	Round Washer	OD 56mm x ID 33mm x 4mm Thk	6	AISI Type 316/Equiv.
9	Tension and Weight Chain Padeye	As per Drawing No. 25135-1M06	2	Q355B/Equiv. (HDG)
10	NC3 Anchor	M36 x 4P	8	SS A4-70+#45+Q235B/Equiv. (SS+HDG)
11	Hex Bolt	M36 x 4P x 100mm L (Fully threaded)	8	SS A4-70/Equiv.
12	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
13	Shear Chain Padeye	As per Drawing No. 25135-1M06	2	Q355B/Equiv. (HDG)
14	NC3 Anchor	M36 x 4P	8	SS A4-70+#45+Q235B/Equiv. (SS+HDG)
15	Hex Bolt	M36 x 4P x 100mm L (Fully threaded)	8	SS A4-70/Equiv.
16	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
17	Tension Chain Assembly	∅26 x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
18	Weight Chain Assembly	∅26 x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
19	Shear Chain Assembly	∅28 x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)



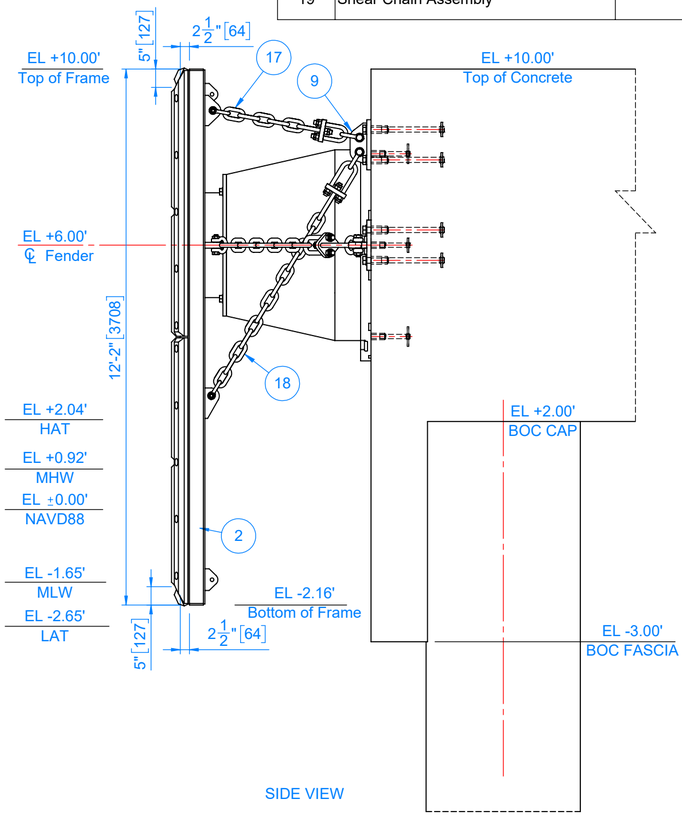
TOP VIEW



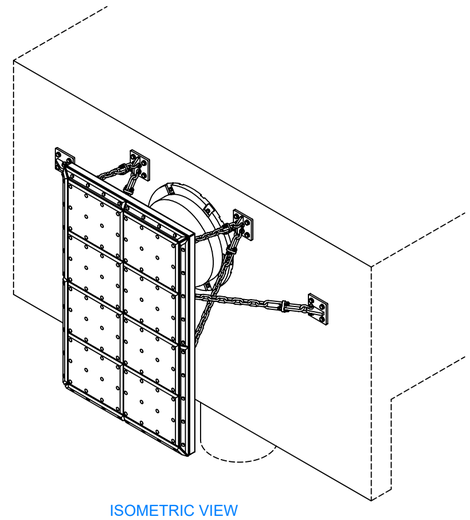
SECTION A-A
SCALE 1 : 4
UHMW Pad Wear Allowance Detail



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW
SCALE 1:60

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- All chain bracket anchors need to be HDG as per ASTM A153 or A123 to minimum thickness of 85 microns unless specified otherwise.
- Only items shown in BOM are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/14/21	ISSUED FOR CONSTRUCTION	ST	PS	
A	09/22/21	ISSUED FOR APPROVAL	AD	PS	

DRAWN	Ayan.Dey
DESIGNED	Kaushal.Patel
CHECKED	Ayan.Dey
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:30
SIZE	A2

FOR CONSTRUCTION

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Web : www.trelleborg.com/en/marine-and-infrastructure

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TITLE:- GENERAL ARRANGEMENT SCN1000 F1.5 (DELIVERY BERTH)

DRAWING NO :- 25135-1M01 Rev. 0

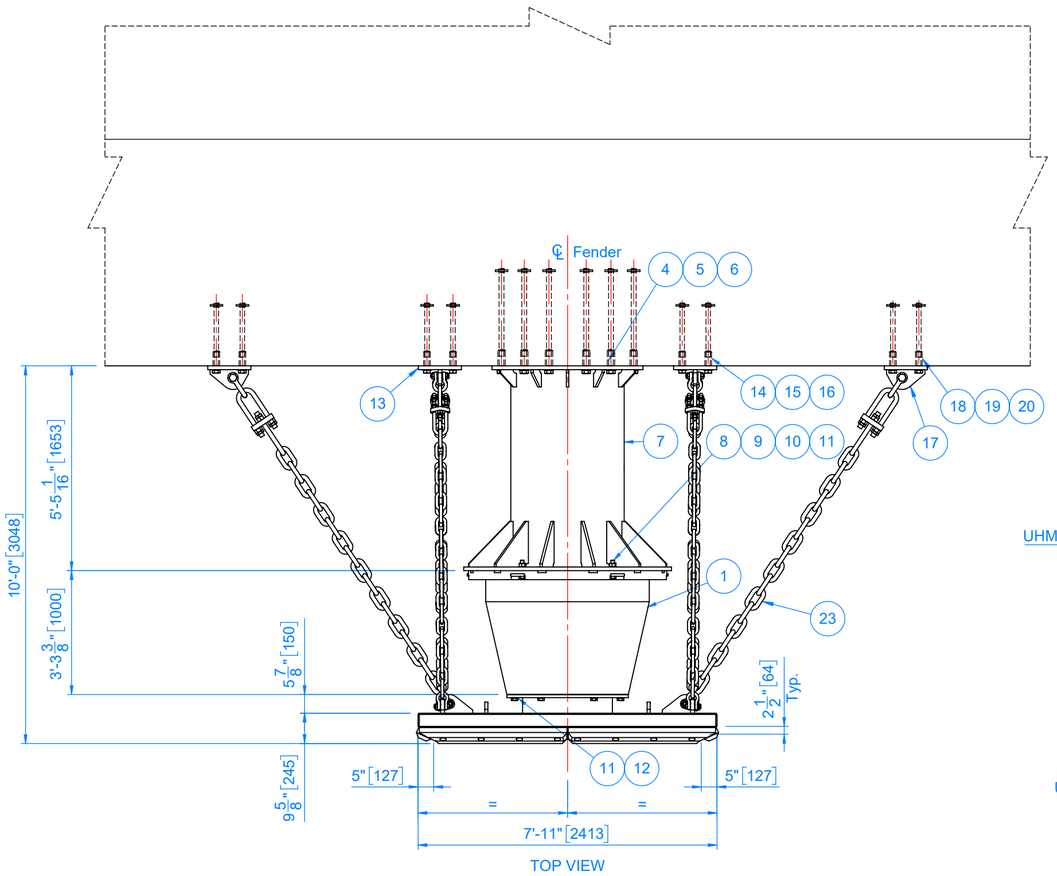
PROJECT:-CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 1 VER : 10

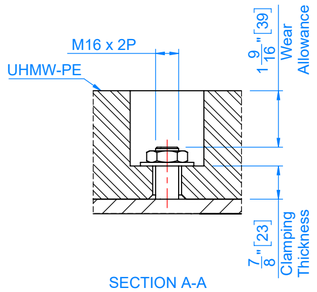
Performance Table (CV)	
Fender Type	SCN 1000 F1.5
Fender Rated Deflection	72 %
Energy	313.5 ft-kips (425 kNm)
Reaction	160.3 kips (713 kN)
Performance Tolerance	Energy -10%
	Reaction +10%
Dimensional Tolerance	±3% or ±2 mm (whichever is the greater)

Total Number of Systems:- 10 Nos.

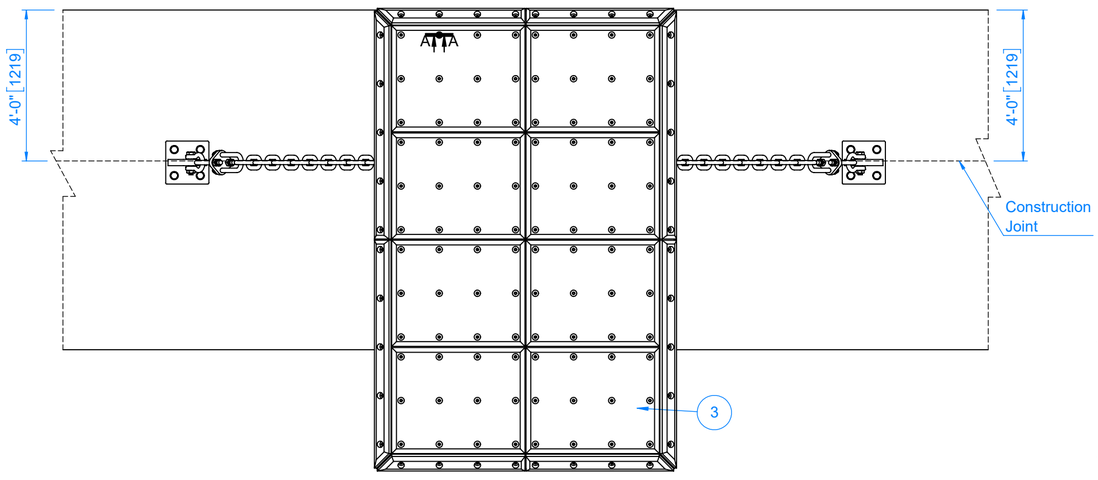
Part No.	Description	Dimension	Qty / System	Material
1	SCN Fender	SCN1000 F1.5	1	Rubber + Steel
2	Frontal Frame (Colour - Black)	12'-2" x 7'-11" x 6 11/16"	1	Q355B/Equiv. (Painted)
3	Facing Pad (Colour - Blue)	2 15/16" Thk	1	UHMW-PE (Virgin)
4	NC3 Anchor	M39 x 4P	10	AISI Type 316+#45+Q235B/Equiv. (SS+HDG)
5	Hex Bolt	M39 x 4P x 100mm L (Fully Threaded)	10	AISI Type 316/Equiv.
6	Round Washer	OD 72mm x ID 42mm x 6mm Thk	10	AISI Type 316/Equiv.
7	Fender Spool	As Per Drawing No 25135-2M07	1	Q355B/Equiv. (Painted)
8	Hex Bolt	M30 x 3.5P x 130mm L (Fully Threaded)	6	AISI Type 316/Equiv.
9	Suitable 'L' Washer (For SCN 1000 F1.5)	As per Drawing No. 25135-2M05	6	AISI Type 316/Equiv.
10	Hex Nut	M30 x 3.5P	6	AISI Type 316/Equiv.
11	Round Washer	OD 56mm x ID 33mm x 4mm Thk	12	AISI Type 316/Equiv.
12	Hex Bolt	M30 x 3.5P x 90mm L (Fully Threaded)	6	AISI Type 316/Equiv.
13	Tension and Weight Chain Padeye	As per Drawing No. 25135-2M06	2	Q355B/Equiv. (HDG)
14	NC3 Anchor	M36 x 4P	8	SS A4-70+#45+Q235B/Equiv. (SS+HDG)
15	Hex Bolt	M36 x 4P x 100mm L (Fully Threaded)	8	SS A4-70/Equiv.
16	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
17	Shear Chain Padeye	As per Drawing No. 25135-2M06	2	Q355B/Equiv. (HDG)
18	NC3 Anchor	M36 x 4P	8	SS A4-70+#45+Q235B/Equiv. (SS+HDG)
19	Hex Bolt	M36 x 4P x 100mm L (Fully Threaded)	8	SS A4-70/Equiv.
20	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
21	Tension Chain Assembly	∅26mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
22	Weight Chain Assembly	∅26mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
23	Shear Chain Assembly	∅34mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)



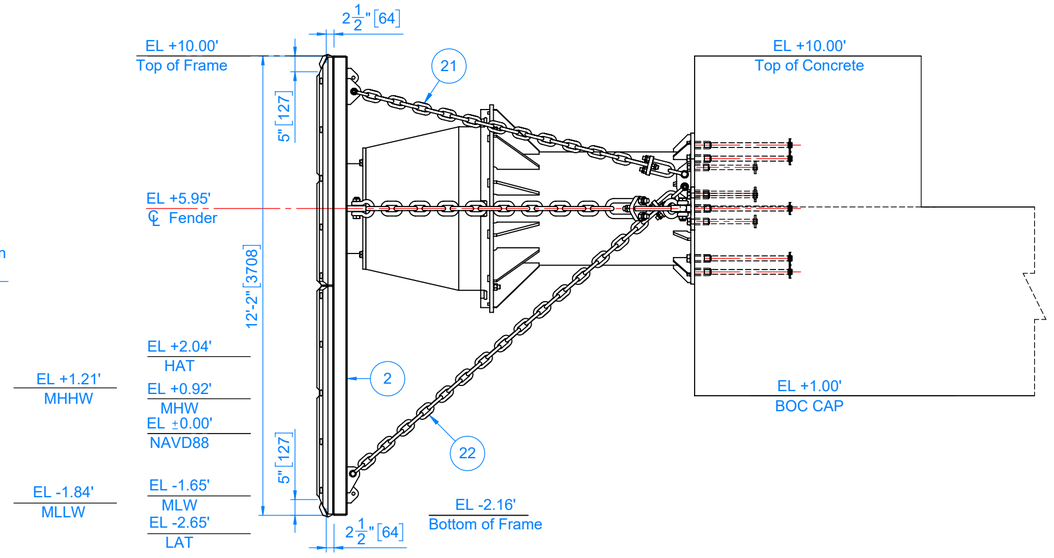
TOP VIEW



SECTION A-A
SCALE 1 : 3
UHMW Pad Wear Allowance Detail



FRONT VIEW



SIDE VIEW

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- All chain bracket anchors need to be HDG as per ASTM A153 or A123 to minimum thickness of 85 microns unless specified otherwise.
- Only items shown in BOM are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/16/21	ISSUED FOR CONSTRUCTION	VP	PS	
A	10/13/21	ISSUED FOR APPROVAL	VP	PS	

DRAWN	Vishal.Panchal
DESIGNED	Kaushal.Patel
CHECKED	Vishal.Panchal
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:35
SIZE A2	

FOR CONSTRUCTION

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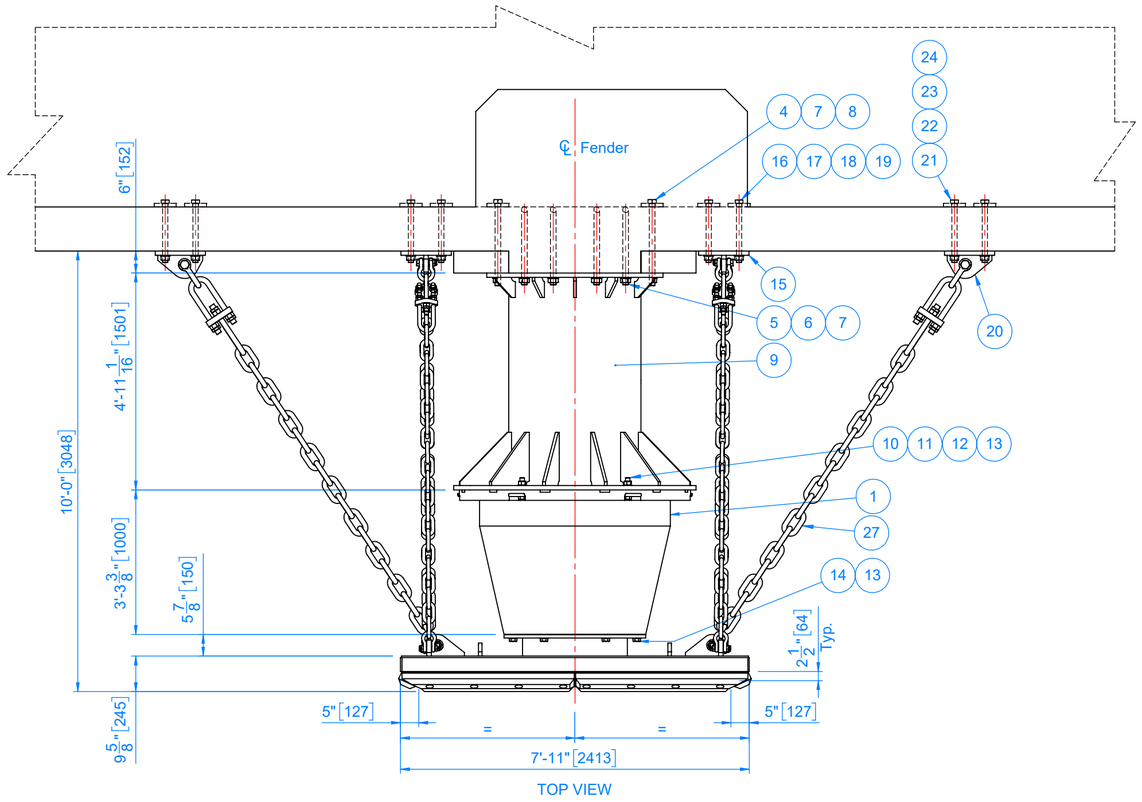
TRELLEBORG

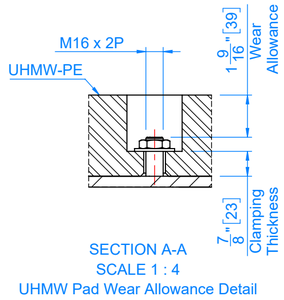
TITLE:- GENERAL ARRANGEMENT SCN1000 F1.5 (INSTALLATION BERTH) (TYPE-1)

DRAWING NO :- 25135-2M01 Rev. 0

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 2 VER : 10



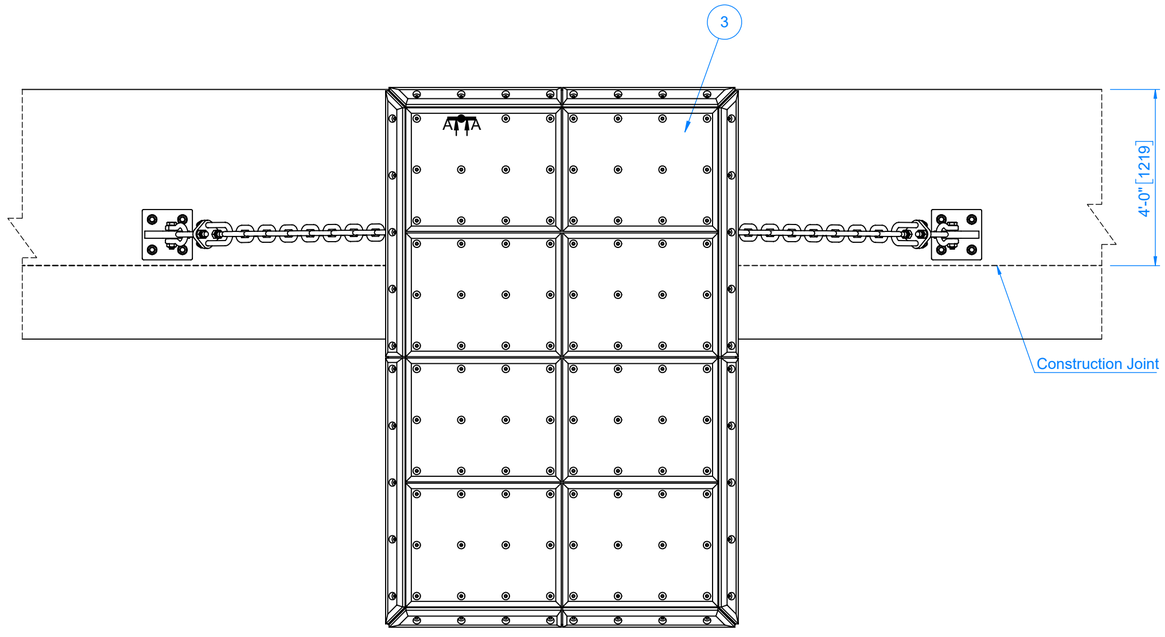


SECTION A-A
SCALE 1 : 4
UHMW Pad Wear Allowance Detail

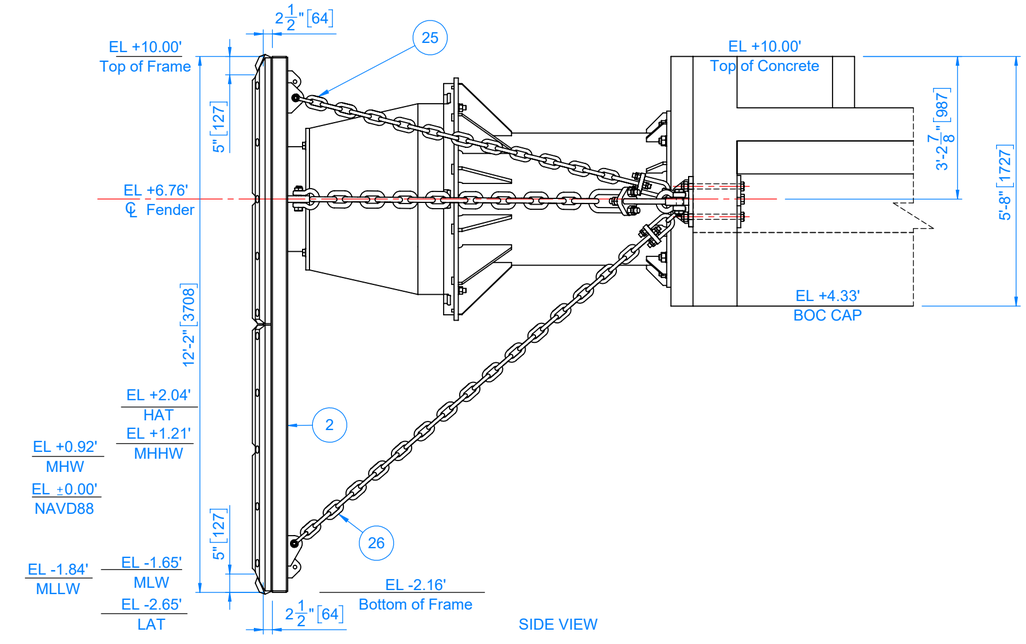
Performance Table (CV)	
Fender Type	SCN 1000 F1.5
Fender Rated Deflection	72 %
Energy	313.5 ft-kips (425 kNm)
Reaction	160.3 kips (713 kN)
Performance Tolerance	Energy -10%
	Reaction +10%
Dimensional Tolerance	±3% or ±2 mm (whichever is the greater)

Total Number of Systems:- 6 Nos.

Part No.	Description	Dimension	Qty / System	Material
1	SCN Fender	SCN1000 F1.5	1	Rubber + Steel
2	Frontal Frame (Colour - Black)	12'-2" x 7'-11" x 6 11/16"	1	Q355B/Equiv. (Painted)
3	Facing Pad (Colour - Blue)	2 15/16" Thk	1	UHMW-PE (Virgin)
4	Hex Bolt	M39 x 4P x 570 mm L (100 mm Threaded)	2	AISI Type 316/Equiv.
5	EC2 Anchor	M39 x 4P x 540 mm L (Fully threaded)	8	AISI Type 316/Equiv.
6	Round Washer	OD 72mm x ID 42mm x 6mm Thk	10	AISI Type 316/Equiv.
7	Hex Nut	M39 x 4P	10	AISI Type 316/Equiv.
8	Bearing Plate (For Fender Spool)	152mm x 152mm x 25mm Thk	2	Q235B/Equiv. (HDG)
9	Fender Spool	As Per Drawing No 25135-5M07	1	Q355B/Equiv. (Painted)
10	Hex Bolt	M30 x 3.5P x 130mm L (Fully Threaded)	6	AISI Type 316/Equiv.
11	Suitable 'L' Washer (For SCN 1000 F1.5)	As per Drawing No. 25135-5M05	6	AISI Type 316/Equiv.
12	Hex Nut	M30 x 3.5P	6	AISI Type 316/Equiv.
13	Round Washer	OD 56mm x ID 33mm x 4mm Thk	12	AISI Type 316/Equiv.
14	Hex Bolt	M30 x 3.5P x 90mm L (Fully Threaded)	6	AISI Type 316/Equiv.
15	Tension and Weight Chain Padeye	As per Drawing No. 25135-5M06	2	Q355B/Equiv. (HDG)
16	Hex Bolt	M36 x 4P x 410 mm L (90 mm Threaded)	8	SS A4-70/Equiv.
17	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
18	Hex Nut	M36 x 4P	8	AISI Type 316/Equiv.
19	Bearing Plate (For Tension & Weight Chain Padeye)	152mm x 152mm x 25mm Thk	8	Q235B/Equiv. (HDG)
20	Shear Chain Padeye	As per Drawing No. 25135-5M06	2	Q355B/Equiv. (HDG)
21	Hex Bolt	M36 x 4P x 410 mm L (90 mm Threaded)	8	SS A4-70/Equiv.
22	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
23	Hex Nut	M36 x 4P	8	AISI Type 316/Equiv.
24	Bearing Plate (For Shear Chain Padeye)	152mm x 152mm x 25mm Thk	8	Q235B/Equiv. (HDG)
25	Tension Chain Assembly	∅26mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
26	Weight Chain Assembly	∅26mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
27	Shear Chain Assembly	∅34mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)



FRONT VIEW



SIDE VIEW

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/15/21	ISSUED FOR CONSTRUCTION	ST	PS	
A	10/12/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	Kaushal.Patel
CHECKED	Vishal.Galia
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:30
SIZE	A2

FOR CONSTRUCTION

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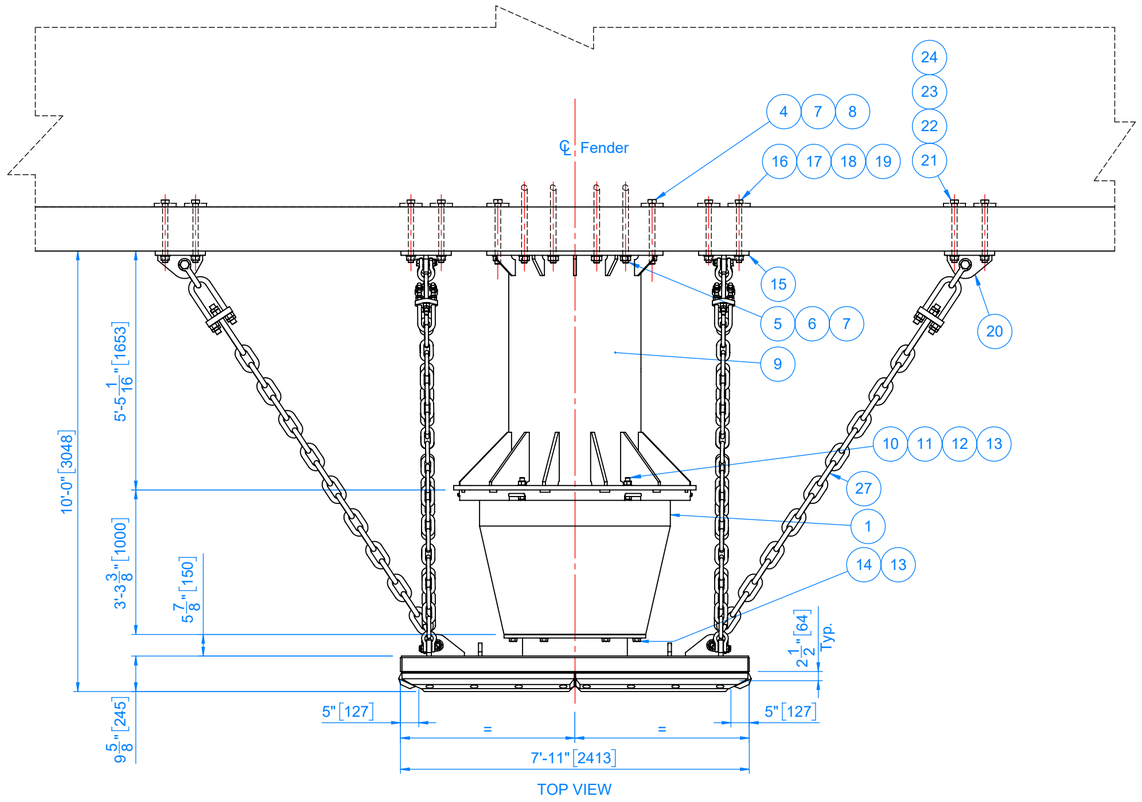
TITLE:- GENERAL ARRANGEMENT SCN1000 F1.5 (INSTALLATION BERTH) (TYPE-2)

DRAWING NO :- 25135-5M01

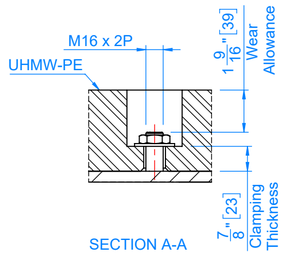
Rev. 0

PROJECT:-CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 2 | VER : 10



TOP VIEW

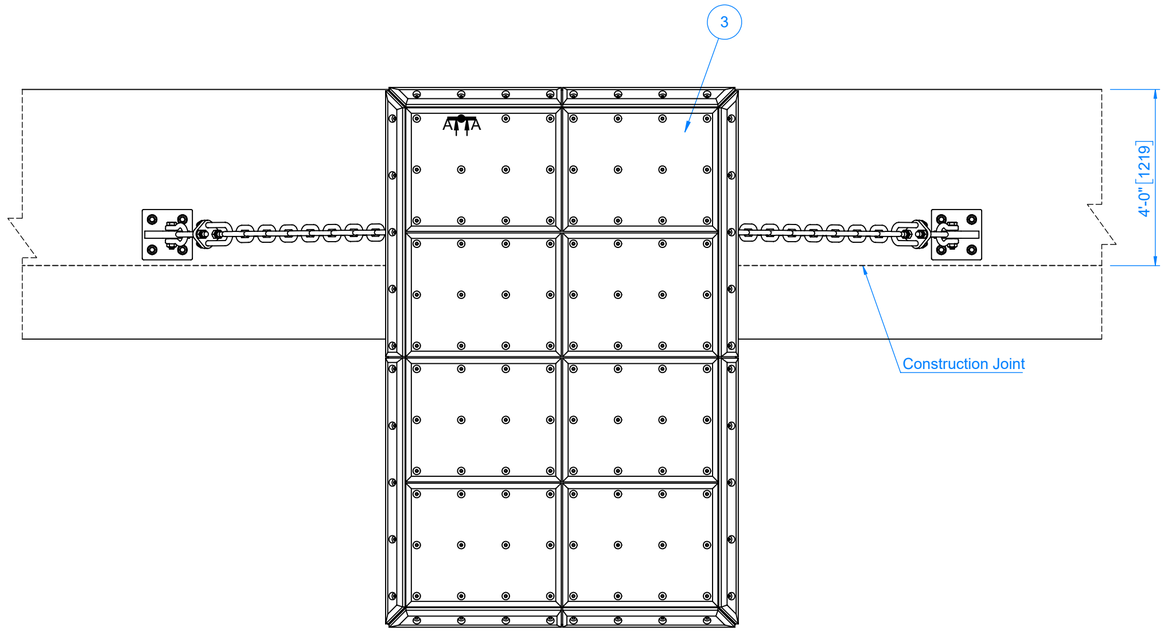


SECTION A-A
SCALE 1 : 4
UHMW Pad Wear Allowance Detail

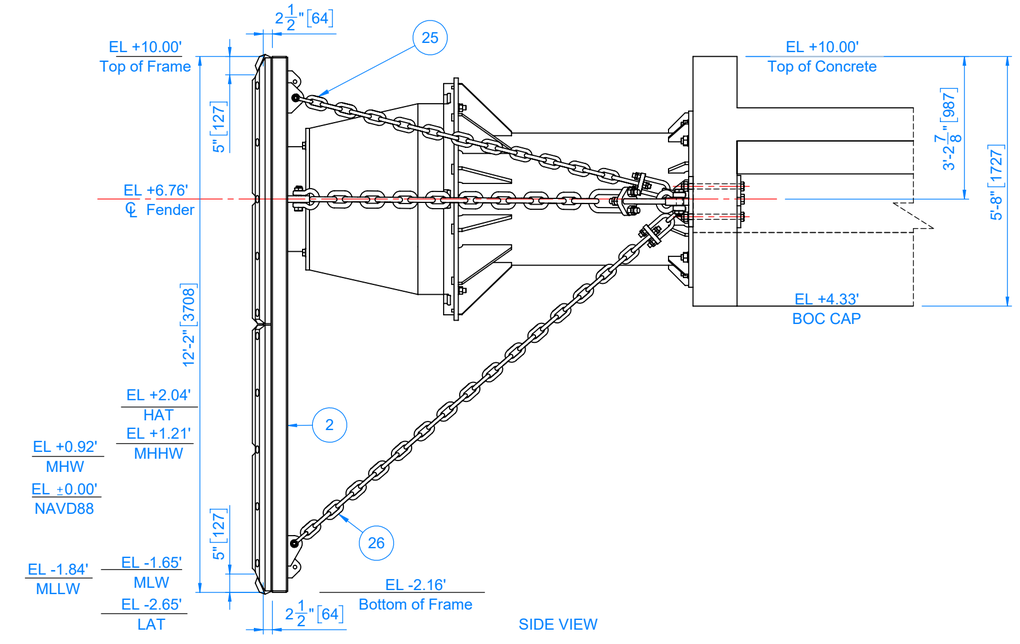
Performance Table (CV)	
Fender Type	SCN 1000 F1.5
Fender Rated Deflection	72 %
Energy	313.5 ft-kips (425 kNm)
Reaction	160.3 kips (713 kN)
Performance Tolerance	Energy -10%
	Reaction +10%
Dimensional Tolerance	±3% or ±2 mm (whichever is the greater)

Total Number of Systems:- 5 Nos.

Part No.	Description	Dimension	Qty / System	Material
1	SCN Fender	SCN1000 F1.5	1	Rubber + Steel
2	Frontal Frame (Colour - Black)	12'-2" x 7'-11" x 6 11/16"	1	Q355B/Equiv. (Painted)
3	Facing Pad (Colour - Blue)	2 15/16" Thk	1	UHMW-PE (Virgin)
4	Hex Bolt	M39 x 4P x 420 mm L (100 mm Threaded)	2	AISI Type 316/Equiv.
5	EC2 Anchor	M39 x 4P x 540 mm L (Fully threaded)	8	AISI Type 316/Equiv.
6	Round Washer	OD 72mm x ID 42mm x 6mm Thk	10	AISI Type 316/Equiv.
7	Hex Nut	M39 x 4P	10	AISI Type 316/Equiv.
8	Bearing Plate (For Fender Spool)	152mm x 152mm x 25mm Thk	2	Q235B/Equiv. (HDG)
9	Fender Spool	As Per Drawing No 25135-6M07	1	Q355B/Equiv. (Painted)
10	Hex Bolt	M30 x 3.5P x 130mm L (Fully Threaded)	6	AISI Type 316/Equiv.
11	Suitable 'L' Washer (For SCN 1000 F1.5)	As per Drawing No. 25135-6M05	6	AISI Type 316/Equiv.
12	Hex Nut	M30 x 3.5P	6	AISI Type 316/Equiv.
13	Round Washer	OD 56mm x ID 33mm x 4mm Thk	12	AISI Type 316/Equiv.
14	Hex Bolt	M30 x 3.5P x 90mm L (Fully Threaded)	6	AISI Type 316/Equiv.
15	Tension and Weight Chain Padeye	As per Drawing No. 25135-6M06	2	Q355B/Equiv. (HDG)
16	Hex Bolt	M36 x 4P x 410 mm L (90 mm Threaded)	8	SS A4-70/Equiv.
17	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
18	Hex Nut	M36 x 4P	8	AISI Type 316/Equiv.
19	Bearing Plate (For Tension & Weight Chain Padeye)	152mm x 152mm x 25mm Thk	8	Q235B/Equiv. (HDG)
20	Shear Chain Padeye	As per Drawing No. 25135-6M06	2	Q355B/Equiv. (HDG)
21	Hex Bolt	M36 x 4P x 410 mm L (90 mm Threaded)	8	SS A4-70/Equiv.
22	Round Washer	OD 66mm x ID 39mm x 5mm Thk	8	AISI Type 316/Equiv.
23	Hex Nut	M36 x 4P	8	AISI Type 316/Equiv.
24	Bearing Plate (For Shear Chain Padeye)	152mm x 152mm x 25mm Thk	8	Q235B/Equiv. (HDG)
25	Tension Chain Assembly	∅26mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
26	Weight Chain Assembly	∅26mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)
27	Shear Chain Assembly	∅34mm x 4D Open Link	2	Gr. U3, G-2130, Gr. 8, Gr. 8.8, Q355B/Equiv. (HDG)



FRONT VIEW



SIDE VIEW

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/15/21	ISSUED FOR CONSTRUCTION	ST	PS	
A	10/20/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	Kaushal.Patel
CHECKED	Vishal.Galia
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:30
SIZE	A2

FOR CONSTRUCTION

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Suite 1725 Houston,
TX 77042, USA

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Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT SCN1000 F1.5 (INSTALLATION BERTH) (TYPE-3)

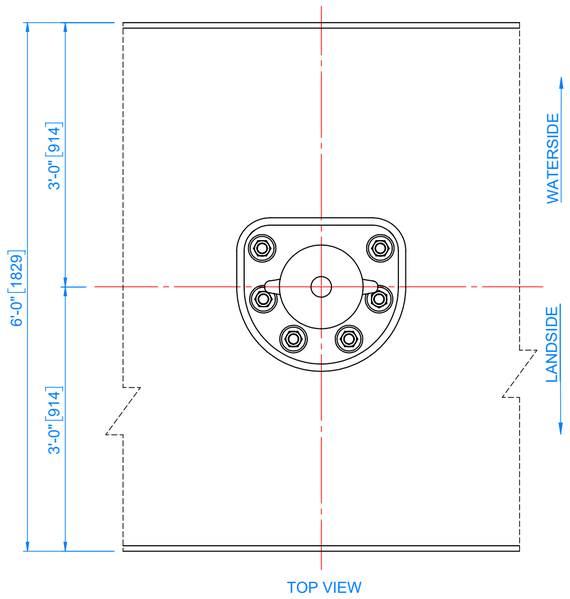
DRAWING NO :- 25135-6M01 Rev. 0

PROJECT:-CONNECTICUT PORT AUTHORITY - STATE PIER

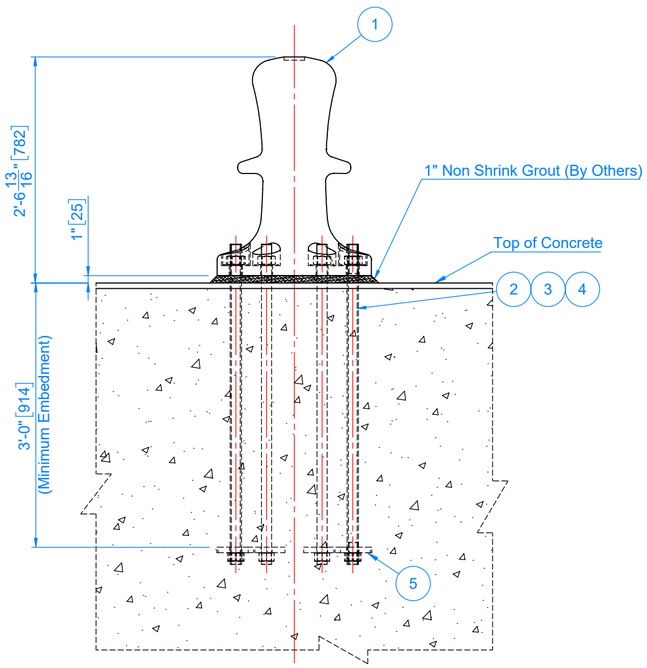
SHEET: 1 OF 2 VER : 10

Total Number of Systems:- 7 Nos

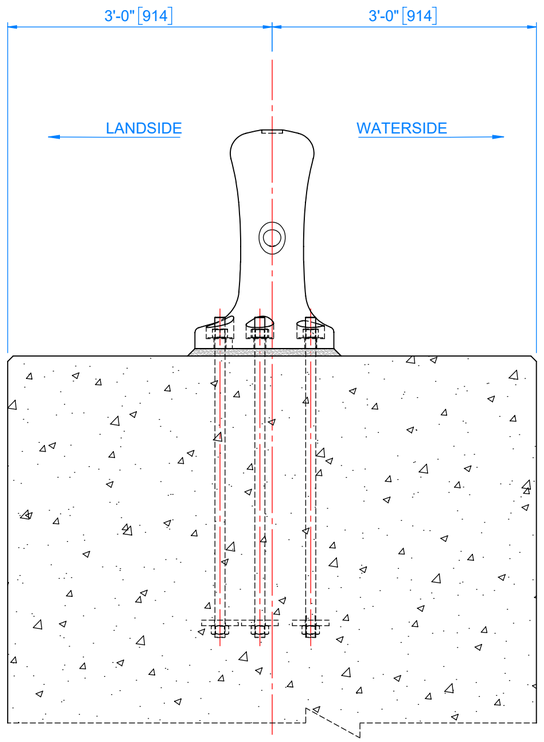
Part No.	Description	Size	Qty / System	Material
1	MSB - 50 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35/Equiv. (Painted)
2	End Threaded Anchor Rod	Ø1 3/8" - 6 UNC-2A x 3'-7 5/8" L	6	ASTM F1554 Gr. 105/Equiv. (HDG)
3	Hex Nut	Ø1 3/8" - 6 UNC-2B	12	ASTM A563 DH/Equiv. (HDG)
4	Round Washer, Ø1 3/8"	OD 3 1/4" x ID 1 1/2" x 1/8" Thk	6	ASTM F436/Equiv. (HDG)
5	Plate Washer	5" x 5" x 3/4" Thk	6	ASTM A36/Equiv. (HDG)



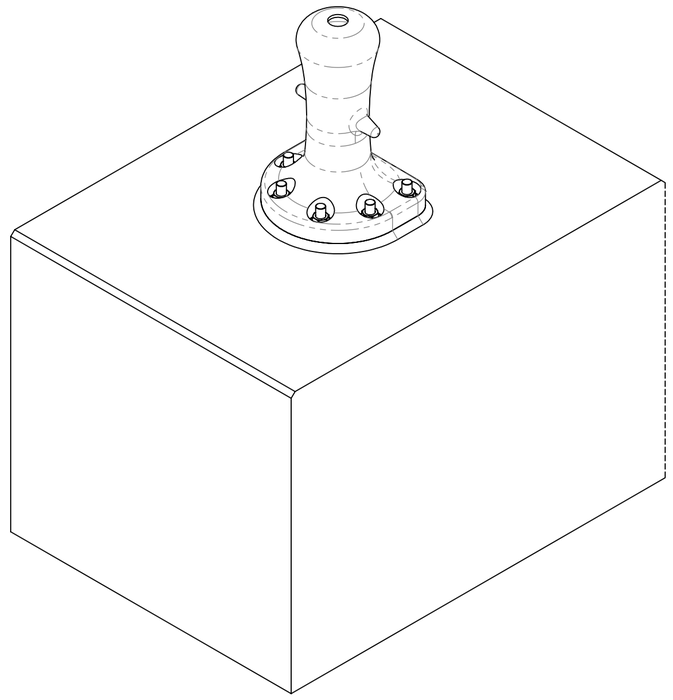
TOP VIEW



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
B	10/18/21	ANCHOR LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:15
SIZE A2	

FOR CONSTRUCTION

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Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
MSB - 50 CAST STEEL SINGLE BITT BOLLARD
DELIVERY BERTH

DRAWING NO :- 25135-3M01

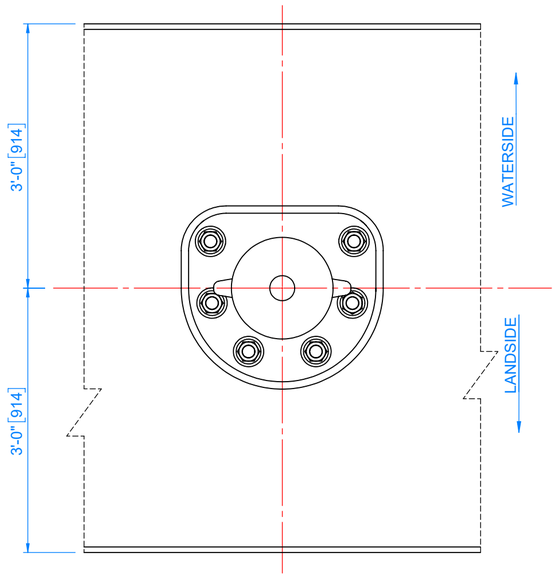
Rev. 0

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

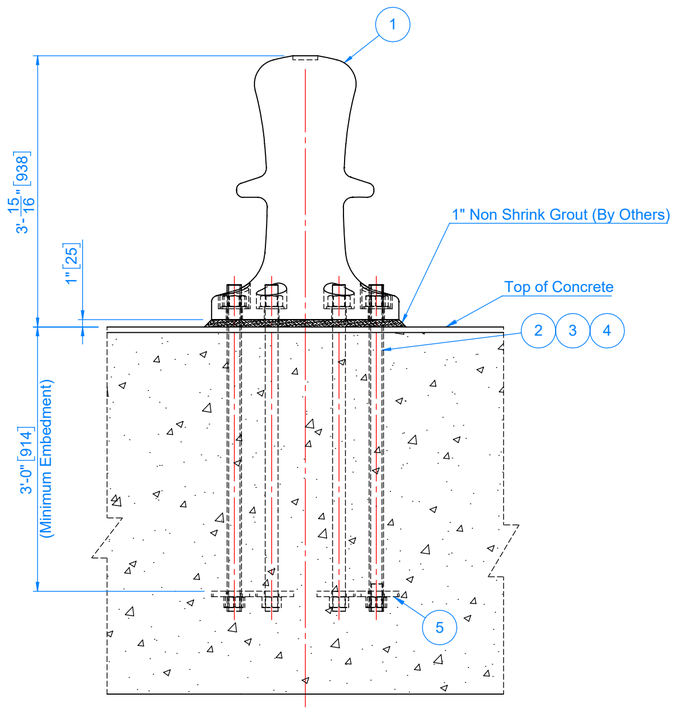
SHEET: 1 OF 2 VER.: 12

Total Number of Systems:- 8 Nos

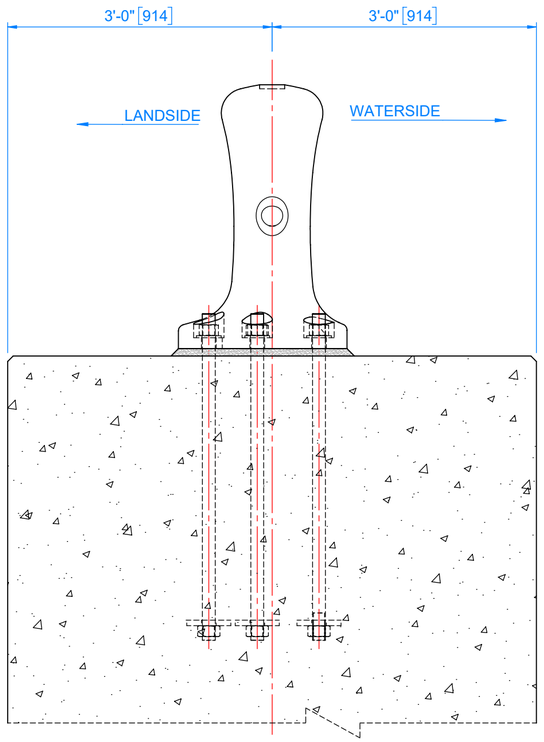
Part No.	Description	Size	Qty / System	Material
1	MSB - 75 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35/Equiv. (Painted)
2	End Threaded Anchor Rod	Ø1 3/4" - 5 UNC-2A x 3'-8 1/2" L	6	ASTM F1554 Gr. 105/Equiv. (HDG)
3	Hex Nut	Ø1 3/4" - 5 UNC-2B	12	ASTM A563 DH/Equiv. (HDG)
4	Round Washer, Ø1 3/4"	OD 3 3/8" x ID 1 7/8" x 1/4" Thk	6	ASTM F436/Equiv. (HDG)
5	Plate Washer	6" x 6" x 3/4" Thk	6	ASTM A36/Equiv. (HDG)



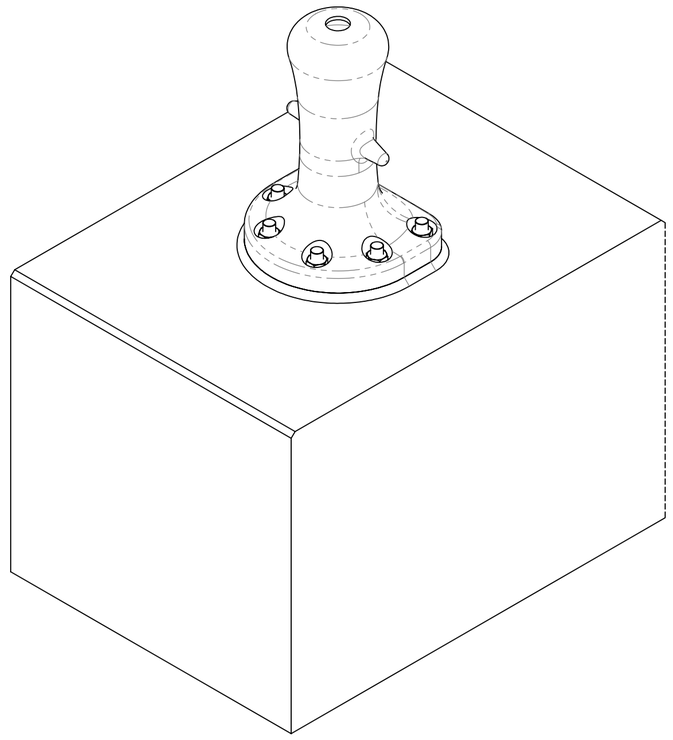
TOP VIEW



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
B	10/18/21	ANCHOR LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:15
SIZE A2	

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TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
MSB - 75 CAST STEEL SINGLE BITT BOLLARD
MAIN PLATFORM (NEW CONCRETE)

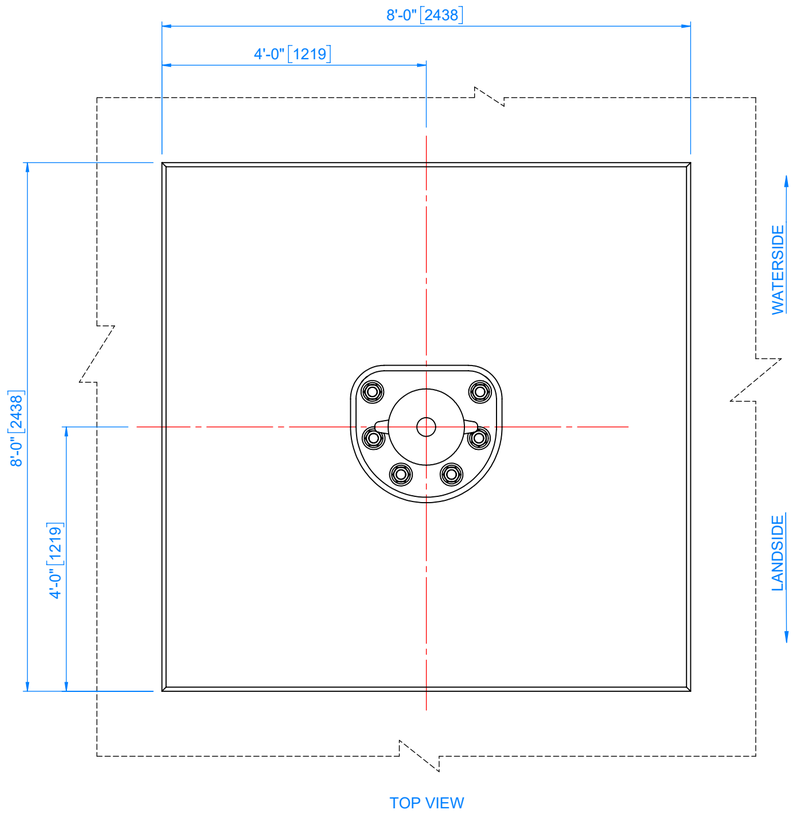
DRAWING NO :- 25135-7M01 Rev. 0

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

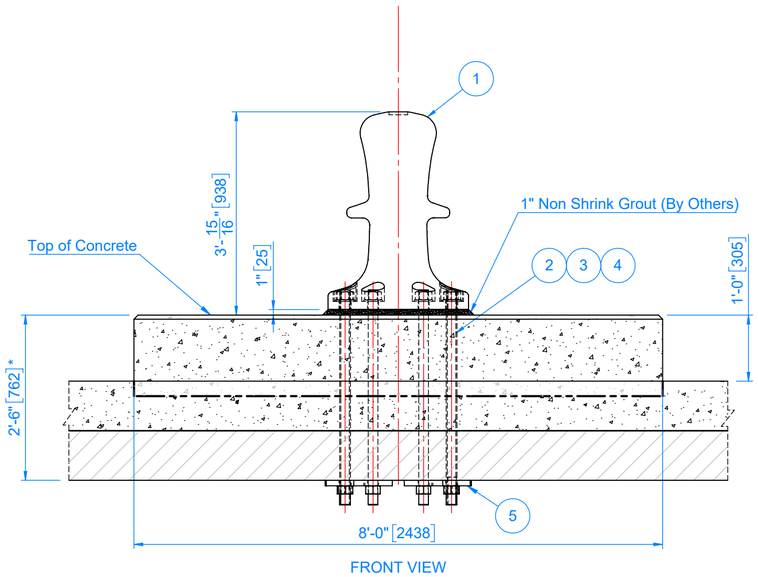
SHEET: 1 OF 2 VER : 12

Total Number of Systems:- 10 Nos

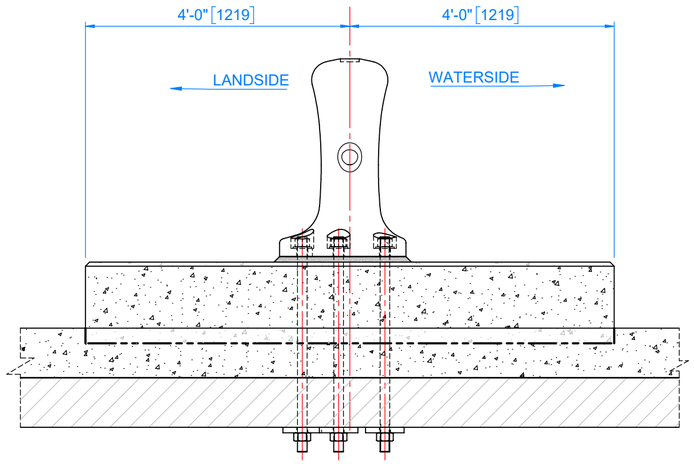
Part No.	Description	Size	Qty / System	Material
1	MSB - 75 Cast Steel Single Bitt Bollard	As per Drawing	1	ASTM A27 Gr. 65 - 35/Equiv. (Painted)
2	End Threaded Anchor Rod	Ø1 3/4" - 5 UNC-2A x 3'-3" L	6	ASTM F1554 Gr. 105/Equiv. (HDG)
3	Hex Nut	Ø1 3/4" - 5 UNC-2B	12	ASTM A563 DH/Equiv. (HDG)
4	Round Washer, Ø1 3/4"	OD 3 3/8" x ID 1 7/8" x 1/4" Thk	6	ASTM F436/Equiv. (HDG)
5	Plate Washer	7" x 7" x 1" Thk	6	ASTM A36/Equiv. (HDG)



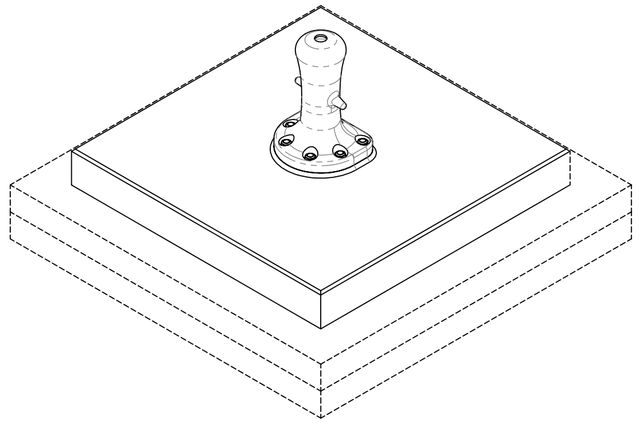
TOP VIEW



FRONT VIEW



SIDE VIEW



ISOMETRIC VIEW
SCALE : 1:30

Note:-
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- * Dimensions to be confirmed by client.
- Only the items shown in Bill of Materials are in Trelleborg's scope of supply.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
0	12/14/21	ISSUED FOR CONSTRUCTION	VP	PS	
B	10/19/21	THREAD LENGTH UPDATED	AD	PS	
A	08/18/21	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Kaushal.Patel
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:20
SIZE A2	

FOR CONSTRUCTION

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Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
MSB - 75 CAST STEEL SINGLE BITT BOLLARD
MAIN PLATFORM (CONCRETE PEDESTAL)

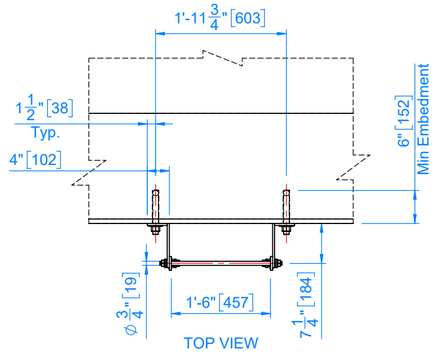
DRAWING NO :- 25135-8M01 Rev. 0

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

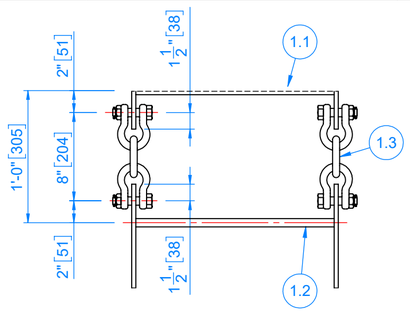
SHEET: 1 OF 2 VER : 12

1. Proposed Delivery Berth Ladder (Total Quantity: 06 Nos.)
Total Ladder Assembly Weight Excluding Anchors: 168 lbs./Qty.

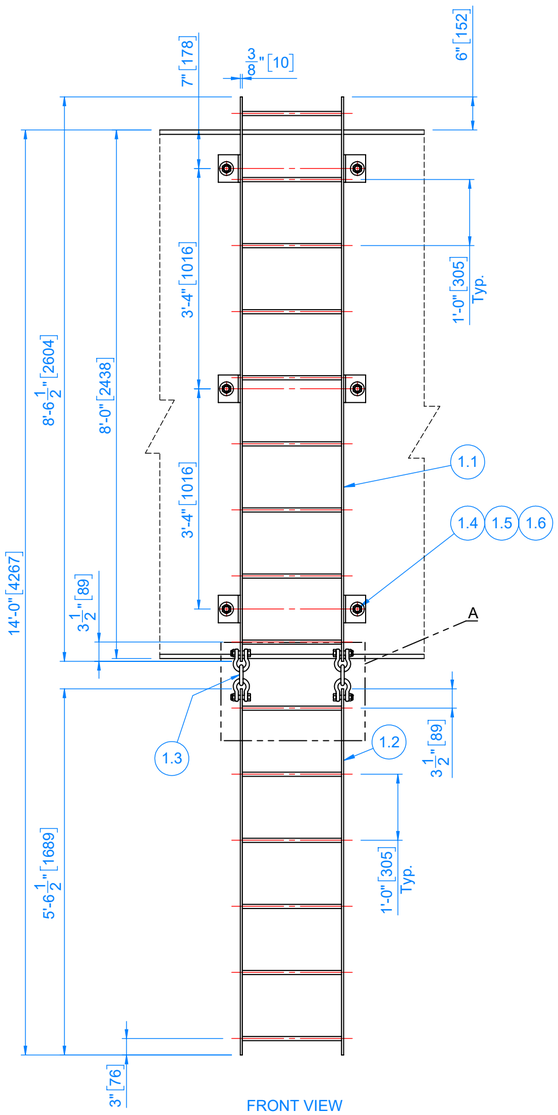
Part No.	Description	Dimension	Qty / System	Material
1.1	Ladder Assembly-1	As Per Drawing No 25135-4M03	1	Q355B (HDG)
1.2	Ladder Assembly-2	As Per Drawing No 25135-4M03	1	Q355B (HDG)
1.3	Ladder Connecting Chain Assembly	Ø16mm x 4D (Open Link)	2	Gr. U3, G-2130 (HDG)
1.4	EC2 Anchor	Ø 1" - 8 UNC - 2A x 8" L (Fully Threaded)	6	ASTM F1554 Gr. 105 (HDG)
1.5	Hex Nut	Ø 1" - 8 UNC - 2B	6	ASTM A563 DH (HDG)
1.6	Round Washer	OD 2 1/2" x ID 1 1/16" x 3/16" Thk	6	ASTM F436 (HDG)



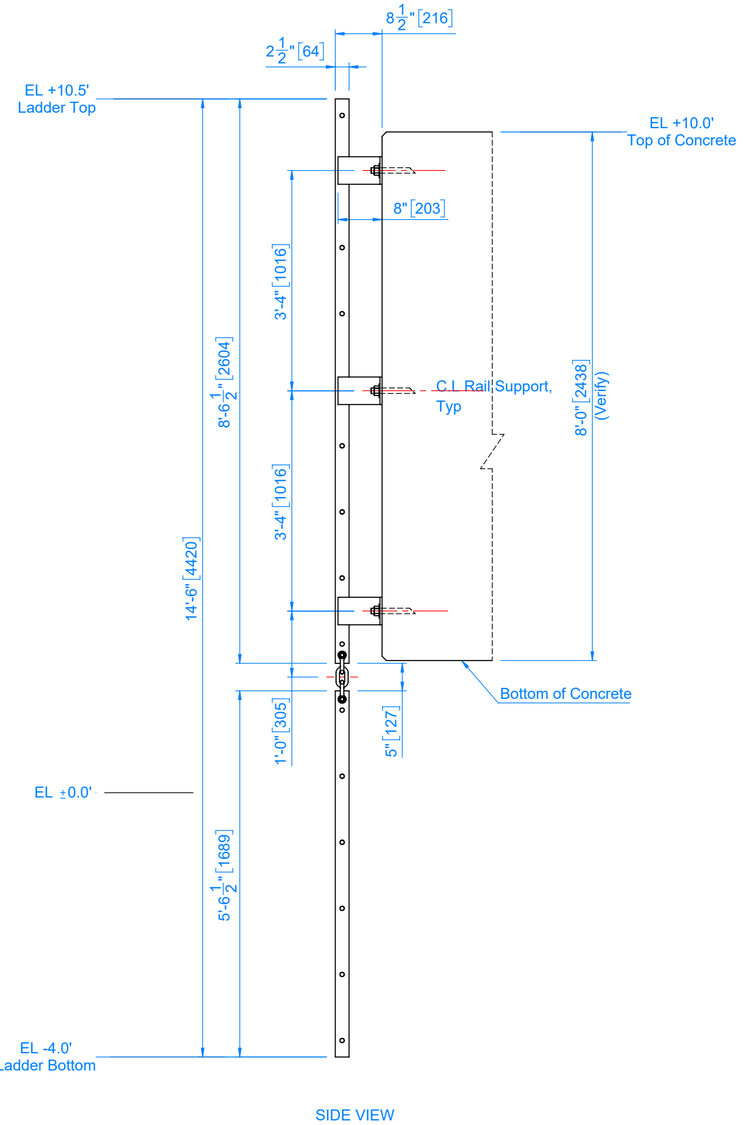
TOP VIEW



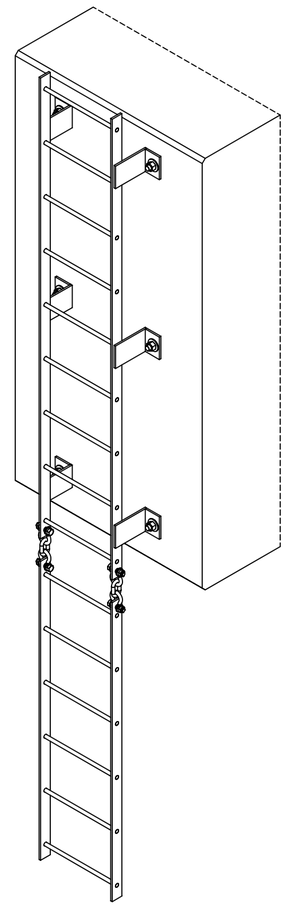
DETAIL A
SCALE 1 : 10



FRONT VIEW
1. Proposed Delivery Berth Ladder



SIDE VIEW



ISOMETRIC VIEW

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in TMS NA's scope of supply.
- For Ladder's all details, Refer drawing no S-534.
- Where applicable, HDG as per ASTM A153 or A123 to a minimum thickness of 85 microns unless specified otherwise.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	11/21/22	LADDER WEIGHT ADDED & ISSUED FOR CONSTRUCTION	SS	PS	
1	11/01/22	ISSUED FOR CONTRUCTION & LADDER ELEVATION CHANGED	SS	PS	
0	06/23/22	ISSUED FOR CONTRUCTION & REVISED AS NOTED	ST	PS	
B	05/05/22	REVISED AS NOTED	AP	PS	
A	03/09/22	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Vishal.Galia
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:20
SIZE	A2

FOR CONSTRUCTION

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Web : www.trelleborg.com/en/marine-and-infrastructure

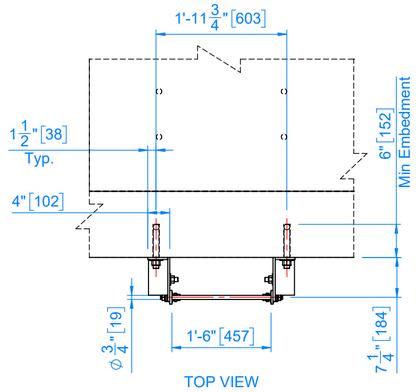
TRELLEBORG

TITLE:- GENERAL ARRANGEMENT
LADDER DETAILS
PROPOSED DELIVERY BERTH LADDER

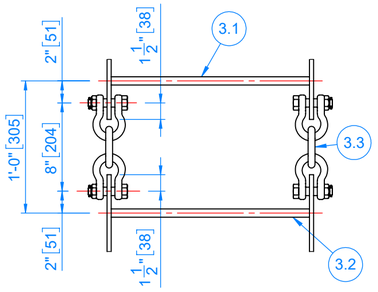
DRAWING NO :- 25135-4M02 Rev. 2

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

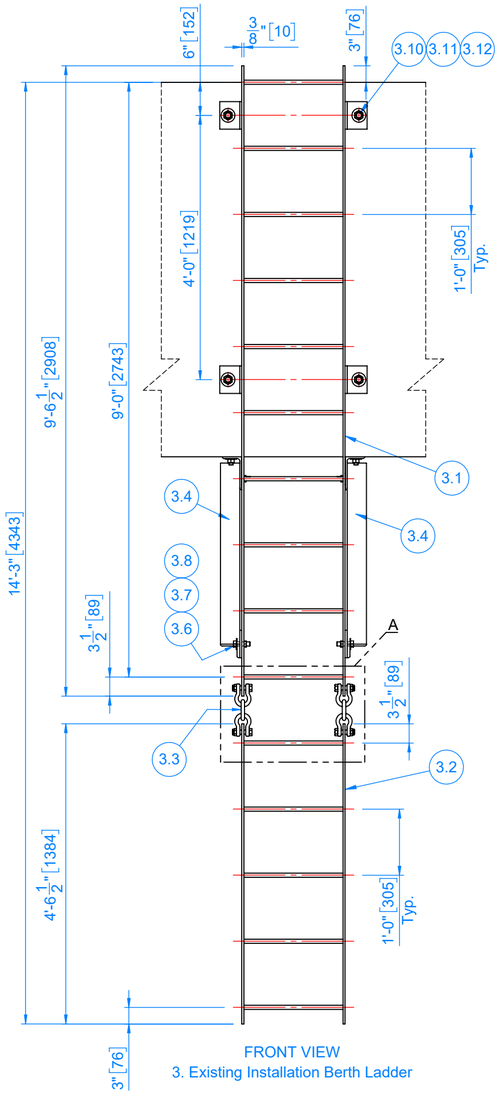
SHEET: 1 OF 1 VER : 20



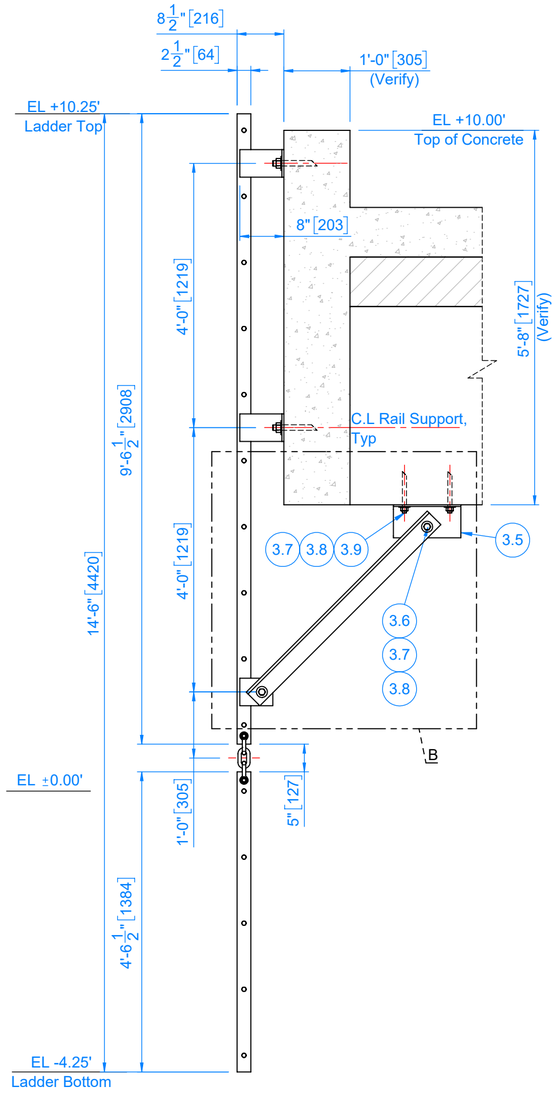
TOP VIEW



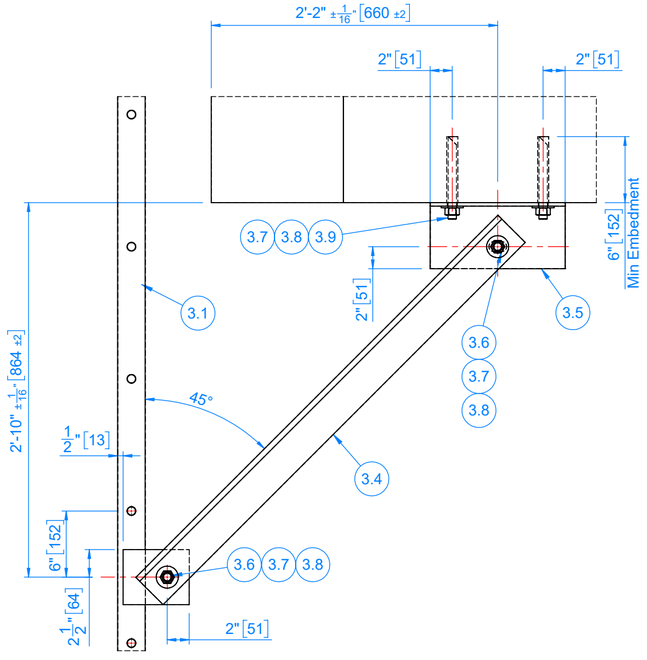
DETAIL A
SCALE 1 : 10



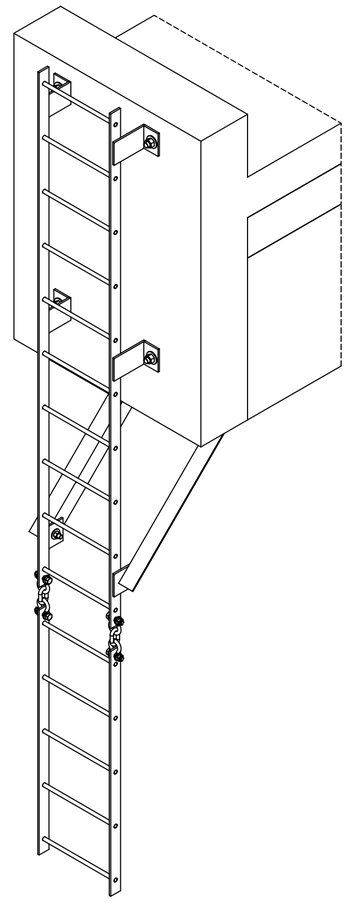
FRONT VIEW
3. Existing Installation Berth Ladder



SIDE VIEW



DETAIL B
SCALE 1 : 10



ISOMETRIC VIEW

3. Existing Installation Berth Ladder (Total Quantity: 9 Nos.)
Total Ladder Assembly Weight Excluding Anchors: 267 lbs./Qty.

Part No.	Description	Dimension	Qty / System	Material
3.1	Ladder Assembly-1	As Per Drawing No 25135-4M05	1	Q355B (HDG)
3.2	Ladder Assembly-2	As Per Drawing No 25135-4M05	1	Q355B (HDG)
3.3	Ladder Connecting Chain Assembly	Ø16mm x 4D (Open Link)	2	Gr. U3, G-2130 (HDG)
3.4	Bottom 'L' Angle	L 3 1/2" x 3 1/2" x 1/2" x 3'-10 1/2"	2	Q355B (HDG)
3.5	Bottom 'L' Bracket	L 6" x 3 1/2" x 5/16" x 1'- 1/4"	2	Q355B (HDG)
3.6	Hex Bolt	Ø 3/4" - 10 UNC - 2A x 2 1/2" L (Fully Threaded)	4	ASTM F1554 Gr. 105 (HDG)
3.7	Hex Nut	Ø 3/4" - 10 UNC - 2B	8	ASTM A563 DH (HDG)
3.8	Round Washer	OD 2" x ID 13/16" x 1/8" Thk	12	ASTM F436 (HDG)
3.9	EC2 Anchor	Ø 3/4" - 10 UNC - 2A x 7 1/2" L (Fully Threaded)	4	ASTM F1554 Gr. 105 (HDG)
3.10	EC2 Anchor	Ø 1" - 8 UNC - 2A x 8" L (Fully Threaded)	4	ASTM F1554 Gr. 105 (HDG)
3.11	Hex Nut	Ø 1" - 8 UNC - 2B	4	ASTM A563 DH (HDG)
3.12	Round Washer	OD 2 1/2" x ID 1 1/16" x 3/16" Thk	4	ASTM F436 (HDG)

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in TMS NA's scope of supply.
- For Ladder's all details, Refer drawing no S-534.
- Where applicable, HDG as per ASTM A153 or A123 to a minimum thickness of 85 microns unless specified otherwise.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
1	11/21/22	LADDER WEIGHT ADDED & ISSUED FOR CONSTRUCTION	SS	PS	
0	06/23/22	ISSUED FOR CONSTRUCTION	ST	PS	
B	05/05/22	REVISED AS NOTED	AP	PS	
A	03/10/22	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Vishal.Galia
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:20
SIZE A2	

FOR CONSTRUCTION

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TRELLEBORG

TITLE:- GENERAL ARRANGEMENT LADDER DETAILS EXISTING INSTALLATION BERTH LADDER

DRAWING NO :- 25135-4M04

Rev. 1

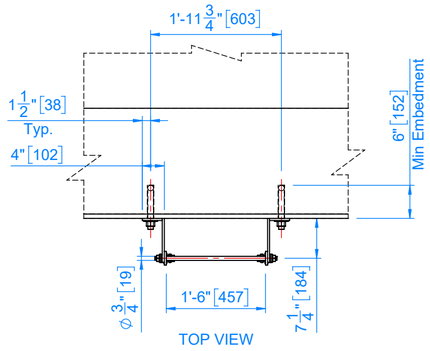
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 1

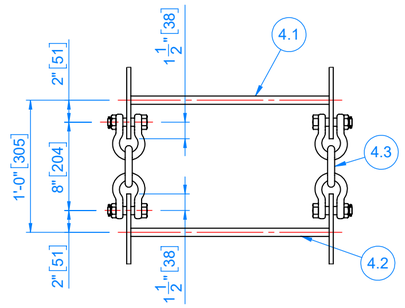
VER : 16

4. Installation Berth Ladder (Total Quantity: 5 Nos.)
Total Ladder Assembly Weight Excluding Anchors: 168 lbs./Qty.

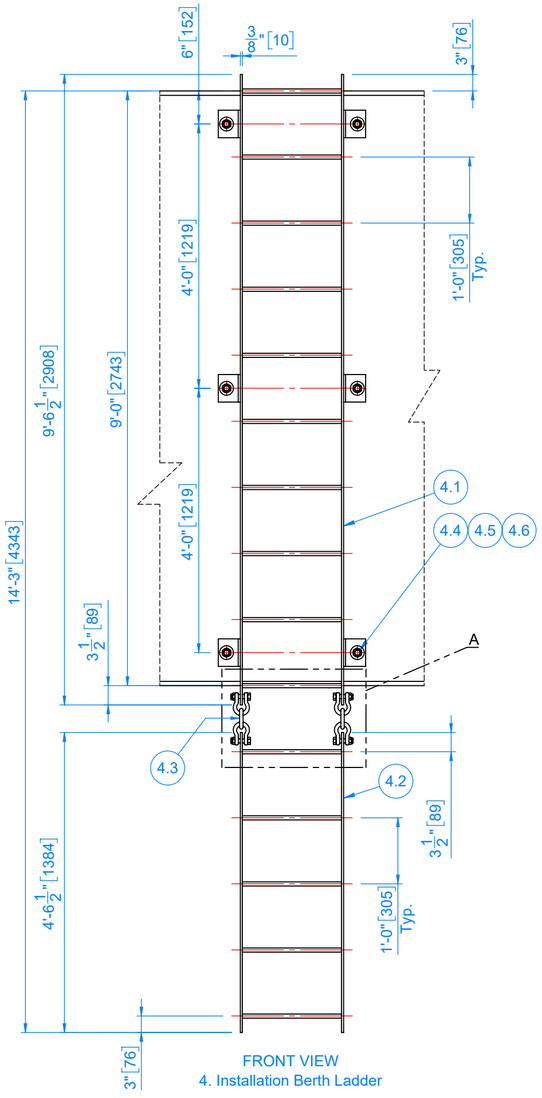
Part No.	Description	Dimension	Qty / System	Material
4.1	Ladder Assembly-1	As Per Drawing No 25135-4M07	1	Q355B (HDG)
4.2	Ladder Assembly-2	As Per Drawing No 25135-4M07	1	Q355B (HDG)
4.3	Ladder Connecting Chain Assembly	Ø16mm x 4D (Open Link)	2	Gr. U3, G-2130 (HDG)
4.4	EC2 Anchor	Ø 1" - 8 UNC - 2A x 8" L (Fully Threaded)	6	ASTM F1554 Gr. 105 (HDG)
4.5	Hex Nut	Ø 1" - 8 UNC - 2B	6	ASTM A563 DH (HDG)
4.6	Round Washer	OD 2 1/2" x ID 1 1/16" x 3/16" Thk	6	ASTM F436 (HDG)



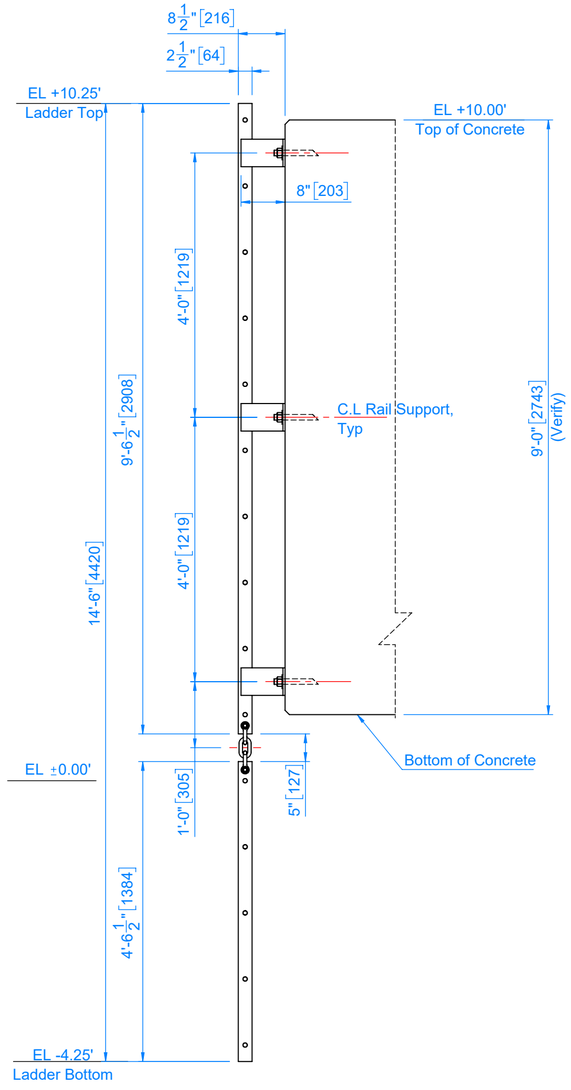
TOP VIEW



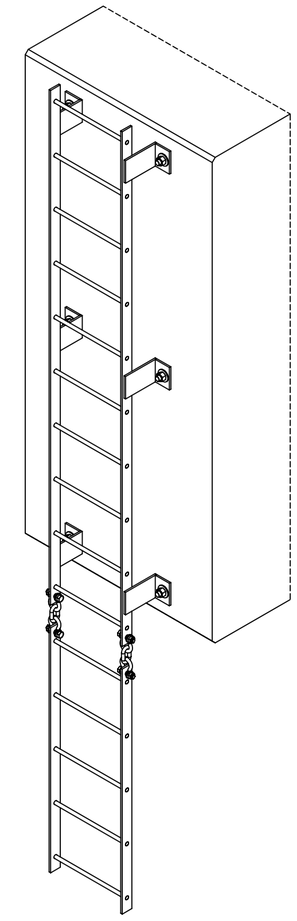
DETAIL A
SCALE 1 : 10



FRONT VIEW
4. Installation Berth Ladder



SIDE VIEW


ISOMETRIC VIEW

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in TMS NA's scope of supply.
- For Ladder's all details, Refer drawing no S-534.
- Where applicable, HDG as per ASTM A153 or A123 to a minimum thickness of 85 microns unless specified otherwise.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE	SIZE A2
1	11/21/22	LADDER WEIGHT ADDED & ISSUED FOR CONSTRUCTION	SS	PS		
0	06/23/22	ISSUED FOR CONSTRUCTION	ST	PS		
B	05/05/22	REVISD AS NOTED	AP	PS		
A	03/09/22	ISSUED FOR APPROVAL	VG	PS		

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Vishal.Galia
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:20

FOR CONSTRUCTION

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10375 Richmond Avenue, Suite 1725 Houston, TX 77042, USA
Tel : +1 (713) 800-7640
Email : tms.usa@trelleborg.com
Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT LADDER DETAILS INSTALLATION BERTH LADDER

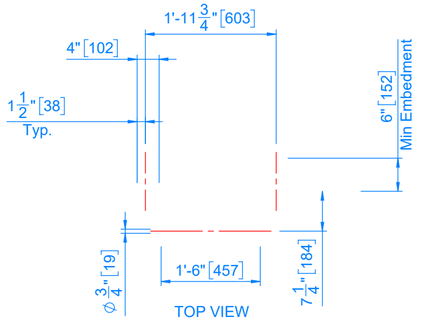
DRAWING NO :- 25135-4M06 Rev. 1

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

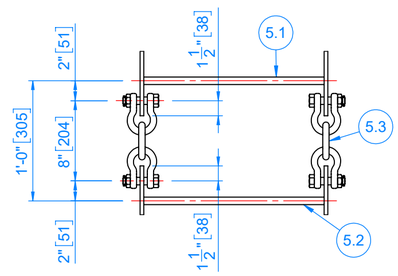
SHEET: 1 OF 1 VER.: 16

5. Revised South Wall Ladder (Total Quantity: 1 No.)
Total Ladder Assembly Weight Excluding Anchors: 130 lbs./Qty.

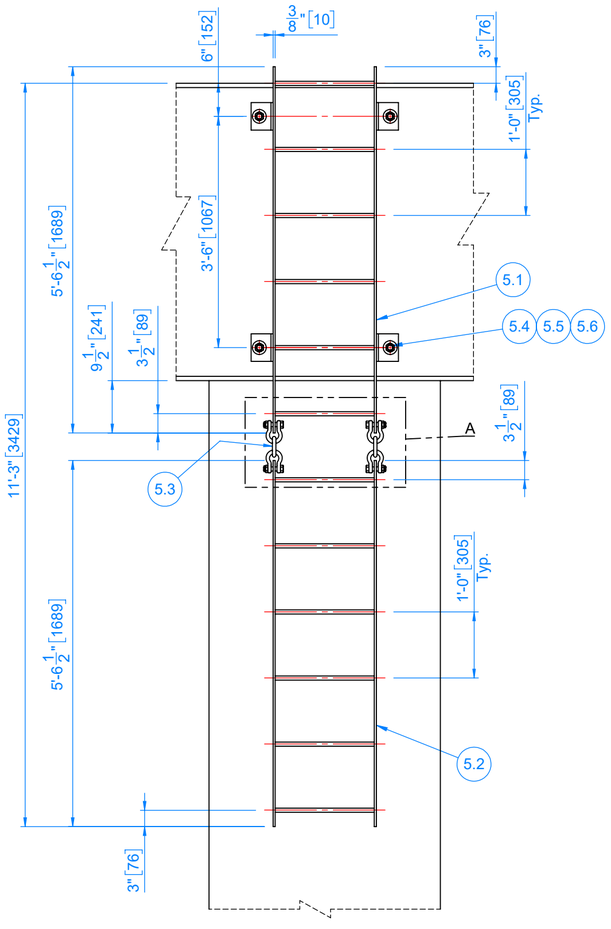
Part No.	Description	Dimension	Qty / System	Material
5.1	Ladder Assembly-1	As Per Drawing No 25135-4M09	1	Q355B (HDG)
5.2	Ladder Assembly-2	As Per Drawing No 25135-4M09	1	Q355B (HDG)
5.3	Ladder Connecting Chain Assembly	Ø16mm x 4D (Open Link)	2	Gr. U3, G-2130 (HDG)
5.4	EC2 Anchor	Ø 1" - 8 UNC - 2A x 8" L (Fully Threaded)	4	ASTM F1554 Gr. 105 (HDG)
5.5	Hex Nut	Ø 1" - 8 UNC - 2B	4	ASTM A563 DH (HDG)
5.6	Round Washer	OD 2 1/2" x ID 1 1/16" x 3/16" Thk	4	ASTM F436 (HDG)



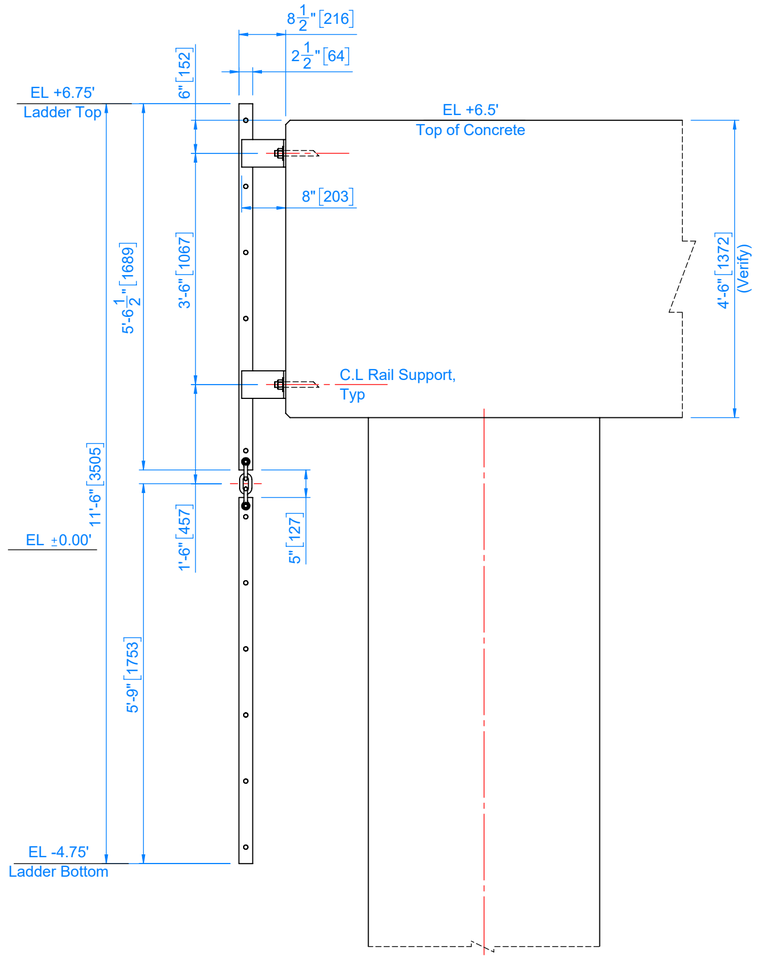
TOP VIEW



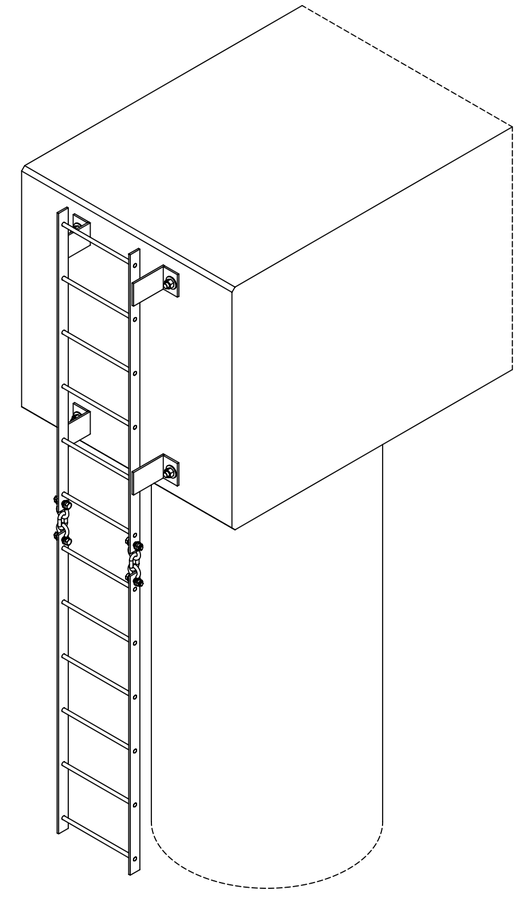
DETAIL A
SCALE 1 : 11



FRONT VIEW
5. Revised South Wall Ladder



SIDE VIEW



ISOMETRIC VIEW

FOR CONSTRUCTION

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in TMS NA's scope of supply.
- For Ladder's all details, Refer drawing no S-534.
- Where applicable, HDG as per ASTM A153 or A123 to a minimum thickness of 85 microns unless specified otherwise.

Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
1	11/21/22	LADDER WEIGHT ADDED & ISSUED FOR CONSTRUCTION	SS	PS	
0	06/23/22	ISSUED FOR CONSTRUCTION	ST	PS	
C	05/05/22	REVISED AS NOTED	AP	PS	
B	04/20/22	REVISED AS NOTED	VP	PS	
A	03/09/22	ISSUED FOR APPROVAL	VG	PS	

DRAWN	Vishal.Galia
DESIGNED	
CHECKED	Vishal.Galia
CHECKED	Kaushal.Patel
APPROVED	Parthiv.Shah
SCALE	1:20
SIZE A2	

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Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT LADDER DETAILS REVISED SOUTH WALL LADDER

DRAWING NO :- 25135-4M08 Rev. 1

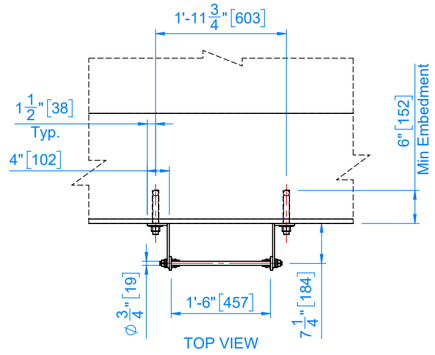
PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 1 VER : 20

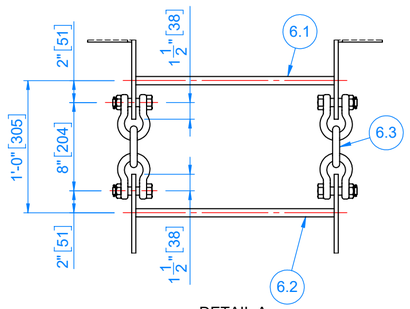
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6. Proposed Delivery Berth Ladder (Total Quantity: 05 Nos.)
Total Ladder Assembly Weight Excluding Anchors: 168 lbs./Qty.

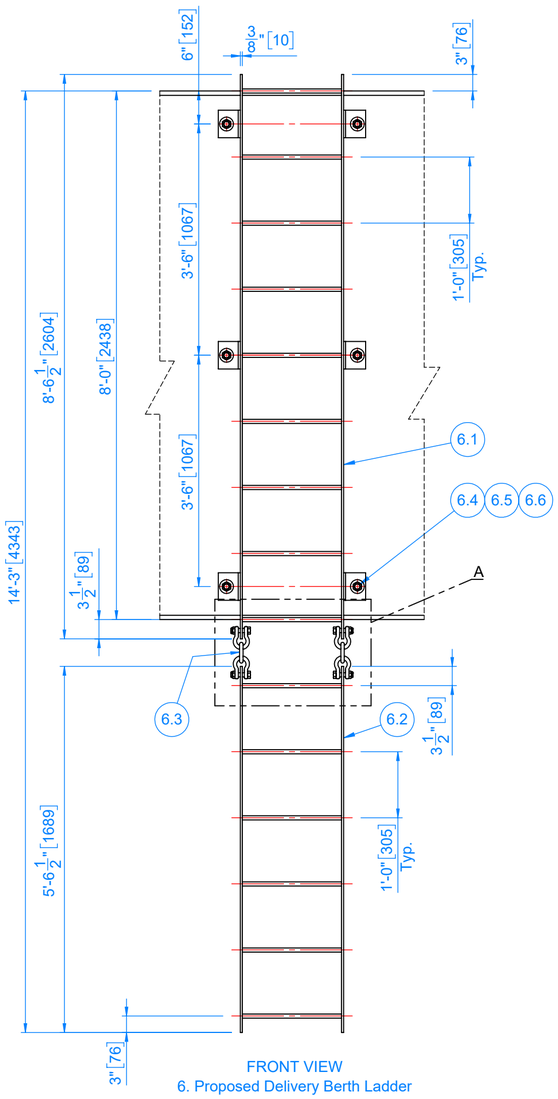
Part No.	Description	Dimension	Qty / System	Material
6.1	Ladder Assembly-1	As Per Drawing No 25135-4M11	1	Q355B (HDG)
6.2	Ladder Assembly-2	As Per Drawing No 25135-4M11	1	Q355B (HDG)
6.3	Ladder Connecting Chain Assembly	Ø16mm x 4D (Open Link)	2	Gr. U3, G-2130 (HDG)
6.4	EC2 Anchor	Ø 1" - 8 UNC - 2A x 8" L (Fully Threaded)	6	ASTM F1554 Gr. 105 (HDG)
6.5	Hex Nut	Ø 1" - 8 UNC - 2B	6	ASTM A563 DH (HDG)
6.6	Round Washer	OD 2 1/2" x ID 1 1/16" x 3/16" Thk	6	ASTM F436 (HDG)



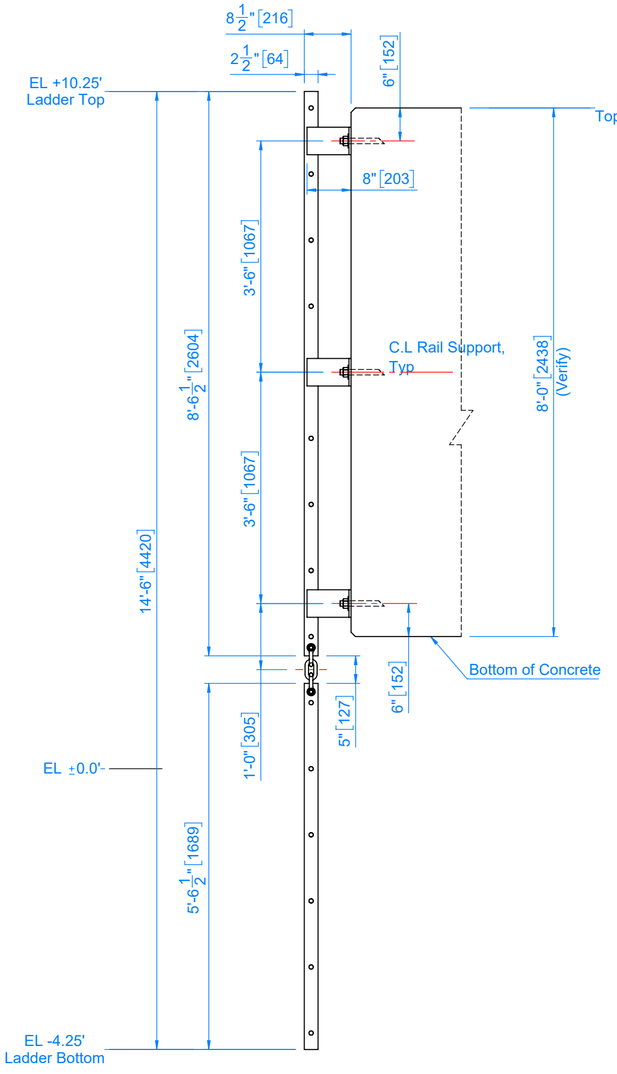
TOP VIEW



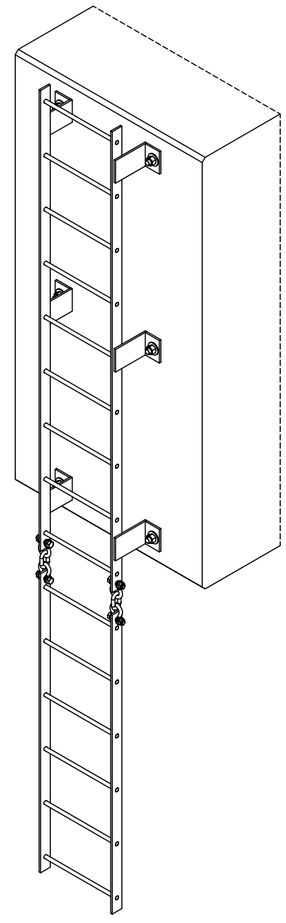
DETAIL A
SCALE 1 : 10



FRONT VIEW
6. Proposed Delivery Berth Ladder



SIDE VIEW


ISOMETRIC VIEW

NOTE :
- All dimensions are in feet and inches[mm] unless specified otherwise.
- All views are in sheet scale unless specified otherwise.
- Threads need to be re-threaded & re-tapped after galvanizing to maintain galvanizing coating on thread.
- Only items shown in BOM are in TMS NA's scope of supply.
- For Ladder's all details, Refer drawing no S-534.
- Where applicable, HDG as per ASTM A153 or A123 to a minimum thickness of 85 microns unless specified otherwise.

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Rev.	DATE	DESCRIPTION	REV. BY	APR. BY	ZONE
2	11/21/22	LADDER WEIGHT ADDED & ISSUED FOR CONSTRUCTION	SS	PS	
1	11/09/22	LADDER ELEVATION CHNAGED & ISSUED FOR CONSTRUCTION	SS	PS	
0	11/01/22	ISSUED FOR CONSTRUCTION	SS	PS	

DRAWN	Shreyansh.Solanki
DESIGNED	
CHECKED	Shreyansh.Solanki
CHECKED	Akash.Patel
APPROVED	Parthiv.Shah
SCALE	1:20
SIZE A2	

FOR CONSTRUCTION

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Web : www.trelleborg.com/en/marine-and-infrastructure

TRELLEBORG

TITLE:- GENERAL ARRANGEMENT LADDER DETAILS PROPOSED DELIVERY BERTH LADDER

DRAWING NO :- 25135-4M10 Rev. 2

PROJECT:- CONNECTICUT PORT AUTHORITY - STATE PIER

SHEET: 1 OF 1 VER : 12

SECTION 1. ITP & IFC DRAWING

1–C:

Project Exceptions

Date: March 23, 2023
Attn: To whom It May Concern:

Subject: Connecticut Port Authority - State Pier
TMS job:# 25135

Enclosed is Trelleborg Marine Systems (TMS) submittal for the Connecticut Port Authority - State Pier. The design of the system is based only on the drawings and project specifications that were provided by KKiewit Infrastructure Co. and additional correspondence. The drawings, specifications and submittals used are listed below:

Drawings: State Pier Infrastructure Improvements
State Pier Complex
New London, Connecticut

Specifications: Section 35 59 13.19 – Marine Fender System
Compliance: To the best of our knowledge and ability, TMS confirms that the designed system meets all provisions of the project specifications.

Exceptions: 1. Section 35 59 13.19, Table 4 : UHMW Pad Properties

We kindly request an exception to the requirement for ASTM testing reports, as this testing is not available in China. Instead, we have provided UHMW materials that conform to ISO standards. As domestic production was not specified, we have sourced the material from our factory in China, ISO standards are globally accepted on our projects and we believe the material we sourced is appropriate for the application. We have included the proposed properties in the Inspection and Test Plan (Pg. 7). We respectfully request that you consider accepting our substitution based on these factors.

2. Section 35 59 13.19, Clause F.1.a.

Q355B (per GB/T 1591-2018) is a commonly used equivalent material to ASTM A572 Gr. 50. Comparison tables, and MTR are included in Annex A. Requesting to review and accept.

3. Section 35 59 13.19, Part 1.04 4 i 7

The factory does not have the AISC 207 certification but is certified by ISO9001 &&EEN1090. Please see supporting documentation and explanation in Annex B. Requesting to accept

Any other drawings and/or specifications that are necessary for the proper design of this system must be provided to TMS prior to your approval. No other drawings or specifications, besides those mentioned above, were considered in the design of this system. Feel free to contact me with any further questions.

Sincerely,

Parthiv Shah
Engineering Manager
Parthiv.Shah@trelleborg.com

Date: March 23, 2023
Attn: To Whom It May Concern:

Subject: Connecticut Port Authority - State Pier
TMS Job:# 25135

Enclosed is Trelleborg Marine Systems (TMS) submittal for the Connecticut Port Authority - State Pier. The design of the system is based only on the drawings and project specifications that were provided by KKiewit Infrastructure Co. and additional correspondence. The drawings, specifications and submittals used are listed below:

Drawings: State Pier Infrastructure Improvements
State Pier Complex
New London, Connecticut

Specifications: Section 35 59 13.19 – Marine Fender System

Compliance: To the best of our knowledge and ability, TMS confirms that the designed system meets all provisions of the project specifications.

Exceptions: 4. Section 35 59 13.19 Part 2.01 F 3: Corrosion Control

Carboline 3-coat system is a high-performance system that give maximum protection on aggressive environments including those found on offshore structures, petrochemical facilities, bridges and ports. This has been designed to provide excellent corrosion resistance in both maintenance and new construction situations. Requesting to review and accept the following system:

Blasting : SSPC-SP10.
Painting : Primer Coat : 2-3 mils of Carbozinc 859.
Intermediate Coat : 4-6 mils Carboguard 890. (Apply as needed)
Top Coat : 2-3 mils of Carbothane 134 Hg.
Total DFT : 14 - 16 mils minimum.

Any other drawings and/or specifications that are necessary for the proper design of this system must be provided to TMS prior to your approval. No other drawings or specifications, besides those mentioned above, were considered in the design of this system. Feel free to contact me with any further questions.

Sincerely,

Parthiv Shah
Engineering Manager
Parthiv.Shah@trelleborg.com

Annex A.
Q355B Material Comparison

Date: May 5, 2022
Attn: To Whom It May Concern:

Subject: Connecticut Port Authority - State Pier
Clarification on the use of equivalent steel material

TMS Job # 25135

On the submittal dated 23rd September 2021, Trelleborg Marine Systems (TMS) had requested for an exception to Specification 35 59 13.19 Part 2.01 F 1 a Steel Fender Panel - Material (pg. 35 59 13.19-9). TMS requested to review and accept Q355B (per GB/T 1591-2018) as an equivalent steel material to ASTM A572 Gr.50. Here we present more evidence to support our request for an exception.

Please note that TMS uses Q355B material extensively on all its global projects. The material is proven in practice and is globally accepted as a substitute for Fy=50 ksi steels.

The following supporting documents / excerpts from relevant standards, are attached as requested the EOR.

1. Chemical properties of Q355B and ASTM A572
2. Mechanical properties of Q355B and ASTM A572
3. Mill certificate of Q355B

Chemical composition of steel per GB/T 1591-2018

Table 1 Grade and chemical composition of hot-rolled steels

Grade		Chemical composition (mass fraction)/%														
Steel grade	Quality grade	C[a]		Si	Mn	P[c]	S[c]	Nb[d]	V[e]	Ti[e]	Cr	Ni	Cu	Mo	N[f]	B
		The following nominal thickness or diameter/mm		No more than												
		≤40[b]	>40													
		No more than														
Q355	B	0.24		0.55	1.60	0.035	0.035	—	—	—	0.30	0.30	0.40	—	0.012	—
	C	0.20	0.22			0.030	0.030									
	D	0.20	0.22			0.025	0.025								—	

TABLE 2 Chemical Requirements[A]
(Heat Analysis)

Diameter, Thickness, or Distance Between Parallel Faces, in. [mm] Plates and Bars	Structural Shape Flange or Leg Thickness, in. [mm]	Grade	Carbon, max, %	Manganese,[B] max, %	Phosphorus,[I] max, %	Sulfur,[I] max, %	Silicon	
							Plates to 1½ in. [40 mm] Thick, Shapes with Flange or Leg Thickness to 3 in. [75 mm] inclusive, Sheet Piling, Bars, Zees, and Rolled Tees[C]	Plates Over 1½ in. [40 mm] Thick and Shapes with Flange Thickness Over 3 in. [75 mm]
							max, %	range, %
6 [150]	all	42 [290]	0.21	1.35[D]	0.030	0.030	0.40	0.15–0.40
4 [100][E]	all	50 [345]	0.23	1.35[D]	0.030	0.030	0.40	0.15–0.40
2 [50][F]	all	55 [380]	0.25	1.35[D]	0.030	0.030	0.40	0.15-0.40
1¼ [32][F]	≤2 [50]	60 [415]	0.26	1.35[D]	0.030	0.030	0.40	[G]
>½ – 1¼ [13–32]	>1–2 [25–50]	65 [450]	0.23	1.65	0.030	0.030	0.40	[G]
≤½ [13][H]	≤ 1	65 [450]	0.26	1.35	0.030	0.030	0.40	[G]

Tensile property of steel per GB/T 1591-2018

Table 7 Tensile property of hot-rolled steels

Grade		Upper yield strength R_{eH}[a]/MPa No lower than									Tensile strength R_m/MPa			
Steel grade	Quality grade	Nominal thickness or diameter/mm												
		≤16	>16~40	>40~63	>63~80	>80~100	>100~150	>150~200	>200~250	>250~400	≤100	>100~150	>150~250	>250~400
Q355	B、C	355	345	335	325	315	295	285	275	-	470~630	450~600	450~600	
	D									265[b]				450~600[b]
Q390	B、C、D	390	380	360	340	340	320	-	-	-	490~650	470~620	-	-
Q420[c]	B、C	420	410	390	370	370	350	-	-	-	520~680	500~650	-	-
Q460[c]	C	460	450	430	410	410	390	-	-	-	550~720	530~700	-	-

[a] When yield is not sharp, the specified plastic elongation strength $R_{p0.2}$ may be used to substitute for upper yield strength.
[b] Applicable to steel plates of quality grade D only.
[c] Applicable to steel sections and bars only.

Elongation of steel per GB/T 1591-2018

Table 8 Elongation of hot-rolled steels

Grade		Elongation after fracture A/% no less than						
Steel grade	Quality grade	Nominal thickness or diameter/mm						
		Sampling direction	≤40	>40~63	>63~100	>100~150	>150~250	>250~400
Q355	B、C、D	Longitudinal	22	21	20	18	17	17[a]
		Transverse	20	19	18	18	17	17[a]
Q390	B、C、D	Longitudinal	21	20	20	19	-	-
		Transverse	20	19	19	18	-	-
Q420[b]	B、C	Longitudinal	20	19	19	19	-	-
Q460b	C	Transverse	18	17	17	17	-	-

[a] Applicable to steel plates of quality grade D only.
[b] Applicable to steel sections and bars only.

Tensile property of steel per ASTM A572

TABLE 4 Tensile Requirements[A]

Grade	Yield Point, min		Tensile Strength, min		Minimum Elongation, %[B,C,D]	
	ksi	[MPa]	ksi	[MPa]	in 8 in. [200 mm]	in 2 in. [50 mm]
42 [290]	42	[290]	60	[415]	20	24
50 [345]	50	[345]	65	[450]	18	21
55 [380]	55	[380]	70	[485]	17	20
60 [415]	60	[415]	75	[520]	16	18
65 [450]	65	[450]	80	[550]	15	17

鞍钢股份有限公司
Angang Steel Company Limited

产品质量证明书
MILL TEST CERTIFICATE

中国鞍山市铁东区团结街42号 邮编 114002
No.42 Tuanjie Street Tiedong District 114002 Anshan.P.R.China
Tel 0086-400-688-0898 Fax 0086-0412-6728486

订货单位 Buyer	烟台鞍钢国际贸易有限公司	中文产品名称 Product	低合金结构用钢	订单号 Order No.	21B700615—32	证明书编号 Certificate No.	B710611413
收货单位 Consignee	鞍钢股份(集港)(鞍钢股份有限公司代鞍山兵工物资有限责任公司)	英文产品名称 Product		计重方式 Weight Mode	理论 Theoretical	发货日期 Date of Delivery	2021-06-30
客户名称 Customer		交货状态 Supply Condition	热轧(AR)	总件数 Total Pieces	6	到站 Destination	金州
标准 Specification	GB/T 1591-2018	出口目的港 Export Destination		总重量(kg) Total Weight	21,626	车号 Wagon No.	4958573

序号 No.	钢牌号 Grade	熔炼号 Heat No.	批号 Batch No.	规格 Dimensions(mm*mm*mm)	物料号 Pack No.	重量 (kg) Weight	物料号 Pack No.	重量 (kg) Weight	物料号 Pack No.	重量 (kg) Weight
1	Q355B	21AD4362	B713460200	16*2500*11300	S16190851000	3,583	S16190852000	3,583		
2	Q355B	21AD4362	B713460200	16*2500*11400	S16190871000	3,615	S16190881000	3,615	S16190882000	3,615
3	Q355B	21AD4362	B713460200	16*2500*11400	S16190872000	3,615				

	熔炼号 Heat No.	化学成分Chemical Composition(熔炼分析 Heat Analysis) %																		
		C 10^{-2}	Si 10^{-2}	Mn 10^{-2}	P 10^{-3}	S 10^{-3}	Als 10^{-3}	Ni 10^{-3}	Cr 10^{-3}	Cu 10^{-3}	Nb 10^{-3}	V 10^{-3}	Ti 10^{-3}	Mo 10^{-2}	B 10^{-4}	N 10^{-4}	Ceq 10^{-2}	Pcm 10^{-2}	复合 10^{-3}	复合 10^{-3}	10^{-4}
熔炼分析	21AD4362	18	25	144	12	7		9	21	13	9	2	1	0.2			42		12	43	
产品分析																					
产品分析																					

批号 Batch No.	屈服 Y.S.	抗拉 T.S.	伸长 EL	屈强比 Y.S./T.S.	冲击(J) Charpy				断面纤维率 SA%			晶粒度 Grain Size	带状组织 Banded Structure	维氏硬度 HV10	冷弯 Bend α=180° d=2a	夹杂物（级） Inclusion				DWTT °C		探伤标准 UT standard	
	MPa		%		°C	1	2	3								A	B	C	D	%		探伤级别 UT Class	
B713460200	400	533	27		20	165	166	168							合格							探伤结果 UT Result	

备注 Remarks	
注释 Notes	Y.S.=Yield Strength T.S.=Tensile Strength EL=Elongation 复合1:V+Nb+Ti 复合2:Ni+Cr+Cu

本产品已按上述标准要求制造和检验，其结果符合要求，特此证明。贵方如查询有关问题，请与我公司联系。
We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with the requirements of the above material specification. If you have any questions, please contact our company.

发货单位 Deliver Department	鞍钢股份有限公司鲅鱼圈钢铁分公司厚板部 Angang Steel Company Ltd.3800 Heavy Plate Making Dept. of Bayuquan Iron & Steel Subsidiary		
发货人 Deliverer	李恩雨	副部长 Deputy Director	王若刘
检查人 Inspector	李先红		

产品质量专用章

Annex B.
Factory Qualifications

Trelleborg's QC engineers, reviewed all CNEC24 QC documents such as quality control process, raw material traceability, PPRQ/WPS/WPQ, and painting process. Trelleborg engineers make sure each item meets the related standards, Trelleborg's requirement and project specifications.

Trelleborg reviewed the factory Quality Control Program and this document is only available in Chinese, the total pages are 1130 and it is difficult to translate it to Englishvversion in a short time, but we can provide the Chinese version immediately if requested..

Trelleborg perform audits to the factory every year and can provide a complete copy off last year audit documentation upon request. Below, you will find ffactory IISO9001 certificate, EN1090 certificate, NDT certificates, and Welder's qualifications.

You can also find attached CWI & NACEEcertificates ffrom Trelleborg QC engineer. Trelleborg QC engineers can check the fabrication quality based on 2D, ITP and relates standards and specifications.



TRELLEBORG MARINE & INFRASTRUCTURE

James XU

Senior Quality Control Engineer

Company Profile

CNEC24 located in Haiyang, Yantai, Shandong, China, it is subsidiary of China Nuclear Engineering & Construction Group Corporation Limited, it is China Central Direct Management company that focus on national defense, nuclear facilities, nuclear power plants, infrastructure and other various industrial and civil construction projects.

The production workshops of CNEC24, which is 22,000 ㎡ in total, includes Steel Structure Fabrication Workshop, Section Steel Workshop, Machining workshop, Module Workshop, Sandblasting and Coating Workshop and Stain-less steel workshop, and the production capacity is about 15,000 t/y.

The structural steel manufacturing workshop is 14000 ㎡, equipped with 290 sets of equipment such as welding equipment, hoisting equipment, processing equipment, heat treatment equipment, sandblasting and painting equipment.

CNEC24 is certificated by ISO9001 & EN1090.

CNEC24 ISO9001 CERTIFICATE

质量管理体系认证证书

注册号：0350119Q30182R7L

兹　证　明

中国核工业二四建设有限公司

四川省绵阳市游仙路11号，621000

统一社会信用代码：91510000621600455J

管 理 体 系 符 合

GB/T 19001-2016 / ISO 9001:2015，GB/T 50430-2017 标准

该管理体系适用于

资质范围内的建筑工程施工总承包、电力工程施工总承包、公路工程施工总承包、石油化工工程施工总承包、市政公用工程施工总承包、机电工程施工总承包、地基基础工程专业承包、钢结构工程专业承包、起重设备安装工程专业承包、建筑机电安装工程专业承包、核工程专业承包、建筑装修装饰工程专业承包、消防设施工程专业承包、防水防腐保温工程专业承包、土石方工程专业承包（涉及场所：河北省三河市燕郊经济开发区行宫东大街51号）***

颁证日期：2019年3月3日

有效期最长可至：2022年3月2日[注]

签发人：

兴原认证中心有限公司

（北京市海淀区上地三街9号嘉华大厦C座7层）

中国认可
管理体系
MANAGEMENT SYSTEM
CNAS C035-M

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使用须复印无效

质量管理体系认证证书

注册号：0350119Q30182R7L-1

兹　证　明

中国核工业二四建设有限公司

四川省绵阳市游仙路11号，621000

统一社会信用代码：91510000621600455J

管 理 体 系 符 合

GB/T 19001-2016 / ISO 9001:2015 标准

该管理体系适用于

许可范围内的民用核安全设备安装*

（涉及场所：河北省三河市燕郊经济开发区行宫东大街51号）

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再次使用无效。

颁证日期：2019年3月3日

有效期最长可至：2022年3月2日[注]

兴原认证中心有限公司

证书专用章

（北京市海淀区上地三街9号嘉华大厦C座7层）

签 发 人：

中国认可
国际互认
管理体系
MANAGEMENT SYSTEM
CNAS C035-M

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环境管理体系认证证书

注册号：0350119E20121R5L

兹　证　明

中国核工业二四建设有限公司

四川省绵阳市游仙路11号，621000

统一社会信用代码：91510000621600455J

管 理 体 系 符 合

GB/T 24001-2016 / ISO 14001:2015 标准

该管理体系适用于

资质范围内的建筑工程施工总承包、电力工程施工总承包、公路工程施工总承包、石油化工工程施工总承包、市政公用工程施工总承包、机电工程施工总承包、地基基础工程专业承包、钢结构工程专业承包、起重设备安装工程专业承包、建筑机电安装工程专业承包、核工程专业承包、建筑装修装饰工程专业承包、消防设施工程专业承包、防水防腐保温工程专业承包、土石方工程专业承包；许可范围内的民用核安全设备安装（涉及场所：河北省三河市燕郊经济开发区行宫东大街51号）***

颁证日期：2019年3月3日

有效期最长可至：2022年3月2日[注]

兴原认证中心有限公司

签发人：

兴原认证中心有限公司 证书专用章

（北京市海淀区上地三街9号嘉华大厦C座7层）

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CNAS

中国认可
国际互认
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职业健康安全管理体系认证证书

注册号：0350119S30116R5L

兹　证　明

中国核工业二四建设有限公司

四川省绵阳市游仙路11号，621000

统一社会信用代码：91510000621600455J

管 理 体 系 符 合

GB/T 45001-2020 / ISO 45001:2018 标准

该管理体系适用于

资质范围内的建筑工程施工总承包、电力工程施工总承包、公路工程施工总承包、石油化工工程施工总承包、市政公用工程施工总承包、机电工程施工总承包、地基基础工程专业承包、钢结构工程专业承包、起重设备安装工程专业承包、建筑机电安装工程专业承包、核工程专业承包、建筑装修装饰工程专业承包、消防设施工程专业承包、防水防腐保温工程专业承包、土石方工程专业承包；许可范围内的民用核安全设备安装（涉及场所：河北省三河市燕郊经济开发区行宫东大街51号）***

颁证日期：2019年3月3日

有效期最长可至：2022年3月2日[注]

换证日期：2020年7月6日

签 发 人：

兴原认证中心有限公司

（北京市海淀区上地三街9号嘉华大厦C座7层）

CNAS

中国认可
管理体系
MANAGEMENT SYSTEM
CNAS C035-M

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仅限待审核单位进行供方审查使用。

CNEC24 EN1090 CERTIFICATE

CERTIFICATE

Conformity of the Factory Production Control

0045-CPR-1090-1.01005.TÜVNORD.2019.003

In compliance with Regulation 305/2011/EU of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR), this certificate applies to the following construction product:

Construction product	**Structural components and kits for steel structures to EXC3 according to EN 1090-2**
Intended use	for load-bearing structures in all types of buildings
CE – marking method	ZA.3.2 and ZA.3.4 acc. to EN 1090-1:2009+A1:2011
	produced by or for
Manufacturer	**China Nuclear Industry 24 Construction Co., Ltd.** **No. 11 Youxian Road** **621022 Mianyang City, Sichuan Province** **CHINA**
Manufacturing plant Production facility of the manufacturer	China Nuclear Industry 24 Construction Co., Ltd. No. 50 Shenzhen Street 265106 Haiyang City, Shandong Province CHINA
Confirmation	This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in Annex ZA of the harmonised standard **EN 1090-1:2009+A1:2011** under system 2+ are applied, and that the factory production control fulfills all the prescribed requirements stated therein.
Date of first issue	12.08.2019
Validity end	24.06.2022
Period of validity	This certificate will remain valid as long as the test methods and/or the factory production control requirements included in the harmonised standard used to assess the performance of the declared characteristics do not change, and the product and the manufacturing conditions in the plant are not modified significantly.
Remarks	see reverse
Place and date of issue	Hamburg, 12.08.2021 Tang 8119450203 4844

notified body TÜV NORD 0045 TÜV NORD Systems

Dipl.-Ing. Kaschner
Technical head of body certification

DAkkS Deutsche Akkreditierungsstelle D-ZE-11074-05-00

Certificate number: 0045-CPR-1090-1.01005.TÜVNORD.2019.003

Remarks

The Notified Body - 0045 TÜV NORD Systems GmbH & Co. KG has performed the initial inspection of the/of manufacturing plant(s) and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

ISO 3834-2 9030/HS/4844/20 TÜV NORD Systems 30.06.2022

General provisions

The regulations of PZO of TÜV NORD Systems GmbH & Co. KG apply in their valid version.

To verify the validity of the digital signature of the TÜV NORD Systems employee, the installation of the TÜV NORD GROUP root certificate is required: https://www.tuev-nord.de/en/customer-login/digital-signature/

SECTION 1. ITP & IFC DRAWING

1–D:

Certificate of Compliance

Certificate of Compliance

This is to certify that all products supplied or manufactured by TRELLEBORG are in accordance with design requirements, standards, customer's specifications and exceptions.

TRELLEBORG MARINE & INFRASTRUCTURE



Lim Chee Yoong

Trelleborg Engineered Systems (Qingdao) Company Limited
Nanwan Community North,Jihongtan Subdistrict,Chengyang District, 266111 Qingdao, Shandong, P.R.China.
Phone: +86 (0)532 89650 700. Fax: +86 (0)532 87907 301/303. www.trelleborg.com

SECTION 2. Rubber Fenders

SECTION 2. Rubber Fenders

2–A:

Certificate of Compliance

Date: 03/02/2023

Attn: David Hollander

Company: Kiewit Infrastructure, Co.

Re: 25135 – Connecticut State Pier Project

Certificate of Conformance (Rubber Fenders)

Trelleborg confirm that the compound used for the rubber fenders supplied for the Connecticut State Pier project is the same represented in the test reports provided. Trelleborg also confirms that our compound includes carbon black and that we used a NR/SBR blend per ASTM D2000 AA Classification.

Fenders were manufactured in accordance with the requirements listed below:

Property Tested		Test Method	Acceptance Requirements
Before Aging	Hardness	ASTM D2240 Shore A	78° Max
	Tensile Strength	ASTM D412 Die C	16 MPa Min
	Ultimate Elongation		350% Min
After Aging	Change in Hardness	ASTM D573 96 hrs @ 70°C	+8° Max
	Change in Tensile Strength		12.8 MPa Min
	Change in Ultimate Elongation		280% Min
Compression Set		ASTM D395 Method B 22 hours at 70°C	30% Max
Ozone Resistance		ASTM D1149	No Visible Cracks
Abrasion Resistance		BS 903.A9 Method B - 1000 rev	1.5cc Max
Adhesion (Rubber to Steel)		ASTM D429	7 N/mm Min
Tear Resistance		ASTM D624 Die B	70 kN/m Min
Water Resistance		ASTM D471 (70 hours at 100 °C)	Volume: +10/-5% Max.

These requirements meet the specification 35 59 13.19. The only discrepancy is on the test method for the Abrasion Resistance and Ozone Resistance test. BS 903.A9 Method B and ASTM D1149 are the only test method regionally available. These are widely accepted and approved testing methods.

Please feel free to contact me with any further questions.

Regards,

Gisael Gomez

Gisael Gomez

Project Manager

Gisael.Gomez@trelleborg.com

SECTION 2. Rubber Fenders

2–B:

Material Certs & Test Reports

SECTION 2. Rubber Fenders

Delivery Berth Batch

Rubber Material Inspection Report

File No.: TMEQ/9-F-03-009

Project Number: 25135-28388

Project Name: Connecticut Port Authority - State Pier

Factory Rep: Gordon Jia

Testing Temperature: 23℃

Trelleborg Rep: Gisael Gomez

Date: 12/23/2021

Type of Fender:	SCN1000F15
Grade of Rubber:	F(1.5)
Quantity:	13PCE

Notes:

RESULTS

	Property Tested	Test Method	Acceptance Requirements	Inspection Results
Before Aging	Hardness	ASTM D2240 Shore A	78° Max	64
Before Aging	Tensile Strength	ASTM D412 Die C	16 MPa Min	17.8
Before Aging	Ultimate Elongation	ASTM D412 Die C	350% Min	576.6
After Aging	Change in Hardness	ASTM D573 96 hrs @ 70°C	+8° Max	+4
After Aging	Change in Tensile Strength	ASTM D573 96 hrs @ 70°C	12.8 MPa Min	16.8
After Aging	Change in Ultimate Elongation	ASTM D573 96 hrs @ 70°C	280% Min	498.7
	Compression Set	ASTM D395 Method B 22 hours at 70°C	30% Max	21.06%
	Ozone Resistance	ASTM D1149	No Visible Cracks	No Visible Cracks
	Abrasion Resistance	BS 903.A9 Method B - 1000 rev	1.5cc Max	0.15cc
	Adhesion (Rubber to Steel)	ASTM D429	7 N/mm Min	18.5
	Tear Resistance	ASTM D624 Die B	70 kN/m Min	80.6
	Water Resistance	ASTM D471 (70 hours at 100 °C)	Volume: +10/-5% Max.	2.79%

Fender Performance Test Report

TRELLEBORG

Project Information

Trelleborg Project Number:	25135-28388	Serial No.:	M071564
Trelleborg Project Reference:	Connecticut Port Authority - State Pier	Test date:	12/29/2021
Fender Model:	SCN1000F15	Location:	TMEQ
Test Machine:	500T	Test temp:	21°

Reference

1. PIANC: Guidelines for the design of fendering systems: 2002

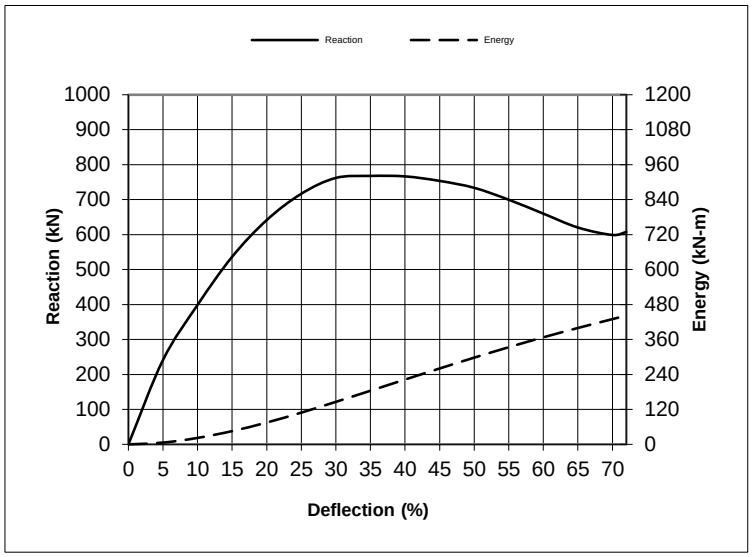
Specified Performance and Tolerance

Reaction	713	kN	784.3	kN	Maximum (including +10% tolerance)
Energy	425	kN-m	382.5	kN-m	Minimum (including -10% tolerance)
Tolerance	10	%			

Test Data

Deflection (%)	Reaction (kN)	Energy (kN-m)
0	0	0
5	241	6
10	399	22
15	537	45
20	641	75
25	717	109
30	762	146
35	768	184
40	766	222
45	754	260
50	734	298
55	700	333
60	660	367
65	620	399
70	599	430
72	607	442

Test Curve



Notes:

The results indicate the tested performance is within the acceptable tolerance range for the project.

Acceptance:

Gisael Gomez

Project Manager
Trelleborg Marine Systems North America, Inc.

Fender Performance Test Report

TRELLEBORG

Project Information

Trelleborg Project Number:	25135-28388	Serial No.:	M072436
Trelleborg Project Reference:	Connecticut Port Authority - State Pier	Test date:	1/17/2022
Fender Model:	SCN1000F15	Location:	TMEQ
Test Machine:	500T	Test temp:	22°

Reference

1. PIANC: Guidelines for the design of fendering systems: 2002

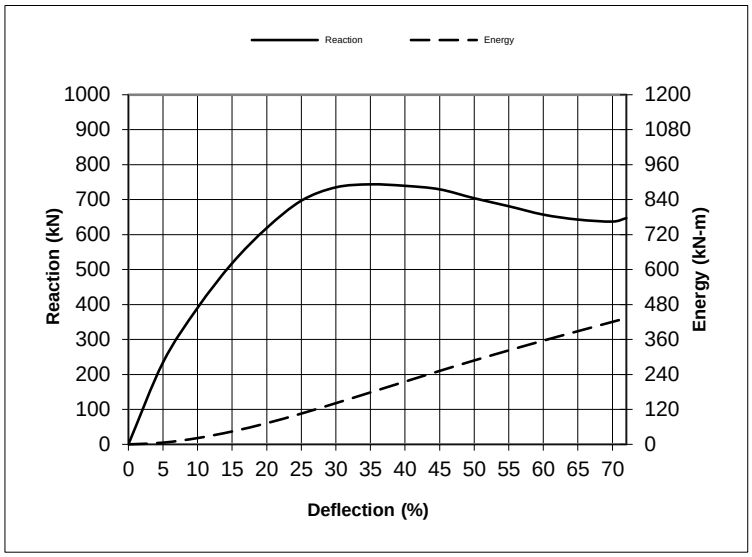
Specified Performance and Tolerance

Reaction	713	kN	784.3	kN	Maximum (including +10% tolerance)
Energy	425	kN-m	382.5	kN-m	Minimum (including -10% tolerance)
Tolerance	10	%			

Test Data

Deflection (%)	Reaction (kN)	Energy (kN-m)
0	0	0
5	234	6
10	390	21
15	518	44
20	619	73
25	697	105
30	735	141
35	744	178
40	739	215
45	729	252
50	704	288
55	681	323
60	657	356
65	643	388
70	637	420
72	647	433

Test Curve



Notes:

The results indicate the tested performance is within the acceptable tolerance range for the project.

Acceptance:

Jisael Gomez

Project Manager
Trelleborg Marine Systems North America, Inc.

SECTION 2. Rubber Fenders

Installation Berth Batch

Rubber Material Inspection Report

File No.: TMEQ/9-F-03-009

Project Number: 25135-28389

Project Name: Connecticut Port Authority - State Pier

Factory Rep: Gordon Jia

Trelleborg Rep: Gisael Gomez

Date: 1/14/2022

Testing Temperature: 23℃

Type of Fender:	SCN1000F15
Grade of Rubber:	F(1.5)
Quantity:	22PCE

Notes:

RESULTS

	Property Tested	Test Method	Acceptance Requirements	Inspection Results
Before Aging	Hardness	ASTM D2240 Shore A	78° Max	65
Before Aging	Tensile Strength	ASTM D412 Die C	16 MPa Min	17.5
Before Aging	Ultimate Elongation	ASTM D412 Die C	350% Min	553.8
After Aging	Change in Hardness	ASTM D573 96 hrs @ 70°C	+8° Max	+4
After Aging	Change in Tensile Strength	ASTM D573 96 hrs @ 70°C	12.8 MPa Min	16.2
After Aging	Change in Ultimate Elongation	ASTM D573 96 hrs @ 70°C	280% Min	453.5
	Compression Set	ASTM D395 Method B 22 hours at 70°C	30% Max	21.38%
	Ozone Resistance	ASTM D1149	No Visible Cracks	No Visible Cracks
	Abrasion Resistance	BS 903.A9 Method B - 1000 rev	1.5cc Max	0.16cc
	Adhesion (Rubber to Steel)	ASTM D429	7 N/mm Min	17.8
	Tear Resistance	ASTM D624 Die B	70 kN/m Min	84.5
	Water Resistance	ASTM D471 (70 hours at 100 °C)	Volume: +10/-5% Max.	2.66%

Fender Performance Test Report

TRELLEBORG

Project Information

Trelleborg Project Number:	25135-28389	Serial No.:	M072445
Trelleborg Project Reference:	Connecticut Port Authority - State Pier	Test date:	1/20/2022
Fender Model:	SCN1000F15	Location:	TMEQ
Test Machine:	500T	Test temp:	24°

Reference

1. PIANC: Guidelines for the design of fendering systems: 2002

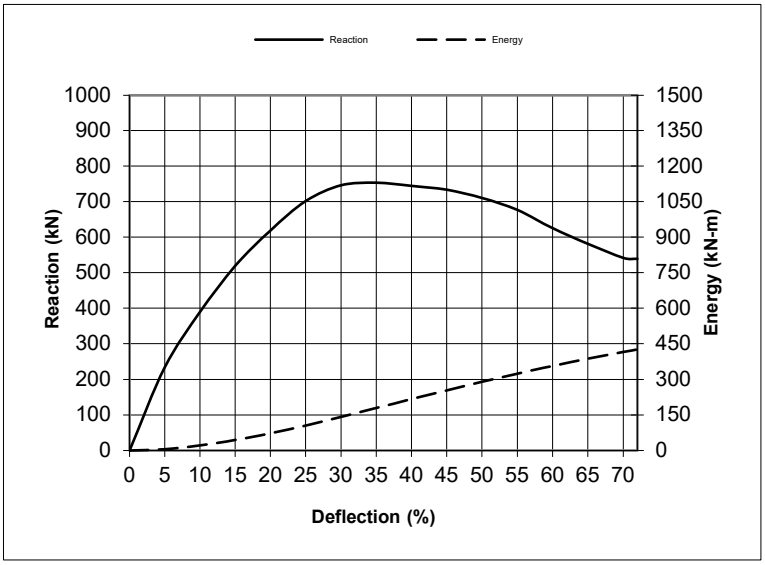
Specified Performance and Tolerance

Reaction	713	kN	784.3	kN	Maximum (including +10% tolerance)
Energy	425	kN-m	382.5	kN-m	Minimum (including -10% tolerance)
Tolerance	10	%			

Test Data

Deflection (%)	Reaction (kN)	Energy (kN-m)
0	0	0
5	234	6
10	390	21
15	519	44
20	620	73
25	702	106
30	747	142
35	754	179
40	745	217
45	734	254
50	711	290
55	677	325
60	626	357
65	582	388
70	542	416
72	539	426

Test Curve



Notes:

The results indicate the tested performance is within the acceptable tolerance range for the project.

Acceptance:

Jisael Gomez

Project Manager
Trelleborg Marine Systems North America, Inc.

Fender Performance Test Report

TRELLEBORG

Project Information

Trelleborg Project Number:	25135-28389	Serial No.:	M072447
Trelleborg Project Reference:	Connecticut Port Authority - State Pier	Test date:	1/21/2022
Fender Model:	SCN1000F15	Location:	TMEQ
Test Machine:	500T	Test temp:	20°

Reference

1. PIANC: Guidelines for the design of fendering systems: 2002

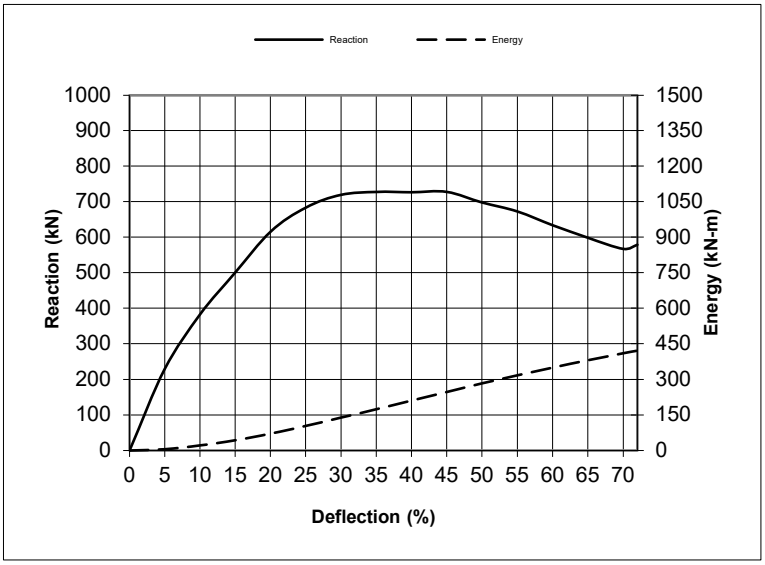
Specified Performance and Tolerance

Reaction	713	kN	784.3	kN	Maximum (including +10% tolerance)
Energy	425	kN-m	382.5	kN-m	Minimum (including -10% tolerance)
Tolerance	10	%			

Test Data

Deflection (%)	Reaction (kN)	Energy (kN-m)
0	0	0
5	230	6
10	383	21
15	501	43
20	616	71
25	684	104
30	720	139
35	728	175
40	727	211
45	728	248
50	698	283
55	673	318
60	634	350
65	599	381
70	568	410
72	579	422

Test Curve



Notes:

The results indicate the tested performance is within the acceptable tolerance range for the project.

Acceptance:

Gisael Gomez

Project Manager
Trelleborg Marine Systems North America, Inc.

Fender Performance Test Report

TRELLEBORG

Project Information

Trelleborg Project Number:	25135-28389	Serial No.:	M072465
Trelleborg Project Reference:	Connecticut Port Authority - State Pier	Test date:	2/10/2022
Fender Model:	SCN1000F15	Location:	TMEQ
Test Machine:	500T	Test temp:	21°

Reference

1. PIANC: Guidelines for the design of fendering systems: 2002

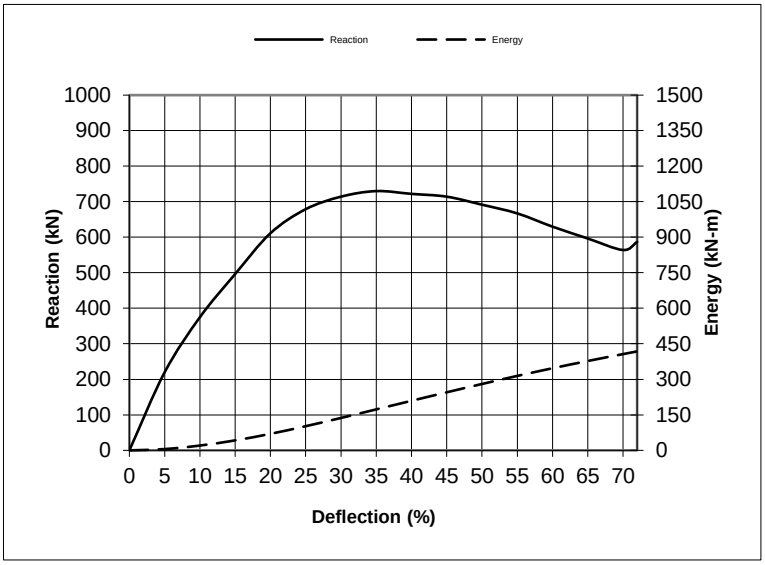
Specified Performance and Tolerance

Reaction	713	kN	784.3	kN	Maximum (including +10% tolerance)
Energy	425	kN-m	382.5	kN-m	Minimum (including -10% tolerance)
Tolerance	10	%			

Test Data

Deflection (%)	Reaction (kN)	Energy (kN-m)
0	0	0
5	220	5
10	375	20
15	496	42
20	611	70
25	679	102
30	714	137
35	730	173
40	722	209
45	714	245
50	692	280
55	667	314
60	630	347
65	596	377
70	564	406
72	587	418

Test Curve



Notes:

The results indicate the tested performance is within the acceptable tolerance range for the project.

Acceptance:

Gisael Gomez

Project Manager

Trelleborg Marine Systems North America, Inc.

SECTION 2. Rubber Fenders

2–C:

3rd Party Test

Fender Test Report

TRELLEBORG

File No.:TMEQ/9-F-08-033

Customer	TRELLEBORG MARINE SYSTEMS NORTH	Fender No.	M072444
Project	n/a	Test Date	17-Feb-22
Customer PO No.	25135-28388	Test Temperature	24 °C
Sales Order No.	20008623	Test Speed	2 - 8 cm/min
Fender Type:	SCN Fender	Test Angle	0 °
Fender Size (H x L)	1000 mm H x -	Test Method	CV
Fender Grade:	F1.5	(As reccomended by PIANC : 2002	
Order Quantity	13pcs	Guidelines for the Design of Fenders Systems)	

Specification			
Reaction Force	713 kN	Reaction Force Limit (+ 10%)	784 kN
Energy Absorption	425 kNm	Energy Absorption Limit (-10%)	383 kNm

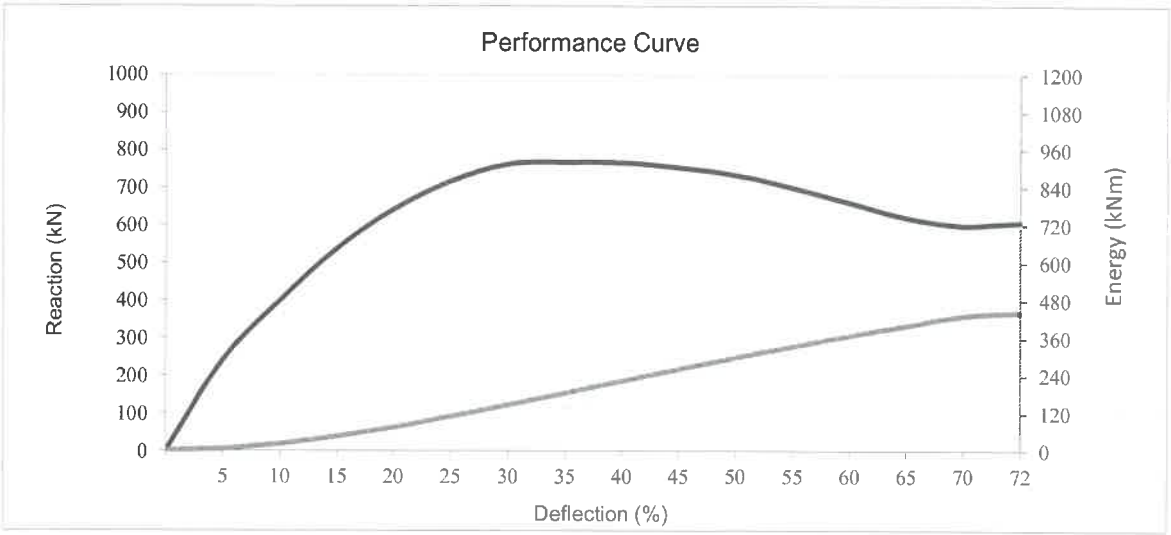
Fender Deflection		Reaction Force		Energy Absorption	
mm	%	t	kN	tm	kNm
50	5	24.6	241	0.6	6
100	10	40.7	399	2.2	22
150	15	54.7	537	4.6	45
200	20	65.4	641	7.6	75
250	25	73.1	717	11.1	109
300	30	77.7	762	14.9	146
350	35	78.3	768	18.8	184
400	40	78.1	766	22.7	222
450	45	76.8	754	26.5	260
500	50	74.8	734	30.3	298
550	55	71.3	700	34.0	333
600	60	67.3	660	37.5	367
650	65	63.2	620	40.7	399
700	70	61.1	599	43.8	430
720	72	61.9	607	45.1	442

87%

Reaction	***620 kN at 65% Deflection***	**Test Results**	***Pass***
Energy	***399 kNm***		

94%

Max Reaction	***768 kN***	***108%***



Tested Gordon 2022.2.17

Reviewed Andy 2022.2.17

Trelleborg Marine Engineering (Qingdao) Co., Ltd
No.35, Ronghai 4 Road, Chengyang District, Qingdao 266111,China
Tel: +86 532 89650700 Fax: +86 532 532 87907300

TRELLEBORG

Fender Test Report

File No.:TMEQ/9-F-08-033

Customer	*TRELLEBORG MARINE SYSTEMS NORTH*	Fender No.	*M072440*
Project	*n/a*	Test Date	*17-Feb-22*
Customer PO No.	*25135-28388*	Test Temperature	*24 °C*
Sales Order No.	*20008623*	Test Speed	*2 - 8 cm/min*
Fender Type:	*SCN Fender*	Test Angle	*0 °*
Fender Size (H x L)	*1000 mm H x*	Test Method	*CV*
Fender Grade:	*F1.5*	(As reccomended by PIANC : 2002	
Order Quantity	*13pcs*	Guidelines for the Design of Fenders Systems)	

Specification			
Reaction Force	*713 kN*	Reaction Force Limit (+ 10%)	*784 kN*
Energy Absorption	*425 kNm*	Energy Absorption Limit (-10%)	*383 kNm*

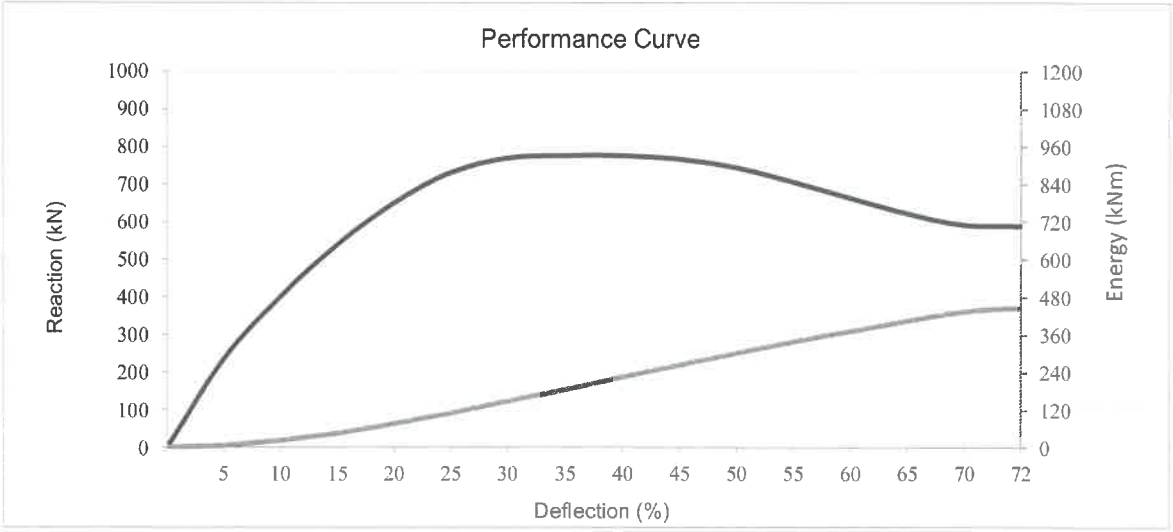
Fender Deflection		Reaction Force		Energy Absorption	
mm	%	t	kN	tm	kNm
50	5	23.9	234	0.6	6
100	10	40.8	400	2.2	22
150	15	55.0	539	4.6	45
200	20	66.3	650	7.6	75
250	25	74.5	731	11.2	109
300	30	78.4	769	15.0	147
350	35	79.1	776	18.9	186
400	40	79.1	776	22.9	224
450	45	78.1	766	26.8	263
500	50	75.8	744	30.7	301
550	55	71.9	705	34.4	337
600	60	67.6	663	37.8	371
650	65	63.4	622	41.1	403
700	70	60.3	592	44.2	434
720	72	60.0	589	45.4	445

87%

Reaction	***622 kN at 65% Deflection***	**Test Results**	***Pass***
Energy	***403 kNm***		

95%

Max Reaction	***776 kN***	***109%***



Tested Gordon 2022.2.17

Reviewed Andy 2022.2.17

Trelleborg Marine Engineering (Qingdao) Co., Ltd
No.35, Ronghai 4 Road, Chengyang District, Qingdao 266111,China
Tel: +86 532 89650700 Fax: +86 532 532 87907300

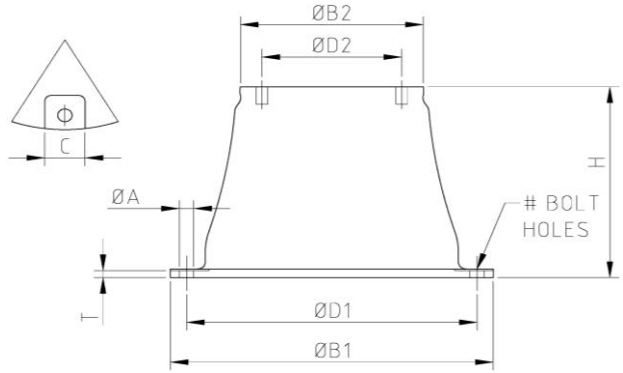
SECTION 2. Rubber Fenders

2–D:

Dimensional Reports

Cone Fender Inspection Report

Project Number: 25135-28388
Project Name: Connecticut Port Authority - State Pier
TESQ Rep: Gordon Jia
Trelleborg Rep: Gisael Gomez
Date: 2021.12.27~2022.01.16

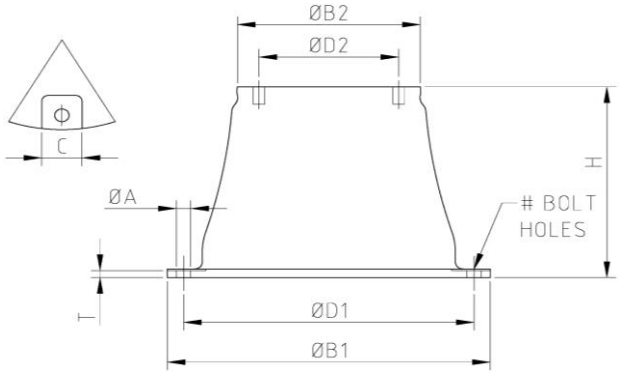


TRELLEBORG

Type of Fender	Dimension	Ø B1	Ø B2	Ø D1	Ø D2	H	Ø A	T	C	# BOLT HOLES	
SCN1000F15	Required Dimension	1600	980	1460	855	1000	35	40-50	125	6	
Fender Serial Number	Tolerance	±3%	±3%	±4mm	±4mm	±3%	±2mm	/	MIN	N/A	
M071564	Measured Dimension	1598	975	1459	854	1016	35	46	130	6	
M071565		1599	973	1460	853	1015	36	47	135	6	
M071566		1600	976	1460	854	1016	36	45	132	6	
M072436		1601	975	1464	855	1015	36	44	133	6	
M072435		1598	976	1462	853	995	35	49	132	6	
M072437		1600	975	1461	855	1015	35	45	128	6	
M072438		1599	975	1461	854	997	36	46	132	6	
M072439		1600	975	1462	854	995	35	45	132	6	
M072440		1600	976	1462	857	1015	35	45	132	6	
M072441		1598	976	1461	858	1016	36	46	128	6	
M072442		1599	975	1462	854	997	35	48	129	6	
M072443		1598	977	1462	856	1016	35	45	130	6	
M072444		1601	976	1461	855	994	36	46	128	6	

Cone Fender Inspection Report

Project Number:	25135-28389
Project Name:	Connecticut Port Authority - State Pier
TESQ Rep:	Gordon Jia
Maritime Rep:	Gisael Gomez
Date:	2022.01.17~01.22



TRELLEBORG

Type of Fender	Dimension	Ø B1	Ø B2	Ø D1	Ø D2	H	Ø A	T	C	# BOLT HOLES	
SCN1000F15	Required Dimension	1600	980	1460	855	1000	36	40-50	125	6	
Fender Serial Number	Tolerance	±3%	±3%	±4mm	±4mm	±3%	±2mm	/	MIN	N/A	
M072445	Measured Dimension	1598	975	1461	855	997	36	44	128	6	
M072446		1597	973	1463	853	1015	35	46	130	6	
M072447		1600	975	1462	857	995	36	47	132	6	
M072448		1598	978	1463	852	996	36	45	131	6	
M072449		1598	976	1459	855	1015	35	45	132	6	
M072450		1597	976	1461	857	996	35	45	130	6	
M072451		1597	978	1461	856	1016	36	46	130	6	
M072452		1598	976	1460	856	1017	36	45	131	6	
M072453		1598	976	1460	857	996	35	45	131	6	
M072454		1598	975	1462	856	1017	36	47	132	6	
M072455		1599	976	1461	857	997	36	46	130	6	
M072456		1598	976	1461	856	1016	35	45	132	6	
M072457		1597	975	1459	856	996	35	45	131	6	
M072458		1598	976	1462	857	1017	36	46	132	6	
M072459		1597	978	1461	856	997	36	45	131	6	
M072460		1598	978	1460	857	1016	35	45	130	6	
M072461		1598	976	1460	856	995	35	46	131	6	
M072462		1597	975	1461	857	1015	36	45	131	6	
M072463		1600	976	1462	856	997	36	45	132	6	
M072464		1598	976	1461	856	1016	35	45	131	6	
M072465		1598	977	1460	857	997	35	46	132	6	
M072466		1597	976	1460	856	1015	36	47	130	6	

SECTION 2. Rubber Fenders

2–E:

Calibration Certificates

TMEQ CALIBRATION SUMMARY

No.	Apparatus Name	Type	S/N	Valid Data
1	500 Ton Presser	YH54-500	11214	24th, Oct 2022
2	Vernier caliper	Mitutoyo	32XJ1900 6548- 0001	5th , Nov 2022
3	Tape	Tajima	GJC-005 GJC-006	10th, Mar 2023
4	Laboratory air circulation oven	Thermo UT-6	40712450	18th，Oct 2022
5	Laboratory air circulation oven	Thermo UT-6	40712449	18th，Oct 2022
6	Zwick material testing machine	Zwick	186547/2 009	10th，Sep 2022
7	Shore Hardness Tester	Teclock-Type A	724227	17th , Nov 2022
8	Thickness tester	GT-313-A1	2009-00235	17th , Nov 2022
9	Electronic Balance	Precisa - XS225A	3104250	18th，Oct 2022
10	Electronic Balance	METTL ER TOLED O-AL204	1231490142	18th，Oct 2022
11	Electronic tensile testing machine	BT1- FR2.5TH. D14	186547/2009	6th，Sep 2022
12	Electronic Balance	METTL ER TOLED O-PB303-S	1127090229	18th，Oct 2022
13	Akron Abrasion Tester	GT-7012-A	2013-01825	5th，Sep 2022

Trelleborg Marine Engineering (Qingdao) Co., Ltd
Quality Department

Trelleborg Marine Engineering (Qingdao) Co., Ltd
No.35, Ronghai 4 Road, Chengyang District, Qingdao 266111,China
Phone: +86 (0)532 89650 700.
Fax: +86 (0)532 87907 301/303.
www.trelleborg.com

青岛奥瑞斯测控技术发展有限公司

Qingdao Origin Measurement and Control Technology Development Co., Ltd.

校准证书

Calibration certificate

证书编号：C2-2203-068 号

Certificate NO.

委托单位：特瑞堡海洋工程（青岛）有限公司

Applicant

地　　址：山东省青岛市城阳区荣海四路 35 号

Address

测量设备名称：钢卷尺

Name of instrument

型号/规格：5 m

Mode /Type

出厂编号：GJC-005

Serial No.

制造单位：田岛工具

Manufacturer

发证单位（校准专用章）

Issued by(stamp)

青岛奥瑞斯测控技术发展有限公司 计量校准专用章

批准人：

Approved Signature

校核员：

Checked by

校准员：

Calibrated by

接收日期：2022 年 03 月 10 日

Received Date year month day

校准日期：2022 年 03 月 10 日

Calibration Date year month day

发布日期：2022 年 03 月 10 日

Issued Date year month day

实验室地址（Add）：青岛市高新区利源路 8 号实验中心 3 楼　　邮编（Post code）：266111

3/F., Experiment Center, No. 8, Liyuan Road, Chengyang District, Qingdao, Shandong, China

电话（Tel）：0532-58710655　　传真（Fax）：0532-58710655　　Email：ars2025@126.com

证书编号（*Certificate NO.*）： C2-2203-068

校准的地点及环境条件：
Place of the calibration, environmental condition

地点： 长度室（301 室） 温度： 20℃ 相对湿度： 58 %
Place Temp R.H

校准所依据的技术文件（编号、名称）： JJG4-2015 《钢卷尺》检定规程
Reference documents for the calibration(Code Name)

本次校准所使用的主要计量标准器具：
Standards of measurement used in this calibration

名 称：*Name*	不确定度或准确度等级或最大允许误差：*Uncertainty or accuracy class or maximum permissible error*	计量标准证书编号：*Certificate No.*	发证机构：*Issuing body*	有效期至：*Valid date to*
标准钢卷尺	U=(5+5L) μm； k=2	CDjx2021-12166	中国计量科学研究院	2022.07.08

本计量标准器具的量值可溯源至国家基准
This measurement standard used in the test can be traced to the national primary standard in P.R. CHINA

校准数据/结果
Date /Results of calibration

被测间隔（m）	实际长度		校准结果的不确定度（k=2）
	m	mm	
0～1	1.0	+0.1	U=0.2mm
0～2	2.0	+0.2	
0～3	3.0	+0.3	
0～4	4.0	+0.6	
0～5	5.0	+0.8	

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建议有效期至： 2023 年 03 月 09 日
Valid date to year month day

注：此页不够时可以接附页。

备注：Note	

说明：1.本证书无批准人签字及本实验室校准专用章无效；
This certificate is invalid if it has no signature by who approves and company stamp for calibration.

2.本证书的校准结果仅对本次所校准的测量设备有效；
This certificate is responsible only for theinstrument.

3.未经本实验室书面批准，不得部分复制此证书。
This certificate can not be partly copied if not allowed.

青岛奥瑞斯测控技术发展有限公司

Qingdao Origin Measurement and Control Technology Development Co., Ltd.

校准证书

Calibration certificate

证书编号：C2-2203-069 号

Certificate NO.

委托单位：特瑞堡海洋工程（青岛）有限公司

Applicant

地　　址：山东省青岛市城阳区荣海四路 35 号

Address

测量设备名称：钢卷尺

Name of instrument

型号/规格：5 m

Mode /Type

出厂编号：GJC-006

Serial No.

制造单位：田岛工具

Manufacturer

发证单位（校准专用章）

Issued by(stamp)

批准人：

Approved Signature

校核员：

Checked by

校准员：

Calibrated by

接收日期：2022 年 03 月 10 日

Received Date year month day

校准日期：2022 年 03 月 10 日

Calibration Date year month day

发布日期：2022 年 03 月 10 日

Issued Date year month day

实验室地址（Add）：青岛市高新区利源路 8 号实验中心 3 楼　　邮编(Post code)：266111

3/F., Experiment Center, No. 8, Liyuan Road, Chengyang District, Qingdao, Shandong, China

电话(Tel)：0532-58710655　　传真(Fax)：0532-58710655　　Email：ars2025@126.com

证书编号（*Certificate NO.*）： C2-2203-069

校准的地点及环境条件：
Place of the calibration, environmental condition
地点： 长度室（301 室） 温度： 20℃ 相对湿度： 58 %
Place Temp R.H

校准所依据的技术文件（编号、名称）： JJG4-2015 《钢卷尺》检定规程
Reference documents for the calibration(Code Name)

本次校准所使用的主要计量标准器具：
Standards of measurement used in this calibration

名 称：*Name*	不确定度或准确度等级或最大允许误差：*Uncertainty or accuracy class or maximum permissible error*	计量标准证书编号：*Certificate No.*	发证机构：*Issuing body*	有效期至：*Valid date to*
标准钢卷尺	U=(5+5L) μm； k=2	CDjx2021-12166	中国计量科学研究院	2022.07.08

本计量标准器具的量值可溯源至国家基准
This measurement standard used in the test can be traced to the national primary standard in P.R. CHINA

校准数据/结果
Date /Results of calibration

被测间隔（m）	实际长度		校准结果的不确定度（k=2）
	m	mm	
0～1	1.0	0	U=0.2mm
0～2	2.0	+0.2	
0～3	3.0	+0.2	
0～4	4.0	+0.4	
0～5	5.0	+0.7	

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建议有效期至： 2023 年 03 月 09 日
Valid date to year month day
注：此页不够时可以接附页。

备注：Note	

说明：1.本证书无批准人签字及本实验室校准专用章无效；
This certificate is invalid if it has no signature by who approves and company stamp for calibration.
2.本证书的校准结果仅对本次所校准的测量设备有效；
This certificate is responsible only for theinstrument.
3.未经本实验室书面批准，不得部分复制此证书。
This certificate can not be partly copied if not allowed.

中车青岛四方机车车辆股份有限公司
计 量 理 化 检 测 中 心
CRRC Qingdao Sifang Corporation Limited Metrology & Inspection Centre

校 准 证 书

Calibration certificate

证书编号：21J1022202 号
Certificate NO.

委 托 单 位：特瑞堡海洋工程（青岛）有限公司
Applicant

地 址：青岛市城阳区荣海四路35号
Address

测量设备名称：专用工作测力仪
Name of instrument

型 号/规 格：YH54-500
Mode/Type

出 厂 编 号：11274
Serial No.

制 造 单 位：合肥
Manufacturer

批准人：赵元利
Approved Signature

校核员：
Approved Signature

校准员：
Calibrated by

发证单位（计量校准专用章）
Issued by (stamp)

发布日期：2021 年 10 月 25 日
Release date year month day

地址（Add）：青岛市城阳区锦宏东路88号 邮编（Post code）：266111
No. 88, Jinhongdong Road, Chengyang District, Qingdao, China
传真（Fax）：0532-68953661 电话（Tel）：0532-68953659 Email：jczx@cqsf.com

中车青岛四方机车车辆股份有限公司计量理化检测中心

CRRC Qingdao Sifang Corporation Limited Metrology & Inspection Centre

校　准　证　书

Calibration certificate

证书编号：21J1022202　　号　　第 2 页 共 2 页

Certificate NO.　　*page*　　*of*

1. 本次校准所使用的主要计量标准：

Standards of measurement used in this calibration

名　称 Name	测量范围 Measuring range	不确定度或准确度等级或最大允许误差 Uncertainty or accuracy class or maximum permissible error	计量标准证书编号 Certificate No.	发证机构 Issuing body	有效期至 Valid date to
标准测力仪	5MN	±0.3%	LSfm2021-10698	中国计量科学研究院	2022.03.21

2.校准所依据的技术文件（编号、名称）：JJF1134-2005《专用工作测力机》校准规范

Reference documents for the calibration(Code　Name)

3.校准的地点及环境条件：

Place of the calibration, environmental condition

地点：现场　　温度：17℃　　相对湿度：/%

Place　　Temp　　R.H.

4.设备接收日期：2021 年 10 月 22 日　　校准日期：2021 年 10 月 22 日

Equipment receipt date　year month day　　Calibration date　year month day

校准数据/结果

Data /Results of Calibration

显示值（t）	标准值（t）	测量不确定度
50.0	49.94	U_r=0.5% k=2
100.0	99.82	
150.0	149.79	
200.0	199.65	
250.0	249.63	
300.0	299.54	

以下空白

建议有效期至：2022 年 10 月 21 日

Valid Until　year month day

注：此页不够时可以接附页。

备　注：Note	1. 本中心评定不确定度的依据为《JJF1059.1 测量不确定度评定与表示》；本实验室在作出符合性声明时，已经考虑了不确定度的影响； 2. 当测量值和不确定度未提供时， 被校准的测量设备不能做量值传递；在客户有要求时，本中心可以提供测量值和不确定度。

说明：本证书无批准人签字及本中心校准专用章无效；

This certificate is invalid if it has no signature by who approves and central stamp for calibration.

本证书的校准结果仅对本次所校准的测量设备有效；

This certificate is responsible only for the instrument.

未经本中心书面批准，不得部分复制此证书。

This certificate can not be partly copied if not allowed.

苏州赛宝校准技术服务有限公司

Suzhou Saibao Calibration Technology Service Co.,Ltd.

校 准 证 书

Calibration Certificate

证书编号：TYJS1912234961-001

Certificate No.

委托方 Client	特瑞堡海洋工程（青岛）有限公司
地址 Address	山东省青岛市城阳区荣海四路35号
器具名称 Name of instrument	电子拉力试验机
型号/规格 Type/Model	BT1-FR2.5TH.D14
制造厂 Manufacturer	Zwick/Roell
出厂编号 No.of instrument	186547/2009
管理编号 No. of regulation	/

校准员 Calibrated by

核验员 Checked by

批准人 Approved by

（校准专用章）stamp

校准日期 Calibration Date 2021 年 09 月 07 日 Year Month Day

发布日期 Issue Date 2021 年 09 月 07 日 Year Month Day

地 址：苏州市吴中区宝通路4号
查询电话：0512-65118735
投诉电话：0512-67077910
传 真：0512-65119807
邮 箱：SBJL@szsaibao.com
网 址：http://www.szsaibao.com

Add.: No.4,Baotong Road,Wuzhong District,Suzhou
Service Tel.: 0512-65118735
Complaints Call: 0512-67077910
Fax: 0512-65119807
E-mail: SBJL@szsaibao.com
Website:http://www.szsaibao.com

本次校准所依据的技术文件：

Reference documents for the calibration：

参照JJG 475-2008《电子式万能试验机检定规程》

JJG 475-2008《Verification Regulation of Electronic Universal Testing Machine》

本次校准所使用的主要计量标准器具：

Main measurement standards used in the calibration:

名称 Name	编号 Number	测量范围 Measure Range	型号/规格 Model	不确定度/准确度/最大允差 Uncertainty /Accuracy/MPE	溯源机构 Traceabillty Mechanism	证书号/有效期 Certificate No. /Valid Date
标准测力仪	T9-012	3kN	DD-1-3kN	0.1级	山东省计量科学研究院	F01-20210247/2022-01-21
						/
						/
						/
						/
						/

校准地点、环境条件和接收/建议复校日期：

Location, environmental conditions of the calibration, receive date and recommended recalibration date:

地点：客户实验室
Location

温度：20.5℃
Temperature

相对湿度：50%
R.H.

其他：/
Others

接收日期：2021 年 09 月 07 日
Receive Date Year Month Day

建议复校日期：2022 年 09 月 06 日
Recommended recalibration date Year Month Day

注：
Note:

1. 未经本实验室批准授权，部分复制本证书无效。
Partly copying this certificate will not be admitted unless allowed by this laboratory.
2. 本证书校准结果仅与受校准的器具有关。
The results relate only to the instrument calibrated.
3. 本证书未加盖校准专用章无效。
The certificate is invalid without offical stamp.
4. 本证书的电子版本或硬拷贝版本不具备法律效力，以纸质版证书原件为准。
Only the original paper version of this certificate is legally valid, and the electronic or hard copy version is not valid.
5. 结果页中备注*号的项目或测量范围不在获CNAS认可的范围内。
The items or the measurement range marked with * in the result page are not within the scope approved by CNAS.

校准结果

RESULTS OF CALIBRATION

一、外观和功能检查（Appearance and Function Check）：

外观和功能符合要求（The appearance and functions meet the requirements）

二、计量特性测量结果（The results related to metrological specification）

试验力 Test force (N)	实测值 Measured value (N)	示值误差 Error (%)	最大允许误差 MPE (%)	示值重复性 Repeatability (%)	最大允许误差 MPE (%)	测量不确定度 Uncertainty in measurement U_{rel} (k=2) (%)	结论 Conclusion (Pass/Fail)
500	501.13	-0.2	±1.0	0.1	1.0	0.5	Pass
1000	1001.32	-0.1	±1.0	0.1	1.0	0.5	Pass
1500	1502.79	-0.2	±1.0	0.1	1.0	0.5	Pass
2000	2002.84	-0.1	±1.0	0.1	1.0	0.5	Pass
2500	2503.83	-0.2	±1.0	0.0	1.0	0.5	Pass

说明(Direction)：

所校项目符合JJG 475-2008相应条款的要求。

It has been found that the instrument calibrated meet metrological requirements in the JJG 475-2008.

以下空白(Blank Below)

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008203-0001
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	测厚仪
型号规格： Model/Type	GT-313-A1
制造厂商： Manufacturer	高铁检测仪器有限公司
机身编号： Serial No.	2009-00235
管理编号： Asset No.	/

接收日期： Acce. Date	2021-11-17	校准日期： Cal. Date	2021-11-17
校 准 人： Calibrated by	柳婷婷	签发日期： App. Date	2021-11-18
核 验 人： Inspected by	周琪		
签 发 人： Approved by		印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

地址/ADDR：苏州市高新区鹿山路 369 号
No.369 Lushan Road, New District,Suzhou
邮编/Post：215100
电话/Tel：0512-6802 0717
传真/Fax：0512-6802 0712
网址/website：http://www.lonbocal.com
邮箱/Email：cal_services@lonbocal.com

校 准 说 明

Directions of Calibration

证书编号：32XJ21008203-0001
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。
The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。
All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。
The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。
The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。
"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 25 (℃) 相对湿度(Relative Humidity)：58 (%)

7. 校准地点 (Place of the calibration)： **朗博实验室**

8. 本次校准的技术依据 (Reference documents for the calibration)：

JJF 1255-2010 厚度表校准规范

9. 本项目 CNAS 认可能力范围及备注

(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 长度:(0～30)mm

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
量块(4 等)/Gauge block(fourth grade)	3072	10ZJ21000102-0003	2022-08-16	朗博实验室	4 等

结论(Conclusion)：所校准项目合格(Passed at Calibration Items)

建议校准周期 (Proposed Cal.Period)：1 年/Year

校准结果(Calibration Results):

1、外观及各部分相互作用(Appearance & Interaction)

结论 (Pass/Fail)
P

2、示值变动性(Reading Fluctuation)

变动性 (Fluctuation) (mm)	允许范围 (Limit) (mm)	结论 (Pass/Fail)
0.01	≤0.01	P

3、漂移(drift)

漂移 (Drift) (mm)	允许范围 (Limit) (mm)	结论 (Pass/Fail)
0.01	≤0.01	P

4、示值误差(Indication Error)

标准值 (Reference) (mm)	示值 (Indication) (mm)	误差 (Error) (mm)	允许误差 (Limit) (mm)	结论 (Pass/Fail)	扩展不确定度 *(U，k=2)* (μm)
0.5	0.50	0.00	±0.03	P	6
1	1.00	0.00	±0.03	P	6
2	2.00	0.00	±0.03	P	6
3	3.00	0.00	±0.03	P	6
4	4.00	0.00	±0.03	P	6
5	5.00	0.00	±0.03	P	6
6	6.00	0.00	±0.03	P	6
7	7.00	0.00	±0.03	P	6
8	8.00	0.00	±0.03	P	6
9	9.00	0.00	±0.03	P	6
10	10.00	0.00	±0.03	P	6
12	12.00	0.00	±0.04	P	10

校准结果(Calibration Results):

附(Appendix):

关于测量结果不确定度的说明:

Directions of measurement uncertainty in the calibration

依据:JJF 1059.1-2012 测量不确定度评定与表示

Reference document:JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

----------以下空白(hereafter no data)----------

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008203-0003
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	邵氏橡胶硬度计
型号规格： Model/Type	A 型
制造厂商： Manufacturer	TECLOCK
机身编号： Serial No.	724227
管理编号： Asset No.	/

接收日期： Acce. Date	2021-11-17	校准日期： Cal. Date	2021-11-17
校 准 人： Calibrated by	童建方	签发日期： App. Date	2021-11-18
核 验 人： Inspected by	周琪		
签 发 人： Approved by	金帆	印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

校 准 说 明

Directions of Calibration

证书编号：32XJ21008203-0003
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。

The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。

All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。

The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。

The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。

"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 25 (℃) 相对湿度(Relative Humidity)：58 (%)

7. 校准地点 (Place of the calibration)： 朗博实验室

8. 本次校准的技术依据 (Reference documents for the calibration)：

JJG 304-2003 A 型邵氏硬度计检定规程

9. 本项目 CNAS 认可能力范围及备注

(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 硬度:(20～100)HA

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
硬度计校准装置	1277	10ZJ20000040-0074	2021-12-30	朗博实验室	±0.1%
硬度计专用量块	/	10ZJ20000040-067	2021-12-30	朗博实验室	±0.1%

结论(Conclusion)：所校准项目合格(Passed at Calibration Items)

建议校准周期 (Proposed Cal.Period)：1 年/Year

校准结果(Calibration Results):

1、外观及功能检查(Appearance and Function Check)

	结论 (Pass/Fail)
	P

2、压针伸出长度和测量指示装置(Press Needle Extending Length and Measuring Indicating Device)

压针伸出长度 （Extended Length） (mm)	硬度计标称值 (Nominal) (HA)	实测值 (Reference) (HA)	误差 (Error) (HA)	允许误差 (Limit) (HA)	结论 (Pass/Fail)
2.50	0	0.0	0.0	±0.5	P
1.25	50	50.0	0.0	±1.0	P
0	100	100.0	0.0	±0.5	P

3、试验力(Test Force)

硬度计标称值 (Nominal Value of hardness tester) (HA)	试验力标称值 (Nominal Value of test force) (mN)	标准值 (Reference) (mN)	误差 (Error) (mN)	允许误差 (Limit) (mN)	结论 (Pass/Fail)
20	2050	1990	60	±80	P
40	3550	3490	60	±80	P
60	5050	5000	50	±80	P
80	6550	6480	70	±80	P
100	8050	7980	70	±80	P

4、硬度(Hardness)

硬度计标称值 (Nominal Value of hardness tester) (HA)	标准值 (Reference) (HA)	误差 (Error) (HA)	允许误差 (Limit) (HA)	结论 (Pass/Fail)
20	19.20	0.80	±1	P
40	39.20	0.80	±1	P
60	59.33	0.67	±1	P
80	79.07	0.93	±1	P
100	99.07	0.93	±1	P

校准结果(Calibration Results):

附(Appendix):

关于测量结果不确定度的说明:

Directions of measurement uncertainty in the calibration

1、 依据:JJF 1059.1-2012 测量不确定度评定与表示

Reference document:JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

2、 本次测量结果的扩展不确定度

The mearsurement expanded uncertainties of the calibration

2.1、硬度(Hardness) U = 0.2HA *(k=2)*

----------以下空白(hereafter no data)----------

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008211-0001
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	电子天平
型号规格： Model/Type	AL204
制造厂商： Manufacturer	METTLERTOLEDO
机身编号： Serial No.	1231490142
管理编号： Asset No.	/

接收日期： Acce. Date	2021-10-18	校准日期： Cal. Date	2021-10-18
校 准 人： Calibrated by		签发日期： App. Date	2021-10-19
核 验 人： Inspected by			
签 发 人： Approved by		印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

地址/ADDR：苏州市高新区鹿山路 369 号
No.369 Lushan Road, New District,Suzhou
邮编/Post：215100
电话/Tel：0512-6802 0717
传真/Fax：0512-6802 0712
网址/website：http://www.lonbocal.com
邮箱/Email：cal_services@lonbocal.com

校 准 说 明

Directions of Calibration

证书编号：32XJ21008211-0001
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。
The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。
All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。
The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。
The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。
"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 21.5 (℃)　　相对湿度(Relative Humidity)：55 (%)

7. 校准地点 (Place of the calibration)： 特瑞堡实验室

8. 本次校准的技术依据 (Reference documents for the calibration)：

JJG 1036-2008 电子天平检定规程

9. 本项目 CNAS 认可能力范围及备注
(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 质量:1mg～2000kg

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
砝码(F1 等级)/Weight(Grade F1)	308-1	801174538-002	2021-10-27	苏州市计量院	F1 级

结论(Conclusion)：所校准项目合格（Passed at Calibration Items）

建议校准周期 (Proposed Cal.Period)：1 年/Year

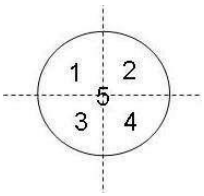
校准结果(Calibration Results):

1、外观(Appearance)

	结论 (Pass/Fail)
	P

2、偏载误差(Partial carrying Error)

示意图：



标准值 (Reference) (g)	位置 (Position)	示值 (Indication) (g)	误差 (Error) (g)
100	1	100.000	0.000
	2	100.000	0.000
	3	100.000	0.000
	4	100.000	0.000
	5	100.000	0.000

3、重复性(Repeatiblity)

标准值 (Reference) (g)	测量次数 (Numeric)	示值 (Indication) (g)
100	1	100.000
	2	100.000
	3	100.000
	4	100.000
	5	100.000
	6	100.000
重复性 Repeatiblity	-	0.000

校准结果(Calibration Results):

4、示值误差(Inidcation Error)

	标准值 (Reference) (g)	示值 (Indication) (g)	误差 (Error) (g)
加载	0	0.000	0.000
	0.1	0.100	0.000
	10	10.000	0.000
	20	20.000	0.000
	100	100.000	0.000
	200	200.000	0.000
卸载	200	200.000	0.000
	100	100.000	0.000
	20	20.000	0.000
	10	10.000	0.000
	0.1	0.100	0.000
	0	0.000	0.000
	0	0.000	0.000

附(Appendix)：

关于测量结果不确定度的说明

Directions of measurement uncertainty in the calibration

1、依据：JJF 1059.1-2012 测量不确定度评定与表示

Reference document：JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

2、本次测量结果的扩展不确定度

The mearsurement expanded uncertainties of the calibration

2.1、重量(Weight)	（0~50)g	*U*= 0.2mg	*(k=2)*
	（>50~200)g	*U*= 0.7mg	*(k=2)*
	（>200~220)g	*U*= 1.3mg	*(k=2)*

----------以下空白(hereafter no data)----------

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008211-0003
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	电子天平
型号规格： Model/Type	XS225A
制造厂商： Manufacturer	Precisa
机身编号： Serial No.	3104250
管理编号： Asset No.	/

接收日期： Acce. Date	2021-10-18	校准日期： Cal. Date	2021-10-18
校 准 人： Calibrated by	朱十富	签发日期： App. Date	2021-10-19
核 验 人： Inspected by	周琪		
签 发 人： Approved by	金枫	印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

地址/ADDR：苏州市高新区鹿山路 369 号
No.369 Lushan Road, New District,Suzhou
邮编/Post：215100
电话/Tel：0512-6802 0717
传真/Fax：0512-6802 0712
网址/website：http://www.lonbocal.com
邮箱/Email：cal_services@lonbocal.com

校 准 说 明

Directions of Calibration

证书编号：32XJ21008211-0003
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。
The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。
All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。
The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。
The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。
"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 21.5 (℃)　　相对湿度(Relative Humidity)：55 (%)

7. 校准地点 (Place of the calibration)： 特瑞堡实验室

8. 本次校准的技术依据 (Reference documents for the calibration)：

JJG 1036-2008 电子天平检定规程

9. 本项目 CNAS 认可能力范围及备注
(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 质量:1mg～2000kg

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
砝码(F1 等级)/Weight(Grade F1)	308-1	801174538-002	2021-10-27	苏州市计量院	F1 级

结论(Conclusion)：所校准项目合格（Passed at Calibration Items）

建议校准周期 (Proposed Cal.Period)：1 年/Year

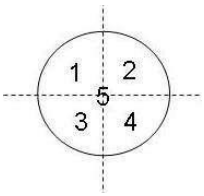
校准结果(Calibration Results):

1、外观(Appearance)

	结论
	(Pass/Fail)
	P

2、偏载误差(Partial carrying Error)

示意图：



标准值 (Reference) (g)	位置 (Position)	示值 (Indication) (g)	误差 (Error) (g)
100	1	100.000	0.000
	2	100.000	0.000
	3	100.000	0.000
	4	100.000	0.000
	5	100.000	0.000

3、重复性(Repeatiblity)

标准值 (Reference) (g)	测量次数 (Numeric)	示值 (Indication) (g)
100	1	100.000
	2	100.000
	3	100.000
	4	100.000
	5	100.000
	6	100.000
重复性 Repeatiblity	-	0.000

校准结果(Calibration Results):

4、示值误差(Inidcation Error)

	标准值 (Reference) (g)	示值 (Indication) (g)	误差 (Error) (g)
加载	0	0.000	0.000
	0.1	0.100	0.000
	10	10.000	0.000
	20	20.000	0.000
	50	50.000	0.000
	100	100.000	0.000
	200	200.000	0.000
卸载	200	200.000	0.000
	100	100.000	0.000
	50	50.000	0.000
	20	20.000	0.000
	10	10.000	0.000
	0.1	0.100	0.000
	0	0.000	0.000

附(Appendix)：

关于测量结果不确定度的说明

Directions of measurement uncertainty in the calibration

1、依据：JJF 1059.1-2012 测量不确定度评定与表示

Reference document：JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

2、本次测量结果的扩展不确定度

The mearsurement expanded uncertainties of the calibration

2.1、重量(Weight)	（0~50)g	*U*= 0.2mg	*(k=2)*
	（>50~200)g	*U*= 0.7mg	*(k=2)*
	（>200~220)g	*U*= 1.3mg	*(k=2)*

----------以下空白(hereafter no data)----------

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008211-0002
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	电子天平
型号规格： Model/Type	PB303-S
制造厂商： Manufacturer	METTLERTOLEDO
机身编号： Serial No.	1127090229
管理编号： Asset No.	/

接收日期： Acce. Date	2021-10-18	校准日期： Cal. Date	2021-10-18
校 准 人： Calibrated by		签发日期： App. Date	2021-10-19
核 验 人： Inspected by			
签 发 人： Approved by		印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

地址/ADDR：苏州市高新区鹿山路 369 号
No.369 Lushan Road, New District,Suzhou
邮编/Post：215100
电话/Tel：0512-6802 0717
传真/Fax：0512-6802 0712
网址/website：http://www.lonbocal.com
邮箱/Email：cal_services@lonbocal.com

校 准 说 明

Directions of Calibration

证书编号：32XJ21008211-0002
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。
The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。
All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。
The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。
The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。
"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 21.5 (℃)　　相对湿度(Relative Humidity)：55 (%)

7. 校准地点 (Place of the calibration)： 特瑞堡实验室

8. 本次校准的技术依据 (Reference documents for the calibration)：

JJG 1036-2008 电子天平检定规程

9. 本项目 CNAS 认可能力范围及备注
(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 质量:1mg～2000kg

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
砝码(F1 等级)/Weight(Grade F1)	308-1	801174538-002	2021-10-27	苏州市计量院	F1 级

结论(Conclusion)：所校准项目合格（Passed at Calibration Items）

建议校准周期 (Proposed Cal.Period)：1 年/Year

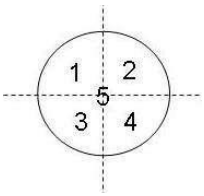
校准结果(Calibration Results):

1、外观(Appearance)

	结论 (Pass/Fail)
	P

2、偏载误差(Partial carrying Error)

示意图：



标准值 (Reference) (g)	位置 (Position)	示值 (Indication) (g)	误差 (Error) (g)
100	1	100.000	0.000
	2	100.000	0.000
	3	100.000	0.000
	4	100.000	0.000
	5	100.000	0.000

3、重复性(Repeatiblity)

标准值 (Reference) (g)	测量次数 (Numeric)	示值 (Indication) (g)
100	1	100.000
	2	100.000
	3	100.000
	4	100.000
	5	100.000
	6	100.000
重复性 Repeatiblity	-	0.000

校准结果(Calibration Results):

4、示值误差(Inidcation Error)

	标准值 (Reference) (g)	示值 (Indication) (g)	误差 (Error) (g)
加载	0	0.000	0.000
	0.1	0.100	0.000
	10	10.000	0.000
	20	20.000	0.000
	100	100.000	0.000
	200	200.000	0.000
	300	300.000	0.000
卸载	300	300.000	0.000
	200	200.000	0.000
	100	100.000	0.000
	20	20.000	0.000
	10	10.000	0.000
	0.1	0.100	0.000
	0	0.000	0.000

附(Appendix)：

关于测量结果不确定度的说明

Directions of measurement uncertainty in the calibration

1、依据：JJF 1059.1-2012 测量不确定度评定与表示

Reference document：JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

2、本次测量结果的扩展不确定度

The mearsurement expanded uncertainties of the calibration

2.1、重量(Weight)	（0~50)g	*U*= 0.2mg	*(k=2)*
	（>50~200)g	*U*= 0.7mg	*(k=2)*
	（>200~220)g	*U*= 1.3mg	*(k=2)*

----------以下空白(hereafter no data)----------

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008211-0004
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	老化试验箱
型号规格： Model/Type	UT-6
制造厂商： Manufacturer	Thermo
机身编号： Serial No.	40712450
管理编号： Asset No.	/

接收日期： Acce. Date	2021-10-18	校准日期： Cal. Date	2021-10-18
校 准 人： Calibrated by	余荣招	签发日期： App. Date	2021-10-19
核 验 人： Inspected by	周琪		
签 发 人： Approved by	余枫	印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

地址/ADDR：苏州市高新区鹿山路 369 号
No.369 Lushan Road, New District,Suzhou
邮编/Post：215100
电话/Tel：0512-6802 0717
传真/Fax：0512-6802 0712
网址/website：http://www.lonbocal.com
邮箱/Email：cal_services@lonbocal.com

校 准 说 明

Directions of Calibration

证书编号：32XJ21008211-0004
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。
The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。
All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。
The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。
The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。
"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 21.8 (℃)　　相对湿度(Relative Humidity)：55 (%)

7. 校准地点 (Place of the calibration)： 特瑞堡实验室

8. 本次校准的技术依据 (Reference documents for the calibration)：
JJF 1101-2003 环境试验设备温度、湿度校准规范

9. 本项目 CNAS 认可能力范围及备注

(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 温度:(-80～300)℃,湿度:(20%～98%)RH

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
标准铂电阻温度传感器	01～100	10ZJ2100004-0001/2 GB21J08100-0001	2022-05-17	朗博实验室	A 级
数据采集开关/单元/Data Acquisition/Switch Unit	US37016665	10ZJ21000040-0002	2022-07-30	朗博实验室	U=0.15℃(k=2)

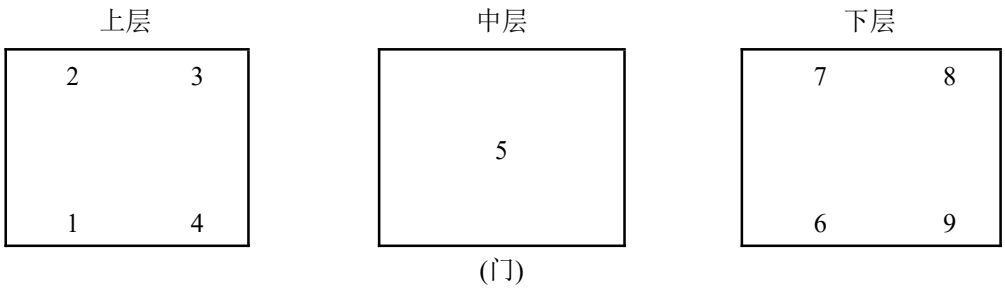
结论(Conclusion)：所校准项目合格（Passed at Calibration Items）

建议校准周期 (Proposed Cal.Period)：1 年/Year

校准结果(Calibration Results):

1、温度测量(Temperature Measurement)

1.1、测量点布置图(Measurement point graph)



1.2、测量值(Measurement Value)

单位(Units)：	℃
标称值(Nominal)：	70
设定值(Setting)：	70.0
示值(Indication)：	70.0

温度(Temperature)

测量点 (No.)	测量平均值 (Average) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
1	70.27	---	---
2	70.71	---	---
3	70.27	---	---
4	70.85	---	---
5	70.87	---	---
6	70.41	---	---
7	70.41	---	---
8	70.20	---	---
9	69.74	---	---

1.3、温度偏差(Temperature Deviation)

温度偏差 (Deviation) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
0.87	±2	P

校准结果(Calibration Results):

1.4、温度波动度(Temperature Fluctuation)

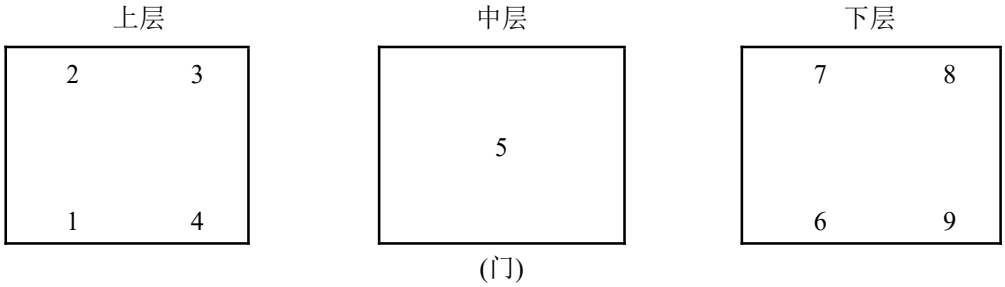
波动度 (Dluctuation) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
±0.04	±0.5	P

1.5、温度均匀度(Temperature Uniformity)

均匀度 (Uniformity) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
1.14	≤2	P

2、温度测量(Temperature Measurement)

2.1、测量点布置图(Measurement point graph)



2.2、测量值(Measurement Value)

单位(Units)：	℃
标称值(Nominal)：	95
设定值(Setting)：	95.0
示值(Indication)：	95.0

温度(Temperature)

测量点 (No.)	测量平均值 (Average) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
1	95.50	---	---
2	95.94	---	---
3	95.50	---	---
4	95.94	---	---
5	95.96	---	---

校准结果(Calibration Results):

温度(Temperature)(cont'd)

测量点 (No.)	测量平均值 (Average) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
6	95.10	---	---
7	95.29	---	---
8	95.66	---	---
9	95.20	---	---

2.3、温度偏差(Temperature Deviation)

温度偏差 (Deviation) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
-0.96	±2	P

2.4、温度波动度(Temperature Fluctuation)

波动度 (Dluctuation) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
±0.04	±0.5	P

2.5、温度均匀度(Temperature Uniformity)

均匀度 (Uniformity) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
0.87	≤2	P

校准结果(Calibration Results):

附(Appendix)：

关于测量结果不确定度的说明

Directions of measurement uncertainty in the calibration

1、依据：JJF 1059.1-2012 测量不确定度评定与表示

Reference document：JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

2、本次测量结果的扩展不确定度

The mearsurement expanded uncertainties of the calibration

2.1、温度(Temperature): $U = 0.50℃$ $(k=2)$

----------以下空白(hereafter no data)----------

校 准 证 书
Calibration Certificate

证书编号： 32XJ21008211-0005
Cer.No.

委托单位： Customer	特瑞堡海洋工程（青岛）有限公司
委托单位地址： Customer Addr.	青岛市城阳区荣海四路 35 号
仪器名称： Description	老化试验箱
型号规格： Model/Type	UT-6
制造厂商： Manufacturer	Thermo
机身编号： Serial No.	40712449
管理编号： Asset No.	/

接收日期： Acce. Date	2021-10-18	校准日期： Cal. Date	2021-10-18
校 准 人： Calibrated by	余荣招	签发日期： App. Date	2021-10-19
核 验 人： Inspected by	周琪		
签 发 人： Approved by	余枫	印章： Chop	苏州朗博校准检测有限公司 校准检测专用章

地址/ADDR：苏州市高新区鹿山路 369 号
No.369 Lushan Road, New District,Suzhou
邮编/Post：215100
电话/Tel：0512-6802 0717
传真/Fax：0512-6802 0712
网址/website：http://www.lonbocal.com
邮箱/Email：cal_services@lonbocal.com

校 准 说 明

Directions of Calibration

证书编号：32XJ21008211-0005
Cer.No.

1. 本实验室能力符合 ISO/IEC 17025:2017《检测和校准实验室能力的通用要求》。
The Capability of Our Lab conforms to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Lab.

2. 本实验室所出具的数据均可溯源到国家计量基准和国际单位制(SI)。
All data issued by this laboratory are traceable to national primary standards and International System of Units(SI).

3. 证书未经本实验室书面授权，不得部分复制。
The certificates must not be partially duplicated except with, prior written approval from the issuing laboratory.

4. 本次校准结果仅与被校件有关。
The calibration results are only related to the Unit Under Test.

5. 证书内页中"P"、"合格"代表"测量结果在允许范围内","F"、"不合格"代表"测量结果不在允许范围内","N/A"代表"不适用"。
"P" and "Pass" in this certificate stand for "Low Limit ≤ the measured value ≤ High Limit","F" and "Fail" Stand for "the measured value < Low Limit or the measured value > High Limit","N/A" stand for "Not Applicable".

6. 环境条件 (Environmental condition)：

温度(Temperature)： 21.5 (℃)　　相对湿度(Relative Humidity)：55 (%)

7. 校准地点 (Place of the calibration)： 特瑞堡实验室

8. 本次校准的技术依据 (Reference documents for the calibration)：
JJF 1101-2003 环境试验设备温度、湿度校准规范

9. 本项目 CNAS 认可能力范围及备注

(CNAS accredited scopes and comments)。(详细认可范围请查看 CNAS 网站中注册号为 L4465 的证书附件 (Please see the attachment of certificate No.L4465 at CNAS website))。

⊙ 温度:(-80～300)℃,湿度:(20%～98%)RH

10. 本次校准所使用的主要测量标准 (Main measurement standards used during the calibration)：

标准器名称 (Description)	出厂编号 (Serial No.)	证书编号 (Certificate No.)	有效期至 (Due Date)	溯源单位 (Traceability to)	技术指标 (Specification)
标准铂电阻温度传感器	01～100	10ZJ2100004-0001/2 GB21J08100-0001	2022-05-17	朗博实验室	A 级
数据采集开关/单元/Data Acquisition/Switch Unit	US37016665	10ZJ21000040-0002	2022-07-30	朗博实验室	U=0.15℃(k=2)

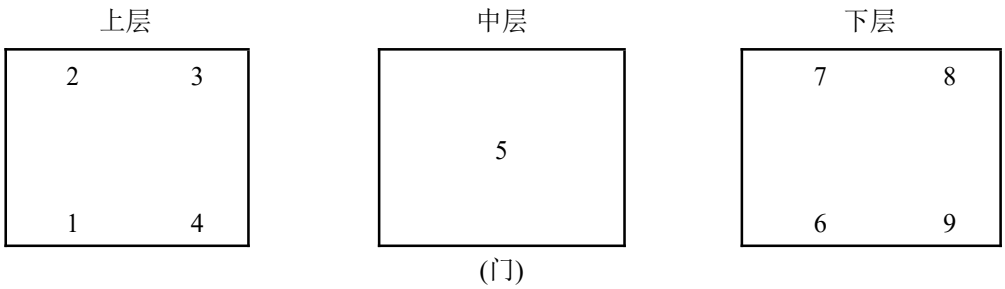
结论(Conclusion)：所校准项目合格（Passed at Calibration Items）

建议校准周期 (Proposed Cal.Period)：1 年/Year

校准结果(Calibration Results):

1、温度测量(Temperature Measurement)

1.1、测量点布置图(Measurement point graph)



1.2、测量值(Measurement Value)

单位(Units)：	℃
标称值(Nominal)：	70
设定值(Setting)：	70.0
示值(Indication)：	70.0

温度(Temperature)

测量点 (No.)	测量平均值 (Average) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
1	70.25	---	---
2	70.70	---	---
3	70.27	---	---
4	70.80	---	---
5	70.87	---	---
6	70.42	---	---
7	70.40	---	---
8	70.20	---	---
9	69.74	---	---

1.3、温度偏差(Temperature Deviation)

温度偏差 (Deviation) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
0.87	±2	P

校准结果(Calibration Results):

1.4、温度波动度(Temperature Fluctuation)

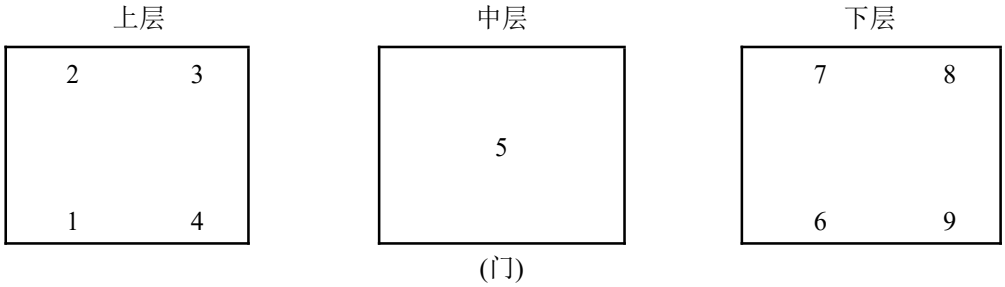
波动度 (Dluctuation) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
±0.04	±0.5	P

1.5、温度均匀度(Temperature Uniformity)

均匀度 (Uniformity) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
1.14	≤2	P

2、温度测量(Temperature Measurement)

2.1、测量点布置图(Measurement point graph)



2.2、测量值(Measurement Value)

单位(Units)：	℃
标称值(Nominal)：	95
设定值(Setting)：	95.0
示值(Indication)：	95.0

温度(Temperature)

测量点 (No.)	测量平均值 (Average) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
1	95.50	---	---
2	95.66	---	---
3	95.51	---	---
4	95.84	---	---
5	95.86	---	---

校准结果(Calibration Results):

温度(Temperature)(cont'd)

测量点 (No.)	测量平均值 (Average) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
6	95.11	---	---
7	95.27	---	---
8	95.66	---	---
9	95.26	---	---

2.3、温度偏差(Temperature Deviation)

温度偏差 (Deviation) (℃)	允许偏差 (Limit) (℃)	结论 (Pass/Fail) (P/F)
-0.96	±2	P

2.4、温度波动度(Temperature Fluctuation)

波动度 (Dluctuation) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
±0.04	±0.5	P

2.5、温度均匀度(Temperature Uniformity)

均匀度 (Uniformity) (℃)	允许范围 (Limit) (℃)	结论 (Pass/Fail) (P/F)
0.87	≤2	P

校准结果(Calibration Results):

附(Appendix)：

关于测量结果不确定度的说明

Directions of measurement uncertainty in the calibration

1、依据：JJF 1059.1-2012 测量不确定度评定与表示

Reference document：JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Mearsurement

2、本次测量结果的扩展不确定度

The mearsurement expanded uncertainties of the calibration

2.1、温度(Temperature): $U = 0.50℃$ $(k=2)$

----------以下空白(hereafter no data)----------

深圳市南科计量检测集团有限公司

Shenzhen Nanke Metrology and Testing Group Co., Ltd.

校 准 证 书

CALIBRATION CERTIFICATE

中国认可
国际互认
校准
CALIBRATION
CNAS L6579

证 书 编 号: *Certificate No.*	NTG2109321006
客 户 名 称 *Name of Customer*	特瑞堡海洋工程（青岛）有限公司
联 络 信 息 *Contact Information*	——
计量器具名称 *Name of Instrument*	阿克隆磨耗试验机
型 号 规 格 *Model/Type*	GT-7012-A
制 造 单 位 *Manufacturer*	高铁检测仪器有限公司
出 厂 编 号 *Serial No.*	2013-01825
管 理 编 号 *Management No.*	/
接 收 日 期 *Date of Receipt*	2021 年 09 月 06 日
校 准 日 期 *Date of Calibration*	2021 年 09 月 06 日
签 发 日 期 *Date of Issue*	2021 年 09 月 06 日

批准人 *Approved by* **职务** *Job* **总经理**

核 验 *Inspected by* 黄叶亭

校 准 *Calibration by* 王 峰

发证单位（专用章）
Issued by (Stamp)

地址：广东省深圳市龙岗区龙城街道黄阁坑社区阁溪西村61号东侧401南科检测中心 邮编：518172
电话：86-755-84535864 传真：86-755-84535867
Add: Nanke testing center, east side 401, No. 61, Gexi West Village, Huanggekeng Community, Longcheng Sub-District, Longgang District, Shenzhen, Guangdong, China Post Code: 518172
Tel:86-755-84535864 Fax:86-755-84535867 E-mail:gdszcxh@163.com

说　　明

证书编号：NTG2109321006
Certificate No.

Directions

1、本实验室质量管理体系符合 ISO/IEC 17025 的要求。

This laboratory quality management system meets the ISO/IEC 17025。

2、本实验室所出具的证书数据均可溯源于国家基准和国际单位制（SI）。

The data issued by this laboratory is traceable to national primary standards and international system of units (SI).

3、依据 JJF1059.1-2012《测量不确定度评定与表示》进行测量结果不确定度评定。

The evaluation was made according to JJF1059.1-2012Evaluation and Expression of Uncertainty in Measurement.

4、本次校准所依据的技术文件及获 CNAS 认可的能力范围，超出范围的内容未被认可。

Reference documents and CNAS accredited scopes for calibration，Beyond the scopes has not been accredited.

JJG（化）103-1991《橡胶阿克隆耐磨试验机检定规程》

5、本次校准所使用的主要计量标准器具：

Major standards of measurement used in the Calibration:

编　　号 Serial No.	标准器名称 Name of Equipment	计量特性 Metrological Characteristic	证书编号 Certificate No.	有效期至 Valid Date To
617356	标准测力仪 500N	0.3 级	LCL202100626	2022-02-18
NTG-SJPL-002	电子秒表	时间间隔 U=0.01s, k=2	213103635	2022-08-02
NTG-CD-106	数显倾角仪	U=0.10°，k=2	201222800	2021-12-22

6、校准地点及环境条件：

Place and environmental conditions of Calibration:

地点： Place:	委托方实验室	温度：23 ℃ 相对湿度： 55 % Temperature: Rel.Humidity:

7、建议复校时间间隔：1 年，送校单位也可按实际使用情况自主决定。

Suggested calibration interval is one year or it can be altered depending on the actual usage of the user.

8、证书中如有允许误差、判定结果，仅供参考。

In the data sheet，MPE & determination is only for reference.

注：(1)本证书校准结果仅与被校准仪器有关，如有疑问请在 15 个工作日内反馈。
The results are only related to the items calibrated，Please feedback to us within 15 working days if you have any question.
(2)本证书未经本机构书面授权，不得部分复制此证书。
This certificate shall not be partly reproduced，without the written approval of the laboratory.
(3)本证书未加盖本机构的证书专用章无效。
The certificate is not valid without the stamps of the laboratory.

深圳市南科计量检测集团有限公司

Shenzhen Nanke Metrology and Testing Group Co., Ltd.

校 准 结 果

证书编号：NTG2109321002
Certificate No.

Results of Calibration

1. 外观及安全性能:符合

2. 示值误差：

量程	标准力值	进程示值	允差	误差	结论	扩展不确定度
(kN)	(kN)	(kN)	(%)	(%)	(Pass/Fail)	(k=2)
0-100	10	10.000	±1.0	0.0	Pass	U_{rel}=0.4%
压缩	20	20.002		0.0	Pass	
	40	40.005		0.0	Pass	
	60	60.012		0.0	Pass	
	80	80.016		0.0	Pass	
	100	100.020		0.0	Pass	

3. 速度：

标称速度	实测值	允差	误差	结论	扩展不确定度
(mm/min)	(mm/min)	(%)	(%)	(Pass/Fail)	(k=2)
100	100.0	±1.0	0.0	Pass	U_{rel}=0.3%

4. 位移：

示值	实测值	允差	误差	结论	扩展不确定度
(mm)	(mm)	(%)	(%)	(Pass/Fail)	(k=2)
25	25.0	±1.0	0.0	Pass	U_{rel}=0.3%
40	40.0		0.0	Pass	
75	75.0		0.0	Pass	
100	100.0		0.0	Pass	

----------校准内容结束----------

SECTION 2. Rubber Fenders

2–F:

Domestic Test Report

December 8, 2022
FL2022.766.10

Mr. Gisael Gomez
Project Manager
Trelleborg Marine Systems - Americas
10375 Richmond Avenue, Suite 1725
Houston, TX 77042

Subject: *Performance testing of Trelleborg SCN 1000 cone fender*

Dear Mr. Gomez:

Performance testing on one Trelleborg SCN1000 F1.5 cone fender (S/N: M071566) was performed in the 5,000K Baldwin test machine at Fritz Laboratory on December 7, 2022, according to the constant velocity (CV) method specified in the *2002 PIANC Guidelines for the Design of Fender Systems.*

The procedure was as follows:

1. Install a steel stool on top of the fender and center the fender in the test machine.
2. Lower the test machine crosshead onto the fender until the test machine indicates an applied load of 300-500 lb.
3. Measure the height between base plate and the loading plate of the test machine. (Note that for cone fenders, subtract the height of the stool from the measured distance between the test machine plates to obtain the fender height).
4. Calculate the rated deflection of the fender (= rated percent deflection x fender height).
5. Compress the fender at least three times to the rated deflection for break-in.
6. Wait one hour after the final break-in compression and then compress the fender a final time at a rate of 0.9 in/min. Fender performance (reaction and energy) is based on the results of this final compression (the performance compression).

Plots of reaction force and energy absorption versus fender compression from the performance compression are shown in Figure 1. The fender installed in the test machine and the compressed fender are shown in Figure 2. Table 1 presents a summary of the measured performance of the fender. The fender meets the performance requirements since the measured performance was within the tolerance of the published reaction and energy, equal to 160.3 kips (+10%) and 313.5 ft-kip (-10%), respectively.

Table 1: Summary of Fender Performance

S/N	Original Height	Reaction at 72% Comp.	Energy at 72% Comp
M071566	39.25 in.	173.4 kips	316.0 ft-kip

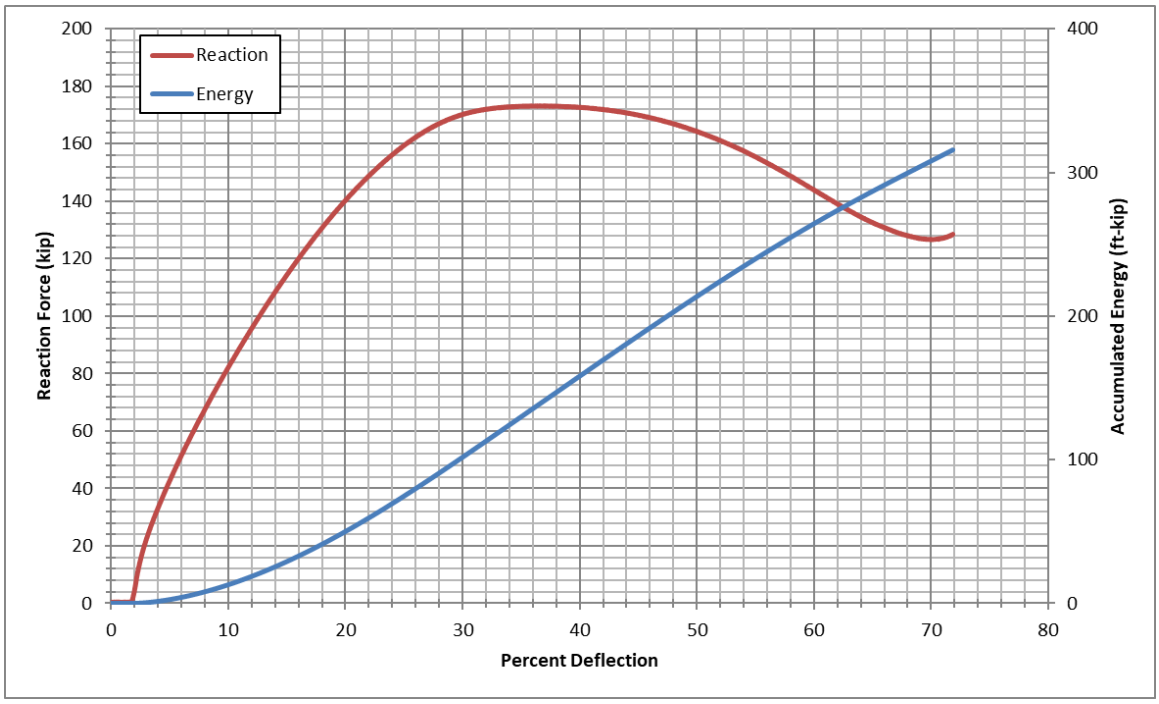
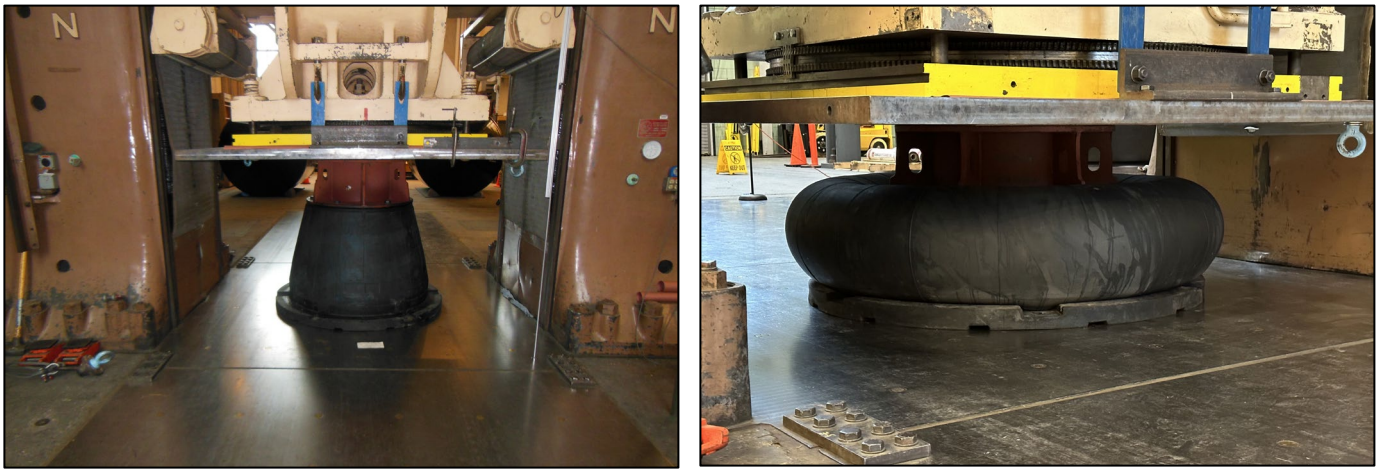


Figure 1: Fender Performance Plots



(a) (b)

Figure 2: Fender in test machine: (a) prior to testing; (b) compressed

Sincerely,

Ian C. Hodgson, P.E., S.E.
Senior Research Engineer

The results of the project presented in this report are provided on an "AS IS" basis. University makes no warranties of any kind, express or implied, as to any matter whatsoever, including, without limitation, warranties with respect to the merchantability or fitness for a particular purpose of the project or any deliverables. University makes no warranty of any kind with respect to freedom from patent, trademark, copyright or trade secret infringement arising from the use of the results of the project, deliverables, services, intellectual property or other materials provided hereunder. University shall not be liable for any direct, indirect, consequential, punitive, or other damages suffered by Sponsor or any other person resulting from the project or use of any deliverables. Sponsor agrees that it shall not make any warranty on behalf of University, express or implied, to any person containing the application of the results or any deliverables of this project.

SECTION 3. Fender Panels and Spools

SECTION 3. Fender Panels and Spools

3-A:

Material Certs & Test Reports

Steel Material Traceability Record

GRADE	DESCRIPTION	MILL CERT No.	HEAT No.	MANUFACTURER	Usage Location (DWG & Part No.)
1M (Delivery Berth) 13 sets					
Q355B	10*1500*C	CX2021100605335	2529255	HAN STEEL GROUP HANBAO IRON& STEEL CO.,LTD	2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.15, 2.16,2.17,2.18,2.19,2.20,2.21, 2.22
	12*2280*10860	C02205310596	22CD3643	Angang Steel Company Limited	2.9
	25*2200*10700	GC202201126827	1114212323	ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD . .	2.10,2.14
	32*2200*11500	GC202112240417	1110212235		2.11,2.12
	40*2200*11600	GC202201126855	1210100268F2		2.13
2M(Installation Berth Type 1)10 sets					
Q355B (panel)	10*1500*C	CX2021100605335	2529255	HAN STEEL GROUP HANBAO IRON& STEEL CO.,LTD	2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.15, 2.16,2.17,2.18,2.19,2.20,2.21
	12*2280*10860	C02205310596	22CD3643	Angang Steel Company Limited	2.9
	25*2200*10700	GC202201126827	1114212323	. . ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD	2.10,2.14
	32*2200*11500	GC202112240417	1110212235		2.11,2.12
	40*2200*11600	GC202201126855	1210100268F2		2.13
Q355B (spool)	20	26000052365	2208103A3	ANYANGIRONANDWTEELCO.,LTD	9.1
	30*2000*13500	JTC22013300419	22H00271	SHOUGANG GROUP : SHOUGANG JINGTANG UNITED IRON & STEEL CO.,LTD	9.2,9.3,9.4,9.5
	30*2000*13500	JTC2202020043	22H00271		9.2,9.3,9.4,9.5
5M(Installation Berth Type 2)7 sets					
Q355B (panel)	10*1500*C	CX2021100605335	2529255	HAN STEEL GROUP HANBAO IRON& STEEL CO.,LTD	2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.15, 2.16,2.17,2.18,2.19,2.20,2.21
	12*2280*10860	C02205310596	22CD3643	Angang Steel Company Limited	2.9

	25*2200*10700	GC202201126827	1114212323	ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD	2.10,2.14
	32*2200*11500	GC202112240417	1110212235		2.11,2.12
	45*2260*1100	06000087165	2249250A2	ANYANGIRONANDWTEELCO.,LTD	2.13
Q355B (spool)	20	26000052365	2208103A3		9.1
	30*2200*9000	GC202103162266	1141203240HJ	ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD	9.2,9.3,9.4,9.5
6M(Installation Berth Type 3)5 sets					
Q355B (panel)	10*1500*C	CX2021100605335	2529255	HAN STEEL GROUP HANBAO IRON& STEEL CO.,LTD	2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.15, 2.16,2.17,2.18,2.19,2.20,2.21
	12*2280*10860	C02205310596	22CD3643	Angang Steel Company Limited	2.9
	25*2200*10700	GC202201126827	1114212323	ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD	2.10,2.14
	32*2200*11500	GC202112240417	1110212235		2.11,2.12
	45*2260*1100	06000087165	2249250A2	ANYANGIRONANDWTEELCO.,LTD	2.13
Q355B (spool)	20	26000052365	2208103A3		9.1
	30*2200*9000	GC202103162266	1141203240HJ	ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD	9.2,9.3,9.4,9.5

Painting Material Traceability Record

No.	DESCRIPTION	Order No.	Batch No.	MANUFACTURER	GRADE
1	Carbozinc 859	CNEC04000000001-CLHT-YJ-22-0045	BLD010464	Carboline Dalian Paint Company Ltd.	Painting
2	Carboguard 890	CNEC04000000001-CLHT-YJ-22-0046	BLD010462	Carboline Dalian Paint Company Ltd.	Painting
3	Carbothane 134 Hg	CNEC04000000001-CLHT-YJ-22-0047	BLD010466	Carboline Dalian Paint Company Ltd.	Painting

Inspector： **Checked By：**

Date: Feb. 26th.2022 **Date:**

合同编号 CONTRACT NO.	I104821004	证明书号 CERTIFICATE NO	CX2021100605335
订货单位 CUSTOMER	邯郸市邯钢附属企业公司	到站 DESTINATION	邯郸309库（使用）
收货单位 PURCHASER	邯郸市邯钢附属企业公司	车号 TRAIN NO	冀D01697D

邯钢集团邯宝钢铁有限公司

HAN STEEL GROUP HANBAO IRON&STEEL CO.,LTD.

质 量 证 明 书

CERTIFICATE OF QUALITY

执行标准 EXECUTIVE STANDARD	GB/T 1591-2018	产品名称 PRODUCT	热轧直发卷	生产许可证号: PRODECTION LICENSE	

批号 BATCH NO	钢种等级 STEEL GRADE	炉号 HEAT No	规格 DIMENSIONS mm 厚 × 宽 × 长	数量 QUANTITY	重量 WEIGHT (t)	化学成分（%） CHEMICAL COMPOSITION C	Si	Mn	P	S	Als	Cu	Ni	Cr																主要缺陷	生产时间
						10-2	10-2	10-2	10-3	10-3	10-3	10-2	10-2	10-2	10-	10-	10-	10-	10-	10-	10-	10-	10-	10-	10-	10-	10-	10-	10-		
21IA32285384	Q355B 一 级 品	2529255	10.00 × 1500 × C	4	120.300	21	19	27	16	1	31	1	1	4																	20211003

批号 BATCH NO	常规拉伸						常规冲击							金相																					
	方向	温度	屈服强度 YS	抗拉强度 TS	断后伸长EL	屈强比	方向	试样厚度	试验温度	冲击功1	冲击功2	冲击功3	冲击功平均值	铁素体晶粒度	带状组织级别	夹杂_A粗	夹杂_A细	夹杂_B粗	夹杂_B细	夹杂_C粗	夹杂_C细	夹杂_D粗	夹杂_D细	夹杂_DS	夹杂物总量										
		℃	Mpa	Mpa	%			mm	℃	J	J	J	J																					
21IA32285384	横向		419	552	30.0		纵向	7.50	20	223	188	185	199																					

总数量： 1 件 总重量（t） 30.300 吨（t）

备注 REMARK	1、此证明书产品经检验，符合规定标准或技术协议要求。 The certificate proved under the examination to meet the contract requirements and technical standards. 2、钢种和规格以本证明书为准。 The steel type, specifications are subjected to the certificate. 3、此质量证明书为电子版本，手写、改写、无印章均属无效。 The quality certificate is available in electronic form. Handwriting, rewriting and no stamping is invalid.
注释 REMARKS	

邯钢集团邯宝钢铁有限公司 产品质量检验专用章 (4)

地 址：河北省邯郸市复兴路232号（邮编ZIPCODE：056015）
ADDRESS:No. 232 Fuxing Road. Handan, Hebei
证书网址：http://wuliu.hansteel.cn
CERTIFICATE URL

质 量 检 验 负 责 人： 姚政
PERSON-IN-CHARGE OF QUALITY EXAMINATION: Yao Zheng
Tel (0310)2093638(质量)，(0310)6074145(异议)
FAX (0310)6072815

开 证 员： 连淑红
OPERATOR(SIGNATURE):
开证日期： 20211006
ISSUING DATE:

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270110 SO2111290227	车 号 VEHICLE NO.	车队9628D		
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126827		
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-27	认证号 AUTHORIZATION NO.			

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1114212323	21S014239	Q355B	25	2200	10900	2		500	621	0.81	20.0	L	20	65.0	75.3	70.6	70.3	合格								
1114212323	21S014238	Q355B	25	2200	10700	6		484	598	0.81	20.0	L	20	104	87.3	143	111	合格								
1110212360	21S014242	Q355B	25	2200	11000	1		498	621	0.80	20.0	L	20	65.9	86.1	81.2	77.7	合格								
总计(TOTAL)						9																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21S014239	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014238	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014242	0.13	0.21	0.86	0.024	0.010			0.0028	0.002	0.055	0.023	0.010	0.021	0.001	0.0001			0.28	0.18		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED 郭娆

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：ISSUE DATE. 2022-01-12

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU (HANDAN) IRON AND STEEL CO., LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202112270101 SO2112310213	车 号 VEHICLE NO.	车队6813D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126855
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2022-01-12	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 UT
2222100195HJ	22E003076	Q355B	30	2200	8800	4						T														
1210100268F2	22E003122	Q355B	40	2200	11800	7						T														
2222100195HJ	22E003076	Q355B	30	2200	10500	1						T														
总计(TOTAL)						12																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION (质量分数) / % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		
22E003122	0.14	0.20	0.86	0.021	0.009		0.012	<0.0010	0.002	0.041	0.024	0.009	0.017	0.001	0.0001			0.29	0.19		
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED
李慧芳

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章
QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2022-01-12
ISSUE DATE.

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270101 SO2112110209	车 号 VEHICLE NO.	车队0710D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202112240417
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-23	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICK-NESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1110212235	21E115148	Q355B	32	2200	11500	4						T														
2122112317-1	21E115154	Q355B	25	2500	12000	2		424	557	0.76	22.0	L	20	200	218	201	206	合格								
2122112317-1	21E115154	Q355B	25	2500	10200	1		424	557	0.76	22.0	L	20	200	218	201	206	合格								
总计(TOTAL)						7																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21E115148	0.17	0.17	0.93	0.023	0.014		0.021	0.0016	0.001	0.020	0.020	0.009	0.013	0.001	0.0001			0.33	0.22		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		

注释 NOTES
1.位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2.交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1.兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
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Please contact us if any quality problem occurred.

签发 ISSUED
李慧芳

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2021-12-24
ISSUE DATE.

鞍 钢 股 份 有 限 公 司
Angang Steel Company Limited

产品质量证明书
INSPECTION CERTIFICATE

中国鞍山市铁东区团结街42号 邮编 114002
No.42 Tuanjie Street Tiedong District 114002
Anshan. P. R. China
Tel 0086-8008900858 Fax 0086-0412-6728486

制 造 厂：鞍钢股份有限公司鞍山中厚板厂2500线
Manufacturer: Anshan Heavy Plate Plant 2500 Line of AnSteel

订货单位 Buyer	沈阳鞍钢国际贸易有限公司	产品名称 Product	中厚板 Medium and Heavy plate	合同编号 Contract No.	C2260574008	证明书编号 Certificate No.	C02205310596
收货单位 Consignee	沈阳鞍钢国际贸易有限公司	客户名称 Customer	沈阳鞍钢国际贸易有限公司			交货状态 Delivery Condition	热轧
标准 Specification	GB/T 3274-2017	许可证编号 License No.					
钢牌号 Grade	Q355B	发货日期 Date of Delivery	20220531	计重方式 Weight Mode	理论重量 Theory		

序号 No.	物料号 Pack No.	熔炼号 Heat No.	规格(mm) Dimensions mm.	重量(kg) Weight	件数 Pcs.	化学成分 Chemical Composition (%)														冷弯Bend		
						*1	C	Si	Mn	P	S	Als	Nb	V	Ti	Ni	Cr	Cu	Ceq		取样位置	α= °	检验批号 Batch No.
							10 -2	10 -2	10 -2	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3				
1	Z25273231000	22CD3643	12*2280*10860	2332		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
2	Z25273232000	22CD3643	12*2280*11060	2375		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
3	Z25273241000	22CD3643	12*2280*11350	2438		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
4	Z25273242000	22CD3643	12*2280*11630	2498		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
5	Z25273311000	22CD3643	12*2280*11800	2534		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
6	Z25273312000	22CD3643	12*2280*11900	2553		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
7	Z25273321000	22CD3643	12*2280*11920	2560		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
8	Z25273322000	22CD3643	12*2280*12060	23310		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
合计Total																						

序号 No.	物料号 Pack No.	拉伸Tension							冲击Charpy										硬度Hardness						厚度方向性能(Z)						
		位置方向 *2	屈服 Y.S. ReH	抗拉 T.S.	伸长率 %	收缩率 %	屈强比 Y.S./T.S. %	检验批号 Batch No.	位置方向 *2	温度 C°	10*10*55mm J KV2				纤维率 SA %				检验批号 Batch No.	位置方向 *2					检验批号 Batch No.	位置方向 *2	1	2	3	Ave	检验批号 Batch No.
			MPa	MPa							1	2	3	Ave	1	2	3	Ave			1	2	3	Ave			%				
1	Z25273231000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
2	Z25273232000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
3	Z25273241000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
4	Z25273242000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
5	Z25273311000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
6	Z25273312000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
7	Z25273321000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
8	Z25273322000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												

探伤NDT	标准Standard：		级别Class：		结果Result：	
注释 Notes	*1化学成分：0:熔炼分析 Heat Analysis、1:产品分析Product Analysis；*2位置方向: 大样位置-T:头部Head、B:尾部Tail + 试验方向-1横向 Transverse、2:纵向Longitudinal、3:Z向 + 取样位置- 1:板宽1/4、2:板宽1/2、3:板边 4:角部 + 厚度方向位置-1、原厚，2、表面下2mm，3、厚度1/4、4、厚度1/2、5、保留一个轧制面、6、表面下小于2mm、7、厚度1/3。 1、Ceq=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。				
备注 Remarks	上述元素仅列出参与复合公式的有意添加元素，但复合元素结果是严格按公式计算得出。				
说明 Description	本产品已按上述标准制造和检验，其结果符合要求。特此证明。贵方如查询有关问题，请与我公司联系。 We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with requirements of the above material specification. If you have any questions, please contact our company.			质量保证负责人 Quality Manager	监理 Surveyor	

ANGANG STEEL COMPANY LIMITED 鞍钢股份有限公司 产品质量专用章 CHINA

合同编号 CONTRACT NO.	I104821004	证明书号 CERTIFICATE NO	CX2021100605335
订货单位 CUSTOMER	邯郸市邯钢附属企业公司	到站 DESTINATION	邯郸309库（使用）
收货单位 PURCHASER	邯郸市邯钢附属企业公司	车号 TRAIN NO	冀D01697D

邯钢集团邯宝钢铁有限公司

HAN STEEL GROUP HANBAO IRON&STEEL CO.,LTD.

质 量 证 明 书

CERTIFICATE OF QUALITY

执行标准 EXECUTIVE STANDARD	GB/T 1591-2018	产品名称 PRODUCT	热轧直发卷	生产许可证号: PRODECTION LICENSE	

批号 BATCH NO	钢种等级 STEEL GRADE	炉号 HEAT No	规格 DIMENSIONS mm 厚×宽×长	数量 QUANTITY	重量 WEIGHT (t)	化学成分（%） CHEMICAL COMPOSITION C	Si	Mn	P	S	Als	Cu	Ni	Cr	主要缺陷	生产时间
						10-2	10-2	10-2	10-3	10-3	10-3	10-2	10-2	10-2		
21IA32285384	Q355B 一 级 品	2529255	10.00 × 1500 × C	4	120.300	21	19	27	16	1	31	1	1	4		20211003

批号 BATCH NO	常规拉伸 方向	温度 ℃	屈服强度 YS Mpa	抗拉强度 TS Mpa	断后伸长EL %	屈强比	常规冲击 方向	试样厚度 mm	试验温度 ℃	冲击功1 J	冲击功2 J	冲击功3 J	冲击功平均值 J	金相 铁素体晶粒度	带状组织级别	夹杂_A粗	夹杂_A细	夹杂_B粗	夹杂_B细	夹杂_C粗	夹杂_C细	夹杂_D粗	夹杂_D细	夹杂_DS	夹杂物总量
21IA32285384	横向		419	552	30.0		纵向	7.50	20	223	188	185	199												

总数量： 1 件 总重量（t） 30.300 吨（t）

备注 REMARK	1、此证明书产品经检验，符合规定标准或技术协议要求。 The certificate proved under the examination to meet the contract requirements and technical standards. 2、钢种和规格以本证明书为准。 The steel type, specifications are subjected to the certificate. 3、此质量证明书为电子版本，手写、改写、无印章均属无效。 The quality certificate is available in electronic form. Handwriting, rewriting and no stamping is invalid.
注释 REMARKS	

邯钢集团邯宝钢铁有限公司 产品质量检验专用章 (4)

地 址：河北省邯郸市复兴路232号（邮编ZIPCODE：056015）
ADDRESS:No. 232 Fuxing Road. Handan, Hebei
证书网址：http://wuliu.hansteel.cn
CERTIFICATE URL

质 量 检 验 负 责 人： 姚政
PERSON-IN-CHARGE OF QUALITY EXAMINATION: Yao Zheng
Tel (0310)2093638(质量)，(0310)6074145(异议)
FAX (0310)6072815

开 证 员： 连淑红
OPERATOR(SIGNATURE):
开证日期： 20211006
ISSUING DATE:

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270110 SO2111290227	车 号 VEHICLE NO.	车队9628D		
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126827		
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-27	认证号 AUTHORIZATION NO.			

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1114212323	21S014239	Q355B	25	2200	10900	2		500	621	0.81	20.0	L	20	65.0	75.3	70.6	70.3	合格								
1114212323	21S014238	Q355B	25	2200	10700	6		484	598	0.81	20.0	L	20	104	87.3	143	111	合格								
1110212360	21S014242	Q355B	25	2200	11000	1		498	621	0.80	20.0	L	20	65.9	86.1	81.2	77.7	合格								
总计(TOTAL)						9																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21S014239	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014238	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014242	0.13	0.21	0.86	0.024	0.010			0.0028	0.002	0.055	0.023	0.010	0.021	0.001	0.0001			0.28	0.18		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED 郭娆

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：ISSUE DATE. 2022-01-12

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202112270101 SO2112310213	车 号 VEHICLE NO.	车队6813D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126855
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2022-01-12	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 UT
2222100195HJ	22E003076	Q355B	30	2200	8800	4						T														
1210100268F2	22E003122	Q355B	40	2200	11800	7						T														
2222100195HJ	22E003076	Q355B	30	2200	10500	1						T														
总计(TOTAL)						12																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION (质量分数) / % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		
22E003122	0.14	0.20	0.86	0.021	0.009		0.012	<0.0010	0.002	0.041	0.024	0.009	0.017	0.001	0.0001			0.29	0.19		
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
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签发 ISSUED 李慧芳

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

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ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2022-01-12
ISSUE DATE.

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270101 SO2112110209	车 号 VEHICLE NO.	车队0710D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202112240417
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-23	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICK-NESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1110212235	21E115148	Q355B	32	2200	11500	4						T														
2122112317-1	21E115154	Q355B	25	2500	12000	2		424	557	0.76	22.0	L	20	200	218	201	206	合格								
2122112317-1	21E115154	Q355B	25	2500	10200	1		424	557	0.76	22.0	L	20	200	218	201	206	合格								
总计(TOTAL)						7																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21E115148	0.17	0.17	0.93	0.023	0.014		0.021	0.0016	0.001	0.020	0.020	0.009	0.013	0.001	0.0001			0.33	0.22		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		

注释 NOTES
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签发 ISSUED
李慧芳

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2021-12-24
ISSUE DATE.

鞍 钢 股 份 有 限 公 司
Angang Steel Company Limited

产品质量证明书
INSPECTION CERTIFICATE

中国鞍山市铁东区团结街42号 邮编 114002
No.42 Tuanjie Street Tiedong District 114002
Anshan. P. R. China
Tel 0086-8008900858 Fax 0086-0412-6728486

制 造 厂：鞍钢股份有限公司鞍山中厚板厂2500线
Manufacturer: Anshan Heavy Plate Plant 2500 Line of AnSteel

订货单位 Buyer	沈阳鞍钢国际贸易有限公司	产品名称 Product	中厚板 Medium and Heavy plate	合同编号 Contract No.	C2260574008	证明书编号 Certificate No.	C02205310596
收货单位 Consignee	沈阳鞍钢国际贸易有限公司	客户名称 Customer	沈阳鞍钢国际贸易有限公司			交货状态 Delivery Condition	热轧
标准 Specification	GB/T 3274-2017	许可证编号 License No.					
钢牌号 Grade	Q355B	发货日期 Date of Delivery	20220531	计重方式 Weight Mode	理论重量 Theory		

序号 No.	物料号 Pack No.	熔炼号 Heat No.	规格(mm) Dimensions mm.	重量(kg) Weight	件数 Pcs.	化学成分 Chemical Composition (%)														冷弯Bend		
						*1	C	Si	Mn	P	S	Als	Nb	V	Ti	Ni	Cr	Cu	Ceq		取样位置	α= °	检验批号 Batch No.
							10^{-2}	10^{-2}	10^{-2}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}				
1	Z25273231000	22CD3643	12*2280*10860	2332		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
2	Z25273232000	22CD3643	12*2280*11060	2375		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
3	Z25273241000	22CD3643	12*2280*11350	2438		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
4	Z25273242000	22CD3643	12*2280*11630	2498		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
5	Z25273311000	22CD3643	12*2280*11800	2534		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
6	Z25273312000	22CD3643	12*2280*11900	2553		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
7	Z25273321000	22CD3643	12*2280*11920	2560		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
8	Z25273322000	22CD3643	12*2280*12060	23310		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
合计Total																						

序号 No.	物料号 Pack No.	拉伸Tension							冲击Charpy										硬度Hardness						厚度方向性能(Z)						
		位置方向 *2	屈服 Y.S. ReH	抗拉 T.S.	伸长率 %	收缩率 %	屈强比 Y.S./T.S. %	检验批号 Batch No.	位置方向 *2	温度 C°	10*10*55mm J								检验批号 Batch No.	位置方向 *2					检验批号 Batch No.	位置方向 *2	1	2	3	Ave	检验批号 Batch No.
											KV2				纤维率 SA %						1	2	3	Ave							
			MPa	MPa							1	2	3	Ave	1	2	3	Ave								%					
1	Z25273231000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
2	Z25273232000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
3	Z25273241000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
4	Z25273242000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
5	Z25273311000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
6	Z25273312000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
7	Z25273321000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
8	Z25273322000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												

探伤NDT	标准Standard：		级别Class：		结果Result：	
注释 Notes	*1化学成分：0:熔炼分析 Heat Analysis、1:产品分析Product Analysis；*2位置方向: 大样位置-T:头部Head、B:尾部Tail + 试验方向-1横向 Transverse、2:纵向Longitudinal、3:Z向 + 取样位置- 1:板宽1/4、2:板宽1/2、3:板边 4:角部 + 厚度方向位置-1、原厚，2、表面下2mm，3、厚度1/4、4、厚度1/2、5、保留一个轧制面、6、表面下小于2mm、7、厚度1/3。 1、Ceq=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。				
备注 Remarks	上述元素仅列出参与复合公式的有意添加元素，但复合元素结果是严格按公式计算得出。				
说明 Description	本产品已按上述标准制造和检验，其结果符合要求。特此证明。贵方如查询有关问题，请与我公司联系。 We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with requirements of the above material specification. If you have any questions, please contact our company.			质量保证负责人 Quality Manager	监理 Surveyor	

ANGANG STEEL COMPANY LIMITED 鞍钢股份有限公司 产品质量专用章 CHINA

安阳钢铁股份有限公司
ANYANGIRONANDWTEELCO.LTD

产品质量证明书
INSPECTION CERTIFICATE

河南省安阳市殷都区 邮编：455004
ANYANGCITY.HENANPROVINCE.CHINA
TEL:0372-3124322 3120146

发货单号（ LIST No. ）：2065214017336　　证书编号（ CERTIFICATE No.）：26000052365
收货单位（ PURGHASER ）：　　到　　站（ DESTINATION ）：
合 同 号（ CONTARCTNO ）：0000070231　　车　　号（ TRAIN No. ）：
产品名称（ NAME ）：碳结钢板 / Q355B　　生产许可证（ LICENSE No. ）：
标准编号（ WTANDARD ）：GB/T3274-2017

生产日期	炉批号	规格（mm）	数量 重量（T）	碳1（%）	硅1（%）	锰1（%）	硫1（%）	磷（%）	铬（%）	镍（%）	铜（%）	上屈服强度 1（MPA）	抗拉强度 1（MPA）	伸长率 1（%）	冷弯 d=a 1
2022-03-27	2208103A3	20mm	51.240	0.18	0.22	0.50	0.024	0.018				270	425	28.0	合格
2022-03-27	2208110A3	25mm	55.340	0.16	0.24	0.45	0.025	0.017				265	430	30.0	合格

备注（NOPES）：
(1)无质量证明专用章无效：THE CERTIFICATE SHALL BE VALID ONLY AFTER BEING STANPED EITH OUALITY SPECLAL SEAL；
(2)牌号以质量证明书为准；THE GRADF IN QUARLITY CERTIFICATE SHALL PREVAIL TO BE OFFICIAL；
(3)交货状态：热轧。CONDITION OF DELIVERY:HOT-ROLLED.

安阳钢铁股份有限公司 质量证明书专用章 CERTIFICATE SEAL 钢材质量证明专用章

No: 200190

签证：邢爱红　打印时间：2022-03-27

产品质量证明书
INSPECTION CERTIFICATE

首钢集团地址:中国北京市石景山区
ADD.OF SHOUGANG GROUP : SHIJINGSHAN DISTRICT, BEIJING, CHINA
邮政编码 POST CODE : 100041
电话TEL. : 0315-8875304
E - mail : sgts@mail.shougang.com.cn
制造厂地址：中国河北省唐山市曹妃甸工业区
ADD. OF MANUFACTURER: CAOFEIDIAN INDUSTRY PARK, TANGSHAN, HEBEI, P.R. CHINA
063200

制 造 厂：首钢集团: 首钢京唐钢铁联合有限责任公司
MANUFACTURER: SHOUGANG GROUP : SHOUGANG JINGTANG UNITED IRON & STEEL CO.,LTD

订货单位 CUSTOMER	天津首钢钢铁贸易有限公司	合同编号 CONTRACT NO.	C2200265/C022027984	许可证编号 LICENSE NO.	
收货单位 PURCHASER	天津首钢钢铁贸易有限公司	产品名称 Product	中厚板 Plate	证明书编号 CERTIFICATE NO.	JTC2201300419
标 准 SPECIFICATION	GB/T 1591-2018 NB/T 47013.3-2015 Ⅰ,Ⅰ、GB/T 709-2019 N类	签发日期 DATE OF DELIVERY	20220130	认证标识/二维码 CERTIFICATION MARK/QR CODE	
牌号 STEEL GRADE	Q355B	交货状态 CONDITION OF DELIVERY	热轧 AR		

序号 NO.	板号 PLATE NO.	炉号 HEAT NO.	尺寸 DIMENSIONS (mm) 厚度 THICKNESS		件数 Pcs.	重量 WT. TON	化学成分CHEMICAL COMPOSITION % (0=×1 1=×10 2=×100 3=×1000 4=×10000 5=×100000)										试样热处理 *2	拉伸试验 TENSILE TEST (标距 G.L= A1) * 6					弯曲 BT 180 °			冲击试验 IMPACT TEST (冲击缺口类型： KV2) *8										厚度方向性能 THROUGH THICKNESS PROPERTIES					探伤 UT
			30				分析区分 *1	C	Si	Mn	P	S	Alt	Nb	V	Ti	Ni		位置方向 *3	屈服 Y.S. ReH MPa	抗拉 T.S. Rm MPa	伸长 EL %	RA *5 %	屈强比 YR *7 %	位置方向 *3	D/a	结果	位置方向 *3	温度 ℃	试样尺寸 mm *9	冲击功 J *4 1	2	3	AVE.	剪切断面率FA % FA=SHEAR-FRACTURE APPEARANCE 1	2	3	AVE.	位置方向 *3	断面收缩率 % REDUCTION OF AREA 1	2	3	AVE.	
			宽度 WIDTH	长度 LENGTH				3	3	2	3	4	3	4	4	4	3																							
								Cr	Cu	Mo	Ceq																												
								3	3	4	2																												
1	P122127207100	222H00271	2000	13500	1	6.359	RF	162	223	145	13	8	31	2	21	38	8	0	T0C	390	530	27		0.74				T1L	20	1	282	269	273	275										合格
								21	9	28	41								2CL00981400									2CC01048300											
2	P122127209100	222H00271	2000	13500	1	6.359	RF	162	223	145	13	8	31	2	21	38	8	0	T0C	390	530	27		0.74				T1L	20	1	282	269	273	275										合格
								21	9	28	41								2CL00981400									2CC01048300											
3	P122127210100	222H00271	2000	13500	1	6.359	RF	162	223	145	13	8	31	2	21	38	8	0	T0C	390	530	27		0.74				T1L	20	1	282	269	273	275										合格
								21	9	28	41								2CL00981400									2CC01048300											
合计 Total			3	19.077																																			

备注 REMARKS	1、Ceq=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。
注 释 NOTES	*1 分析区分 ANALYSIS:RF=熔炼分析(LADLE ANALYSIS), CF=成品分析(PRODUCT ANALYSIS) *2 试样热处理区分 HEAT TREATMENT OF TEST PIECE 0-交货态(CONDITION OF DELIVERY),1-最大模拟焊后热处理(Max·PWHT),2-最小模拟焊后热处理(Min·PWHT),3-消应力热处理(SR),4-回火(Tempering) *3 位置方向 LOCATION AND ORIENTATION： B=尾部(BOTTOM), T=头部(TOP), C=横向(TRANS), L=纵向(LONGI), Z=板厚方向(THROUGH-THICK), 0=原厚(FULL THICKNESS), 1=近表面(NEAR THE SURFACE) 2=1/2厚度(1/2THICKNESS) 3=1/3厚度(1/3THICKNESS)4=1/4厚度1/4THICKNESS) D=保留一个轧制面 *4 冲击功 ABSORBED ENERGY *5 断面收缩率 REDUCTION OF AREA *6 标距 G.L.= GAUGE LENGTH A:比例标距 1=5.65SQRT(S0), 2=11.3SQRT(S0);B:定标距 1=45mm,2=50mm,3=50.8mm,4=60mm,5=70mm,6=80mm,7=100mm,8=200mm. *7 YR=屈强比YIELD RATIO Y.S/T.S (TR= 强屈比T.S/Y.S) *8 冲击缺口类型 TYPE OF IMPACT NOTCH *9 试样尺寸 SPECIMENTS DIMENSIONS 1=10×10×55mm,2=10×7.5×55mm,3=10×5×55mm
说明 DESCRIPTION	本产品已按上述要求进行制造和检验，其结果符合要求，特此证明。 WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS MANUFACTURED AND TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE ABOVE MATERIAL SPECIFICATION.

质量负责人:
QUALITY MANAGER

刘 [illegible]

首钢京唐钢铁联合有限责任公司 检验专用章

防伪码：GEqAyb

产品质量证明书
INSPECTION CERTIFICATE

首钢集团地址:中国北京市石景山区
ADD.OF SHOUGANG GROUP : SHIJINGSHAN DISTRICT, BEIJING, CHINA
邮政编码 POST CODE : 100041
电话TEL. : 0315-8875304
E - mail : sgts@mail.shougang.com.cn
制造厂地址：中国河北省唐山市曹妃甸工业区
ADD. OF MANUFACTURER: CAOFEIDIAN INDUSTRY PARK, TANGSHAN, HEBEI, P.R. CHINA 063200

制 造 厂：首钢集团: 首钢京唐钢铁联合有限责任公司
MANUFACTURER: SHOUGANG GROUP : SHOUGANG JINGTANG UNITED IRON & STEEL CO.,LTD

订货单位 CUSTOMER	天津首钢钢铁贸易有限公司	合同编号 CONTRACT NO.	C2200265/C022027984	许可证编号 LICENSE NO.	
收货单位 PURCHASER	天津首钢钢铁贸易有限公司	产品名称 Product	中厚板 Plate	证明书编号 CERTIFICATE NO.	JTC2202020043
标 准 SPECIFICATION	GB/T 1591-2018 NB/T 47013.3-2015 Ⅰ,Ⅰ、GB/T 709-2019 N类	签发日期 DATE OF DELIVERY	20220202	认证标识/二维码 CERTIFICATION MARK/QR CODE	
牌号 STEEL GRADE	Q355B	交货状态 CONDITION OF DELIVERY	热轧 AR		

序号 NO.	板号 PLATE NO.	炉号 HEAT NO.	尺寸 DIMENSIONS (mm) 厚度 THICKNESS		件数 Pcs.	重量 WT. TON	化学成分CHEMICAL COMPOSITION % (0=×1 1=×10 2=×100 3=×1000 4=×10000 5=×100000)										试样热处理 *2	拉伸试验 TENSILE TEST (标距 G.L= A1) * 6					弯曲 BT 180 °			冲击试验 IMPACT TEST (冲击缺口类型： KV2) *8										厚度方向性能 THROUGH THICKNESS PROPERTIES					探伤 UT
			30				分析区分 *1	C	Si	Mn	P	S	Alt	Nb	V	Ti	Ni		位置方向 *3	屈服 Y.S. ReH MPa	抗拉 T.S. Rm MPa	伸长 EL %	RA *5 %	屈强比 YR *7 %	位置方向 *3	D/a	结果	位置方向 *3	温度 ℃	试样尺寸 mm *9	冲击功 J *4 1	2	3	AVE.	剪切断面率FA % FA=SHEAR-FRACTURE APPEARANCE 1	2	3	AVE.	位置方向 *3	断面收缩率 % REDUCTION OF AREA 1	2	3	AVE.	
			宽度 WIDTH	长度 LENGTH				Cr	Cu	Mo	Ceq																													
1	P122127208100	222H00271	2000	13500	1	6.359	RF	162	223	145	13	8	31	2	21	38	8	0	T0C	390	530	27		0.74				T1L	20	1	282	269	273	275										合格
								21	9	28	41								2CL00981400								2CC01048300												
合计 Total					1	6.359																																	

备注 REMARKS	1、Ceq=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。
注 释 NOTES	*1 分析区分 ANALYSIS:RF=熔炼分析(LADLE ANALYSIS), CF=成品分析(PRODUCT ANALYSIS) *2 试样热处理区分 HEAT TREATMENT OF TEST PIECE 0-交货态(CONDITION OF DELIVERY),1-最大模拟焊后热处理(Max·PWHT),2-最小模拟焊后热处理(Min·PWHT),3-消应力热处理(SR),4-回火(Tempering) *3 位置方向 LOCATION AND ORIENTATION： B=尾部(BOTTOM), T=头部(TOP), C=横向(TRANS), L=纵向(LONGI), Z=板厚方向(THROUGH-THICK), 0=原厚(FULL THICKNESS), 1=近表面(NEAR THE SURFACE) 2=1/2厚度(1/2THICKNESS) 3=1/3厚度(1/3THICKNESS)4=1/4厚度1/4THICKNESS) D=保留一个轧制面 *4 冲击功 ABSORBED ENERGY *5 断面收缩率 REDUCTION OF AREA *6 标距 G.L.= GAUGE LENGTH A:比例标距 1=5.65SQRT(S0), 2=11.3SQRT(S0);B:定标距 1=45mm,2=50mm,3=50.8mm,4=60mm,5=70mm,6=80mm,7=100mm,8=200mm. *7 YR=屈强比YIELD RATIO Y.S/T.S (TR= 强屈比T.S/Y.S) *8 冲击缺口类型 TYPE OF IMPACT NOTCH *9 试样尺寸 SPECIMENTS DIMENSIONS 1=10×10×55mm,2=10×7.5×55mm,3=10×5×55mm
说明 DESCRIPTION	本产品已按上述要求进行制造和检验，其结果符合要求，特此证明。 WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS MANUFACTURED AND TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE ABOVE MATERIAL SPECIFICATION.
质量负责人: QUALITY MANAGER	刘 [illegible]

防伪码：vyKtL8

首钢京唐钢铁联合有限责任公司 检验专用章 (壹)

安阳钢铁股份有限公司
ANYANGIRONANDWTEELCO.LTD

产品质量证明书
INSPECTION CERTIFICATE

河南省安阳市殷都区 邮编：455004
ANYANGCITY.HENANPROVINCE.CHINA
TEL:0372-3124322 3120146

发货单号（ LIST No. ）：2065214789035　　证书编号（ CERTIFICATE No. ）：06000087165
收货单位（ PURGHASER ）：　　到　　站（ DESTINATION ）：
合 同 号（ CONTARCTNO ）：0000096017　　车　　号（ TRAIN No. ）：
产品名称（ NAME ）：低合金高强度钢板 / Q355B　　生产许可证（ LICENSE No. ）：
标准编号（ MTANDARD ）：GB/T3274-2017

生产日期	炉批号	规格（mm）	数量 重量（T）	碳1（%）	硅1（%）	锰1（%）	硫1（%）	磷（%）	铬（%）	镍（%）	铜（%）	上屈服强度 1（MPA）	抗拉强度 1（MPA）	伸长率1（%）	冷弯 d=a 1
2022-06-20	2249235A2	30*2260*430	0.229	0.17	0.28	1.35	0.020	0.017	0.01	0.01	0.02	370	525	28.5	合格
2022-06-20	2249247A2	40*2260*2500	1.774	0.16	0.25	1.45	0.018	0.016	0.01	0.01	0.01	365	520	28.0	合格
2022-06-20	2249250A2	45*2260*1100	0.878	0.18	0.26	1.40	0.019	0.018	0.01	0.01	0.01	368	523	27.0	合格

备注（NOPES）：
(1)无质量证明专用章无效：THE CERTIFICATE SHALL BE VALID ONLY AFTER BEING STAMPED EITH QUALITY SPECLAL SEAL;
(2)牌号以质量证明书为准：THE GRADF IN QUARLITY CERTIFICATE SHALL PREVAIL TO BE OFFICIAL;
(3)交货状态：热轧。CONDITION OF DELIVERY:HOT-ROLLED.

安阳钢铁股份有限公司 质量证明书专用章 CERTIFICATE-SEAL 钢材质量证明专用章

No: 202585

签证：邢爱红　打印时间：2022-06-20

合同编号 CONTRACT NO.	I104821004	证明书号 CERTIFICATE NO	CX2021100605335
订货单位 CUSTOMER	邯郸市邯钢附属企业公司	到站 DESTINATION	邯郸309库（使用）
收货单位 PURCHASER	邯郸市邯钢附属企业公司	车号 TRAIN NO	冀D01697D

邯钢集团邯宝钢铁有限公司

HAN STEEL GROUP HANBAO IRON&STEEL CO.,LTD.

质 量 证 明 书

CERTIFICATE OF QUALITY

执行标准 EXECUTIVE STANDARD	GB/T 1591-2018	产品名称 PRODUCT	热轧直发卷	生产许可证号: PRODECTION LICENSE	

批号 BATCH NO	钢种等级 STEEL GRADE	炉号 HEAT No	规格 DIMENSIONS mm 厚×宽×长	数量 QUANTITY	重量 WEIGHT (t)	化学成分（%） CHEMICAL COMPOSITION C	Si	Mn	P	S	Als	Cu	Ni	Cr	主要缺陷	生产时间
						10^{-2}	10^{-2}	10^{-2}	10^{-3}	10^{-3}	10^{-3}	10^{-2}	10^{-2}	10^{-2}		
21IA32285384	Q355B 一 级 品	2529255	10.00 × 1500 × C	4	120.300	21	19	27	16	1	31	1	1	4		20211003

批号 BATCH NO	常规拉伸 方向	温度 ℃	屈服强度 YS Mpa	抗拉强度 TS Mpa	断后伸长EL %	屈强比	常规冲击 方向	试样厚度 mm	试验温度 ℃	冲击功1 J	冲击功2 J	冲击功3 J	冲击功平均值 J	金相 铁素体晶粒度	带状组织级别	夹杂_A粗	夹杂_A细	夹杂_B粗	夹杂_B细	夹杂_C粗	夹杂_C细	夹杂_D粗	夹杂_D细	夹杂_DS	夹杂物总量
21IA32285384	横向		419	552	30.0		纵向	7.50	20	223	188	185	199												

总数量： 1 件 总重量（t） 30.300 吨（t）

备注 REMARK	1、此证明书产品经检验，符合规定标准或技术协议要求。 The certificate proved under the examination to meet the contract requirements and technical standards. 2、钢种和规格以本证明书为准。 The steel type, specifications are subjected to the certificate. 3、此质量证明书为电子版本，手写、改写、无印章均属无效。 The quality certificate is available in electronic form. Handwriting, rewriting and no stamping is invalid.
注释 REMARKS	

邯钢集团邯宝钢铁有限公司 产品质量检验专用章 (4)

地 址：河北省邯郸市复兴路232号（邮编ZIPCODE：056015）
ADDRESS:No. 232 Fuxing Road. Handan, Hebei
证书网址：http://wuliu.hansteel.cn
CERTIFICATE URL

质 量 检 验 负 责 人： 姚政
PERSON-IN-CHARGE OF QUALITY EXAMINATION: Yao Zheng
Tel (0310)2093638(质量)，(0310)6074145(异议)
FAX (0310)6072815

开 证 员： 连淑红
OPERATOR(SIGNATURE):
开证日期： 20211006
ISSUING DATE:

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270110 SO2111290227	车 号 VEHICLE NO.	车队9628D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126827
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-27	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1114212323	21S014239	Q355B	25	2200	10900	2		500	621	0.81	20.0	L	20	65.0	75.3	70.6	70.3	合格								
1114212323	21S014238	Q355B	25	2200	10700	6		484	598	0.81	20.0	L	20	104	87.3	143	111	合格								
1110212360	21S014242	Q355B	25	2200	11000	1		498	621	0.80	20.0	L	20	65.9	86.1	81.2	77.7	合格								
总计(TOTAL)						9																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21S014239	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014238	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014242	0.13	0.21	0.86	0.024	0.010			0.0028	0.002	0.055	0.023	0.010	0.021	0.001	0.0001			0.28	0.18		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED 郭娆

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2022-01-12
ISSUE DATE.

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU (HANDAN) IRON AND STEEL CO., LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202112270101 SO2112310213	车 号 VEHICLE NO.	车队6813D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126855
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2022-01-12	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 UT
2222100195HJ	22E003076	Q355B	30	2200	8800	4						T														
1210100268F2	22E003122	Q355B	40	2200	11800	7						T														
2222100195HJ	22E003076	Q355B	30	2200	10500	1						T														
总计(TOTAL)						12																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION (质量分数) / % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		
22E003122	0.14	0.20	0.86	0.021	0.009		0.012	<0.0010	0.002	0.041	0.024	0.009	0.017	0.001	0.0001			0.29	0.19		
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		

注释 NOTES

1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS

1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED 李慧芳

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2022-01-12
ISSUE DATE.

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270101 SO2112110209	车 号 VEHICLE NO.	车队0710D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202112240417
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-23	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICK-NESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1110212235	21E115148	Q355B	32	2200	11500	4						T														
2122112317-1	21E115154	Q355B	25	2500	12000	2		424	557	0.76	22.0	L	20	200	218	201	206	合格								
2122112317-1	21E115154	Q355B	25	2500	10200	1		424	557	0.76	22.0	L	20	200	218	201	206	合格								
总计(TOTAL)						7																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21E115148	0.17	0.17	0.93	0.023	0.014		0.021	0.0016	0.001	0.020	0.020	0.009	0.013	0.001	0.0001			0.33	0.22		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		

注释 NOTES
1.位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2.交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1.兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2.本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3.如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED
李慧芳

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2021-12-24
ISSUE DATE.

鞍 钢 股 份 有 限 公 司
Angang Steel Company Limited

产品质量证明书
INSPECTION CERTIFICATE

中国鞍山市铁东区团结街42号 邮编 114002
No.42 Tuanjie Street Tiedong District 114002
Anshan. P. R. China
Tel 0086-8008900858 Fax 0086-0412-6728486

制 造 厂：鞍钢股份有限公司鞍山中厚板厂2500线
Manufacturer: Anshan Heavy Plate Plant 2500 Line of AnSteel

订货单位 Buyer	沈阳鞍钢国际贸易有限公司	产品名称 Product	中厚板 Medium and Heavy plate	合同编号 Contract No.	C2260574008	证明书编号 Certificate No.	C02205310596
收货单位 Consignee	沈阳鞍钢国际贸易有限公司	客户名称 Customer	沈阳鞍钢国际贸易有限公司			交货状态 Delivery Condition	热轧
标准 Specification	GB/T 3274-2017	许可证编号 License No.					
钢牌号 Grade	Q355B	发货日期 Date of Delivery	20220531	计重方式 Weight Mode	理论重量 Theory		

序号 No.	物料号 Pack No.	熔炼号 Heat No.	规格(mm) Dimensions mm.	重量(kg) Weight	件数 Pcs.	化学成分 Chemical Composition (%)														冷弯Bend		
						*1	C	Si	Mn	P	S	Als	Nb	V	Ti	Ni	Cr	Cu	Ceq		取样位置	α= °	检验批号 Batch No.
							10 -2	10 -2	10 -2	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3	10 -3				
1	Z25273231000	22CD3643	12*2280*10860	2332		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
2	Z25273232000	22CD3643	12*2280*11060	2375		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
3	Z25273241000	22CD3643	12*2280*11350	2438		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
4	Z25273242000	22CD3643	12*2280*11630	2498		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
5	Z25273311000	22CD3643	12*2280*11800	2534		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
6	Z25273312000	22CD3643	12*2280*11900	2553		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
7	Z25273321000	22CD3643	12*2280*11920	2560		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
8	Z25273322000	22CD3643	12*2280*12060	23310		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
合计Total																						

序号 No.	物料号 Pack No.	拉伸Tension							冲击Charpy										硬度Hardness						厚度方向性能(Z)						
		位置方向 *2	屈服 Y.S. ReH	抗拉 T.S.	伸长率 %	收缩率 %	屈强比 Y.S./T.S. %	检验批号 Batch No.	位置方向 *2	温度 C°	10*10*55mm J KV2				纤维率 SA %				检验批号 Batch No.	位置方向 *2	1	2	3	Ave	检验批号 Batch No.	位置方向 *2	1	2	3	Ave	检验批号 Batch No.
			MPa	MPa							1	2	3	Ave	1	2	3	Ave								%					
1	Z25273231000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
2	Z25273232000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
3	Z25273241000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
4	Z25273242000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
5	Z25273311000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
6	Z25273312000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
7	Z25273321000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
8	Z25273322000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												

探伤NDT	标准Standard：		级别Class：		结果Result：	
注释 Notes	*1化学成分：0:熔炼分析 Heat Analysis、1:产品分析Product Analysis；*2位置方向: 大样位置-T:头部Head、B:尾部Tail + 试验方向-1横向 Transverse、2:纵向Longitudinal、3:Z向 + 取样位置- 1:板宽1/4、2:板宽1/2、3:板边 4:角部 + 厚度方向位置-1、原厚，2、表面下2mm，3、厚度1/4、4、厚度1/2、5、保留一个轧制面、6、表面下小于2mm、7、厚度1/3。 1、Ceq=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。				
备注 Remarks	上述元素仅列出参与复合公式的有意添加元素，但复合元素结果是严格按公式计算得出。				
说明 Description	本产品已按上述标准制造和检验，其结果符合要求。特此证明。贵方如查询有关问题，请与我公司联系。 We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with requirements of the above material specification. If you have any questions, please contact our company.			质量保证负责人 Quality Manager	监理 Surveyor

ANGANG STEEL COMPANY LIMITED 鞍钢股份有限公司 产品质量专用章 CHINA

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO., LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202102240100 SO2102280008	车 号 VEHICLE NO.	车队82
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF SUPPLY	AR	证明书号 CERTIFICATE NO.	GC202103162266
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-03-16	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm)			张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST				冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY						弯曲 BEND TEST 180°	硬度 HARDNESS				Z向断面收缩率% Z-PERCENTAGE				探伤 U T
			厚度 THICKNESS	宽度 WIDTH	长度 LENGTH			屈服强度 R_{eH} MPa	抗拉强度 Rm MPa	屈强比 YSR	断后伸长率A %	方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.		1	2	3	AVE.	1	2	3	AVE.	
1141203240HJ	21E113346	Q355B	30	2200	9000	8						C														
1141203235HJ	21E108443	Q355B	40	2200	8500	4						C														
总计(TOTAL)						12																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION, %																			其它 OTHER
	C	Si	Mn	P	S	Al	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		
21E113346	0.16	0.29	1.33	0.017	0.003	0.040	0.0122	0.001	0.017	0.024	0.012	0.020	0.002	0.0004	0.004		0.39	0.24		
21E108443	0.16	0.31	1.26	0.017	0.002	0.043	0.0122	0.002	0.017	0.026	0.013	0.021	0.001	0.0016	0.003		0.38	0.24		

注释 NOTES
1.位置方向 C=横向 TRANS L=纵向 LONGI
2.交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1.兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
IT IS HEREBY CERTIFIED THAT THE PRODUCT IS MANUFACTURED, TESTED AND INDGED IN ACCORDANCE WITH THE IMPLEMENTATION STANDARDS OF THE LABELED PRODUCT AND THE ORDER AGREEMENTS. THE NITROGEN CONTENT IS GUARANTEED WITHIN THE LIMITS SPECIFIED IN THE PRODUCT IMPLEMENTATION STANDARDS.
2.本产品质量证明书无产品质量专用章无效。
THE CERTIFICATE OF PRODUCT QUALITY IS INVALID WITHOUT QUALITY STAMP.
3.如发现质量问题请与我公司联系。
PLEASE CONTACT US IF ANY QUALITY PROBLEM OCCURRED.

签发:
ISSUED
申利晶

质量证明书专用章
QUALITY CERTIFICATE SEAL
产品质量专用章

电话：(0310) 5178978、5178999
地 址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2021-03-16
ISSUE DATE.

产品质量证明书
INSPECTION CERTIFICATE

安阳钢铁股份有限公司
ANYANGIRONANDWTEELCO.LTD

河南省安阳市殷都区 邮编：455004
ANYANGCITY.HENANPROVINCE.CHINA
TEL:0372-3124322 3120146

发货单号（ LIST No. ）：2065214017336　　证书编号（ CERTIFICATE No. ）：26000052365
收货单位（ PURGHASER ）：　　到　　站（ DESTINATION ）：
合 同 号（ CONTARCTNO ）：0000070231　　车　　号（ TRAIN No. ）：
产品名称（ NAME ）：碳结钢板 / Q355B　　生产许可证（ LICENSE No. ）：
标准编号（ WTANDARD ）：GB/T3274-2017

生产日期	炉批号	规格（mm）	数量 重量（T）	碳1（%）	硅1（%）	锰1（%）	硫1（%）	磷（%）	铬（%）	镍（%）	铜（%）	上屈服强度 1（MPA）	抗拉强度 1（MPA）	伸长率 1（%）	冷弯 d=a 1
2022-03-27	2208103A3	20mm	51.240	0.18	0.22	0.50	0.024	0.018				270	425	28.0	合格
2022-03-27	2208110A3	25mm	55.340	0.16	0.24	0.45	0.025	0.017				265	430	30.0	合格

备注（NOPES）：
(1)无质量证明专用章无效：THE CERTIFICATE SHALL BE VALID ONLY AFTER BEING STANPED EITH OUALITY SPECLAL SEAL；
(2)牌号以质量证明书为准；THE GRADF IN QUARLITY CERTIFICATE SHALL PREVAIL TO BE OFFICIAL；
(3)交货状态：热轧。CONDITION OF DELIVERY:HOT-ROLLED.

安阳钢铁股份有限公司 质量证明书专用章 CERTIFICATE SEAL 钢材质量证明专用章

No: 200190

第 1 页/共 1 页

签证：邢爱红　打印时间：2022-03-27

安阳钢铁股份有限公司
ANYANGIRONANDWTEELCO.LTD

产品质量证明书
INSPECTION CERTIFICATE

河南省安阳市殷都区 邮编：455004
ANYANGCITY.HENANPROVINCE.CHINA
TEL:0372-3124322 3120146

发货单号（ LIST No. ）：2065214789035　　证书编号（ CERTIFICATE No. ）：06000087165
收货单位（ PURGHASER ）：　　到　站（ DESTINATION ）：
合同号（ CONTARCTNO ）：0000096017　　车　号（ TRAIN No. ）：
产品名称（ NAME ）：低合金高强度钢板 / Q355B　　生产许可证（ LICENSE No. ）：
标准编号（ MTANDARD ）：GB/T3274-2017

生产日期	炉批号	规格（mm）	数量 重量（T）	碳1（%）	硅1（%）	锰1（%）	磷1（%）	镍（%）	铬（%）	铜（%）	上屈服强度 1（MPA）	抗拉强度 1（MPA）	伸长率1（%）	冷弯 d=a 1
2022-06-20	2249235A2	30*2260*430	0.229	0.17	0.28	1.35	0.020	0.017	0.01	0.01	0.02	370	525	28.5	合格
2022-06-20	2249247A2	40*2260*2500	1.774	0.16	0.25	1.45	0.018	0.016	0.01	0.01	0.01	365	520	28.0	合格
2022-06-20	2249250A2	45*2260*1100	0.878	0.18	0.26	1.40	0.019	0.018	0.01	0.01	0.01	368	523	27.0	合格

备注（NOPES）：
(1)无质量证明专用章无效：THE CERTIFICATE SHALL BE VALID ONLY AFTER BEING STAMPED EITH QUALITY SPECLAL SEAL;
(2)牌号以质量证明书为准：THE GRADF IN QUARLITY CERTIFICATE SHALL PREVAIL TO BE OFFICIAL;
(3)交货状态：热轧。CONDITION OF DELIVERY:HOT-ROLLED.

安阳钢铁股份有限公司 质量证明书专用章 CERTIFICATE-SEAL 钢材质量证明专用章

No: 202585

签证：邢爱红　打印时间：2022-06-20

合同编号 CONTRACT NO.	I104821004	证明书号 CERTIFICATE NO	CX2021100605335
订货单位 CUSTOMER	邯郸市邯钢附属企业公司	到站 DESTINATION	邯郸309库（使用）
收货单位 PURCHASER	邯郸市邯钢附属企业公司	车号 TRAIN NO	冀D01697D

邯钢集团邯宝钢铁有限公司

HAN STEEL GROUP HANBAO IRON&STEEL CO.,LTD.

质 量 证 明 书

CERTIFICATE OF QUALITY

执行标准 EXECUTIVE STANDARD	GB/T 1591-2018	产品名称 PRODUCT	热轧直发卷	生产许可证号: PRODECTION LICENSE	

批号 BATCH NO	钢种等级 STEEL GRADE	炉号 HEAT No	规格 DIMENSIONS mm 厚×宽×长	数量 QUANTITY	重量 WEIGHT (t)	化学成分（%） CHEMICAL COMPOSITION C	Si	Mn	P	S	Als	Cu	Ni	Cr	主要缺陷	生产时间
						10^{-2}	10^{-2}	10^{-2}	10^{-3}	10^{-3}	10^{-3}	10^{-2}	10^{-2}	10^{-2}		
21IA32285384	Q355B 一 级 品	2529255	10.00 × 1500 × C	4	120.300	21	19	27	16	1	31	1	1	4		20211003

批号 BATCH NO	常规拉伸 方向	温度 ℃	屈服强度 YS Mpa	抗拉强度 TS Mpa	断后伸长EL %	屈强比	常规冲击 方向	试样厚度 mm	试验温度 ℃	冲击功1 J	冲击功2 J	冲击功3 J	冲击功平均值 J	金相 铁素体晶粒度	带状组织级别	夹杂_A粗	夹杂_A细	夹杂_B粗	夹杂_B细	夹杂_C粗	夹杂_C细	夹杂_D粗	夹杂_D细	夹杂_DS	夹杂物总量
21IA32285384	横向		419	552	30.0		纵向	7.50	20	223	188	185	199												

总数量： 1 件 总重量（t） 30.300 吨（t）

备注 REMARK	1、此证明书产品经检验，符合规定标准或技术协议要求。 The certificate proved under the examination to meet the contract requirements and technical standards. 2、钢种和规格以本证明书为准。 The steel type, specifications are subjected to the certificate. 3、此质量证明书为电子版本，手写、改写、无印章均属无效。 The quality certificate is available in electronic form. Handwriting, rewriting and no stamping is invalid.
注释 REMARKS	

邯钢集团邯宝钢铁有限公司 产品质量检验专用章 (4)

地 址：河北省邯郸市复兴路232号（邮编ZIPCODE：056015）
ADDRESS:No. 232 Fuxing Road. Handan, Hebei
证书网址：http://wuliu.hansteel.cn
CERTIFICATE URL

质 量 检 验 负 责 人： 姚政
PERSON-IN-CHARGE OF QUALITY EXAMINATION: Yao Zheng
Tel (0310)2093638(质量)，(0310)6074145(异议)
FAX (0310)6072815

开 证 员： 连淑红
OPERATOR(SIGNATURE):
开证日期： 20211006
ISSUING DATE:

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270110 SO2111290227	车 号 VEHICLE NO.	车队9628D		
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126827		
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-27	认证号 AUTHORIZATION NO.			

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1114212323	21S014239	Q355B	25	2200	10900	2		500	621	0.81	20.0	L	20	65.0	75.3	70.6	70.3	合格								
1114212323	21S014238	Q355B	25	2200	10700	6		484	598	0.81	20.0	L	20	104	87.3	143	111	合格								
1110212360	21S014242	Q355B	25	2200	11000	1		498	621	0.80	20.0	L	20	65.9	86.1	81.2	77.7	合格								
总计(TOTAL)						9																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21S014239	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014238	0.14	0.24	0.88	0.015	0.005			0.0039	0.002	0.051	0.022	0.010	0.015	0.001	0.0002			0.29	0.20		
21S014242	0.13	0.21	0.86	0.024	0.010			0.0028	0.002	0.055	0.023	0.010	0.021	0.001	0.0001			0.28	0.18		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED 郭娆

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：ISSUE DATE. 2022-01-12

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU (HANDAN) IRON AND STEEL CO., LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202112270101 SO2112310213	车 号 VEHICLE NO.	车队6813D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202201126855
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2022-01-12	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 UT
2222100195HJ	22E003076	Q355B	30	2200	8800	4						T														
1210100268F2	22E003122	Q355B	40	2200	11800	7						T														
2222100195HJ	22E003076	Q355B	30	2200	10500	1						T														
总计(TOTAL)						12																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION (质量分数) / % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		
22E003122	0.14	0.20	0.86	0.021	0.009		0.012	<0.0010	0.002	0.041	0.024	0.009	0.017	0.001	0.0001			0.29	0.19		
22E003076	0.17	0.24	1.07	0.020	0.001		0.012	0.0145	0.003	0.017	0.023	0.013	0.014	0.001	0.0002			0.36	0.23		

注释 NOTES
1. 位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2. 交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1. 兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
It is hereby certified that the product is manufactured, tested and judged in accordance with the implementation standards of the labeled product and the order agreements. The nitrogen content is guaranteed within the limits specified in the product implementation standards.
2. 本产品质量证明书无产品质量专用章无效。
The certificate of product quality is invalid without quality stamp.
3. 如发现质量问题请与我公司联系。
Please contact us if any quality problem occurred.

签发 ISSUED 李慧芳

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2022-01-12
ISSUE DATE.

ZHONGPU

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO.,LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202111270101 SO2112110209	车 号 VEHICLE NO.	车队0710D
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF DELIVERY	AR	证明书号 CERTIFICATE NO.	GC202112240417
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-12-23	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm) 厚度 THICK-NESS	宽度 WIDTH	长度 LENGTH	张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST 屈服强度 R_{eH} MPa	抗拉强度 R_m MPa	屈强比 YSR	断后伸长率A %	冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY 方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.	弯曲 BEND TEST 180°	硬度 HARDNESS 1	2	3	AVE.	Z向断面收缩率% SECTION SHRINKAGE 1	2	3	AVE.	探伤 U T
1110212235	21E115148	Q355B	32	2200	11500	4						T														
2122112317-1	21E115154	Q355B	25	2500	12000	2		424	557	0.76	22.0	L	20	200	218	201	206	合格								
2122112317-1	21E115154	Q355B	25	2500	10200	1		424	557	0.76	22.0	L	20	200	218	201	206	合格								
总计(TOTAL)						7																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION（质量分数）/ % C	Si	Mn	P	S	Alt	Als	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		其它 OTHER
21E115148	0.17	0.17	0.93	0.023	0.014		0.021	0.0016	0.001	0.020	0.020	0.009	0.013	0.001	0.0001			0.33	0.22		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		
21E115154	0.17	0.29	1.40	0.018	0.007		0.010	0.0120	0.003	0.021	0.010	0.008	0.012	0.001	0.0004			0.41	0.25		

注释 NOTES
1.位置方向 T=横向 TRANSVERSE L=纵向 LONGITUDINAL
2.交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1.兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
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Please contact us if any quality problem occurred.

签发 ISSUED
李慧芳

中普（邯郸）钢铁有限公司 产品质量专用章 (2)

质量证明书专用章 QUALITY CERTIFICATE SEAL

电话：（0310）5178978、5178999
地　　址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2021-12-24
ISSUE DATE.

鞍钢股份有限公司
Angang Steel Company Limited

产品质量证明书
INSPECTION CERTIFICATE

中国鞍山市铁东区团结街42号 邮编 114002
No.42 Tuanjie Street Tiedong District 114002
Anshan. P. R. China
Tel 0086-8008900858 Fax 0086-0412-6728486

制 造 厂：鞍钢股份有限公司鞍山中厚板厂2500线
Manufacturer: Anshan Heavy Plate Plant 2500 Line of AnSteel

订货单位 Buyer	沈阳鞍钢国际贸易有限公司	产品名称 Product	中厚板 Medium and Heavy plate	合同编号 Contract No.	C2260574008	证明书编号 Certificate No.	C02205310596
收货单位 Consignee	沈阳鞍钢国际贸易有限公司	客户名称 Customer	沈阳鞍钢国际贸易有限公司			交货状态 Delivery Condition	热轧
标准 Specification	GB/T 3274-2017	许可证编号 License No.					
钢牌号 Grade	Q355B	发货日期 Date of Delivery	20220531	计重方式 Weight Mode	理论重量 Theory		

序号 No.	物料号 Pack No.	熔炼号 Heat No.	规格(mm) Dimensions mm.	重量(kg) Weight	件数 Pcs.	化学成分 Chemical Composition (%)														冷弯Bend		
						*1	C	Si	Mn	P	S	Als	Nb	V	Ti	Ni	Cr	Cu	Ceq		取样位置	α= °	检验批号 Batch No.
							10^{-2}	10^{-2}	10^{-2}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}	10^{-3}				
1	Z25273231000	22CD3643	12*2280*10860	2332		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
2	Z25273232000	22CD3643	12*2280*11060	2375		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
3	Z25273241000	22CD3643	12*2280*11350	2438		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
4	Z25273242000	22CD3643	12*2280*11630	2498		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
5	Z25273311000	22CD3643	12*2280*11800	2534		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
6	Z25273312000	22CD3643	12*2280*11900	2553		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
7	Z25273321000	22CD3643	12*2280*11920	2560		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
8	Z25273322000	22CD3643	12*2280*12060	23310		0	15	32	103	14	8	17	9	3	1	5	13	6	326				
合计Total																						

序号 No.	物料号 Pack No.	拉伸Tension							冲击Charpy										硬度Hardness						厚度方向性能(Z)						
		位置方向 *2	屈服 Y.S. ReH	抗拉 T.S.	伸长率 %	收缩率 %	屈强比 Y.S./T.S. %	检验批号 Batch No.	位置方向 *2	温度 C°	10*10*55mm J KV2				纤维率 SA %				检验批号 Batch No.	位置方向 *2					检验批号 Batch No.	位置方向 *2						检验批号 Batch No.
			MPa	MPa							1	2	3	Ave	1	2	3	Ave			1	2	3	Ave			%				
1	Z25273231000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
2	Z25273232000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
3	Z25273241000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
4	Z25273242000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
5	Z25273311000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
6	Z25273312000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
7	Z25273321000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												
8	Z25273322000	T111	374	526	24			Z252723500	T216	20	89	99	77	88					Z252723500												

探伤NDT	标准Standard：		级别Class：		结果Result：	
注释 Notes	*1化学成分：0:熔炼分析 Heat Analysis、1:产品分析Product Analysis；*2位置方向: 大样位置-T:头部Head、B:尾部Tail + 试验方向-1横向 Transverse、2:纵向Longitudinal、3:Z向 + 取样位置- 1:板宽1/4、2:板宽1/2、3:板边 4:角部 + 厚度方向位置-1、原厚，2、表面下2mm，3、厚度1/4、4、厚度1/2、5、保留一个轧制面、6、表面下小于2mm、7、厚度1/3。 1、Ceq=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15。				
备注 Remarks	上述元素仅列出参与复合公式的有意添加元素，但复合元素结果是严格按公式计算得出。				
说明 Description	本产品已按上述标准制造和检验，其结果符合要求。特此证明。贵方如查询有关问题，请与我公司联系。 We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with requirements of the above material specification. If you have any questions, please contact our company.			质量保证负责人 Quality Manager	监理 Surveyor

ANGANG STEEL COMPANY LIMITED 鞍钢股份有限公司 产品质量专用章 CHINA

中普（邯郸）钢铁有限公司
ZHONGPU(HANDAN) IRON AND STEEL CO., LTD

产品质量证明书
CERTIFICATE OF PRODUCT QUALITY

收货单位 PURCHASER		订单编号 CONTRACT NO.	BHT202102240100 SO2102280008	车 号 VEHICLE NO.	车队82
产品名称 PRODUCT	低合金高强度结构钢 HIGH STRENGTH LOW ALLOY STRUCTURAL STEELS	交货状态 CONDITION OF SUPPLY	AR	证明书号 CERTIFICATE NO.	GC202103162266
执行标准 SPECIFICATION	GB/T1591-2018	发货日期 DATE OF DELIVERY	2021-03-16	认证号 AUTHORIZATION NO.	

炉号 HEAT NO.	批号 BATCH NO.	牌号 GRADE	尺寸 SIZE(mm)			张数 PIECES	重量 WEIGHT (t)	拉伸试验 TENSILE TEST				冲击吸收能量 J(KV_2) IMPACT ABSORBED ENERGY						弯曲 BEND TEST 180°	硬度 HARDNESS				Z向断面收缩率% Z-PERCENTAGE				探伤 U T
			厚度 THICKNESS	宽度 WIDTH	长度 LENGTH			屈服强度 R_{eH} MPa	抗拉强度 Rm MPa	屈强比 YSR	断后伸长率A %	方向 DIRECTION	温度 TEMP ℃	1	2	3	AVE.		1	2	3	AVE.	1	2	3	AVE.	
1141203240HJ	21E113346	Q355B	30	2200	9000	8						C														
1141203235HJ	21E108443	Q355B	40	2200	8500	4						C														
总计(TOTAL)						12																				

批号 BATCH NO.	化学成分 CHEMICAL COMPOSITION, %																			其它 OTHER
	C	Si	Mn	P	S	Al	Nb	V	Ti	Cr	Ni	Cu	Mo	B	N	H	CEV	Pcm		
21E113346	0.16	0.29	1.33	0.017	0.003	0.040	0.0122	0.001	0.017	0.024	0.012	0.020	0.002	0.0004	0.004		0.39	0.24		
21E108443	0.16	0.31	1.26	0.017	0.002	0.043	0.0122	0.002	0.017	0.026	0.013	0.021	0.001	0.0016	0.003		0.38	0.24		

注释 NOTES
1.位置方向 C=横向 TRANS L=纵向 LONGI
2.交货状态 N=正火 Q=淬火 CR=控轧 TMCP=热机械轧制 AR=热轧 NR=正火轧制 T=回火

说明 REMARKS
1.兹证明本产品按照标示产品执行标准和订货协议要求制造、检测并判定，氮含量提供产品执行标准规定限制值内保证。
IT IS HEREBY CERTIFIED THAT THE PRODUCT IS MANUFACTURED, TESTED AND INDGED IN ACCORDANCE WITH THE IMPLEMENTATION STANDARDS OF THE LABELED PRODUCT AND THE ORDER AGREEMENTS. THE NITROGEN CONTENT IS GUARANTEED WITHIN THE LIMITS SPECIFIED IN THE PRODUCT IMPLEMENTATION STANDARDS.
2.本产品质量证明书无产品质量专用章无效。
THE CERTIFICATE OF PRODUCT QUALITY IS INVALID WITHOUT QUALITY STAMP.
3.如发现质量问题请与我公司联系。
PLEASE CONTACT US IF ANY QUALITY PROBLEM OCCURRED.

签发:
ISSUED
申利晶

质量证明书专用章
QUALITY CERTIFICATE SEAL
产品质量专用章

电话：(0310) 5178978, 5178999
地 址：中国.河北.武安.阳邑镇
ADDRESS: YANG YI TOWN, WU AN CITY, HEBEI PROVINCE, P.R.CHINA

开证日期：2021-03-16
ISSUE DATE.

产品质量证明书
INSPECTION CERTIFICATE

安阳钢铁股份有限公司
ANYANGIRONANDWTEELCO.LTD

河南省安阳市殷都区 邮编：455004
ANYANGCITY.HENANPROVINCE.CHINA
TEL:0372-3124322 3120146

发货单号（ LIST No. ）：2065214017336　　证书编号（ CERTIFICATE No. ）：26000052365
收货单位（ PURGHASER ）：　　到　　站（ DESTINATION ）：
合 同 号（ CONTARCTNO ）：0000070231　　车　　号（ TRAIN No. ）：
产品名称（ NAME ）：碳结钢板 / Q355B　　生产许可证（ LICENSE No. ）：
标准编号（ WTANDARD ）：GB/T3274-2017

生产日期	炉批号	规格（mm）	数量 重量（T）	碳1（%）	硅1（%）	锰1（%）	硫1（%）	磷（%）	铬（%）	镍（%）	铜（%）	上屈服强度 1（MPA）	抗拉强度 1（MPA）	伸长率 1（%）	冷弯 d=a 1
2022-03-27	2208103A3	20mm	51.240	0.18	0.22	0.50	0.024	0.018				270	425	28.0	合格
2022-03-27	2208110A3	25mm	55.340	0.16	0.24	0.45	0.025	0.017				265	430	30.0	合格

备注（NOPES）：
(1)无质量证明专用章无效：THE CERTIFICATE SHALL BE VALID ONLY AFTER BEING STANPED EITH OUALITY SPECLAL SEAL；
(2)牌号以质量证明书为准；THE GRADF IN QUARLITY CERTIFICATE SHALL PREVAIL TO BE OFFICIAL；
(3)交货状态：热轧。CONDITION OF DELIVERY:HOT-ROLLED.

安阳钢铁股份有限公司 质量证明书专用章 CERTIFICATE SEAL 钢材质量证明专用章

No: 200190

签证：邢爱红　打印时间：2022-03-27

carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号：SOC008065
Shipment / 装运标识： WHS045254

Customer / 客户名称： 武汉诺义成科技有限公司
Project / 项目名称： GE配套设备

Carboline Dalian Paint Company Ltd. hereby confirm that the following specified product is approved by our Quality Control and in accordance with the specification for the product.If you have further questions, please contact us.
卡宝拉因（大连）油漆有限公司在此郑重声明,下述产品已经品质保证部检验批准,符合对产品的质量要求。
如有任何问题，请与我公司联系。

Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carbothane 134 HG Part B Batch Number / 批次号： BLD010325	Production Date / 生产日期： 31-12-2021 Expiry Date / 过期日期： 31-12-2023	
Density (25C)	1.1-1.14 g/ml	1.1200
Non-Volatile by Wt%	88-92 %	90.0000

REMARKS:

CARBOLINE (DALIAN) PAINT CO., LTD 卡宝拉因(大连)油漆 有限公司 质检专用章

Date: _____

CARBOLINE (DALIAN) PAINT CO., LTD 卡宝拉因(大连)油漆 有限公司 质检专用章

Carboline Dalian Paint Company Ltd. Houshicun,Daweijiazhen,Jinzhouqu,Dalian City P.R.C. Tel:0411-87898441, Fax: 0411-87898445
卡宝拉因（大连）油漆有限公司 大连市金州区大魏家镇后石村 电话：0411-87898441 传真：0411-87898445

carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号 : SOC008065
Shipment / 装运标识 : WHS045254

Customer / 客户名称 : 武汉诺义成科技有限公司
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Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carboguard 890 Gray #0700 Batch Number / 批次号 : BLD010462	Production Date / 生产日期 : 20-01-2022 Expiry Date / 过期日期 : 20-01-2025	
Density (25C)	1.31-1.35 g/ml	1.3100
Fineness of grind (um)	50-50 µm	50.0000
Sag (Mils)	25-2500 Mils	25.0000
Gloss Determination	70-7000 Gu	70.0000
Viscosity (25C) BrookField cps	2200-4200 cPs	3400.0000

REMARKS:

CARBOLINE (DALIAN) PAINT CO. LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Date: _____

CARBOLINE (DALIAN) PAINT CO. LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Carboline Dalian Paint Company Ltd. Houshicun,Daweijiazhen,Jinzhouqu,Dalian City P.R.C. Tel:0411-87898441, Fax: 0411-87898445
卡宝拉因（大连）油漆有限公司 大连市金州区大魏家镇后石村 电话：0411-87898441 传真：0411-87898445

carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号 : SOC008065
Shipment / 装运标识 : WHS045254

Customer / 客户名称 : 武汉诺义成科技有限公司
Project / 项目名称 : GE配套设备

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Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carbothane 134 HG Ral 9005 Batch Number / 批次号 : BLD010466	Production Date / 生产日期 : 20-01-2022 Expiry Date / 过期日期 : 20-01-2025	
Density (25C)	1.21-1.25 g/ml	1.2200
Non-Volatile by Wt%	74.27-78.27 %	76.2300
Viscosity (25C) Stomer (KU)	80-90 KU	90.0000
Fineness of grind (um)	0.001-12.5 µm	12.5000
Sag (Mils)	6-9999 Mils	6.0000
Dry time (24C, Hours) Touch	0.01-1 Hours	1.00
Gloss Determination	80-100 Gu	90.0000
Dry time (24C, Hours) Recoat	0.01-24 Hours	24.00

REMARKS:

CARBOLINE (DALIAN) PAINT CO. LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Date: _____

CARBOLINE (DALIAN) PAINT CO. LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Carboline Dalian Paint Company Ltd. Houshicun,Daweijiazhen,Jinzhouqu,Dalian City P.R.C. Tel:0411-87898441, Fax: 0411-87898445
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carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号：SOC008065
Shipment / 装运标识： WHS045254

Customer / 客户名称： 武汉诺义成科技有限公司
Project / 项目名称： GE配套设备

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Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carbothane 134 HG Part B Batch Number / 批次号： BLD010467	Production Date / 生产日期： 20-01-2022 Expiry Date / 过期日期： 20-01-2024	
Density (25C)	1.1-1.14 g/ml	1.1200
Non-Volatile by Wt%	88-92 %	90.0000

REMARKS:

CARBOLINE (DALIAN) PAINT CO., LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Date: _____

CARBOLINE (DALIAN) PAINT CO., LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Carboline Dalian Paint Company Ltd. Houshicun,Daweijiazhen,Jinzhouqu,Dalian City P.R.C. Tel:0411-87898441, Fax: 0411-87898445
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carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号 : SOC008065
Shipment / 装运标识 : WHS045254

Customer / 客户名称 : 武汉诺义成科技有限公司
Project / 项目名称 : GE配套设备

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Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carbozinc 859(2K) Part B Batch Number / 批次号 : BLD010465	Production Date / 生产日期 : 20-01-2022 Expiry Date / 过期日期 : 20-01-2024	
Density (25C)	0.84-0.88 g/ml	0.8600

REMARKS:

CARBOLINE (DALIAN) PAINT CO. LTD 卡宝拉因(大连)油漆有限公司 质检专用章

CARBOLINE (DALIAN) PAINT CO. LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Date: _____

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carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号：SOC008065
Shipment / 装运标识： WHS045254

Customer / 客户名称： 武汉诺义成科技有限公司
Project / 项目名称： GE配套设备

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Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carbozinc 859(2K) Gray #0700 Batch Number / 批次号： BLD010464	Production Date / 生产日期： 20-01-2022 Expiry Date / 过期日期： 20-01-2024	
Density (25C)	3.3-3.38 g/ml	3.3400
Non-Volatile by Wt%	90-94 %	92.1000
Sag (Mils)	8-9999 Mils	8.0000
Viscosity (25C) BrookField cps	35000-45000 cPs	35000.0000

REMARKS:

CARBOLINE (DALIAN) PAINT CO., LTD 卡宝拉因(大连)油漆有限公司 质检专用章

Date: _____

CARBOLINE (DALIAN) PAINT CO., LTD 卡宝拉因(大连)油漆有限公司 质检专用章

carboline®
Coatings - Linings - Fireproofing

MATERIAL CERTIFICATE

Sales Order / 项目编号：SOC008065
Shipment / 装运标识： WHS045254

Customer / 客户名称： 武汉诺义成科技有限公司
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Type of Analysis / 分析项目	Specification / 规范	Result of Analysis / 结果
Carboguard 890 Part B Batch Number / 批次号： BLD010463	Production Date / 生产日期： 20-01-2022 Expiry Date / 过期日期： 20-04-2023	
Density (25C)	1.59-1.63 g/ml	1.6200
Fineness of grind (um)	25-25 µm	25.0000
Sag (Mils)	25-2500 Mils	25.0000
Viscosity (25C) BrookField cps	4000-10000 cPs	10000.0000

REMARKS:

CARBOLINE (DALIAN) PAINT CO.,LTD 卡宝拉因(大连)油漆有限公司 质检专用章

CARBOLINE (DALIAN) PAINT CO.,LTD 卡宝拉因(大连)油漆有限公司 质检专用章

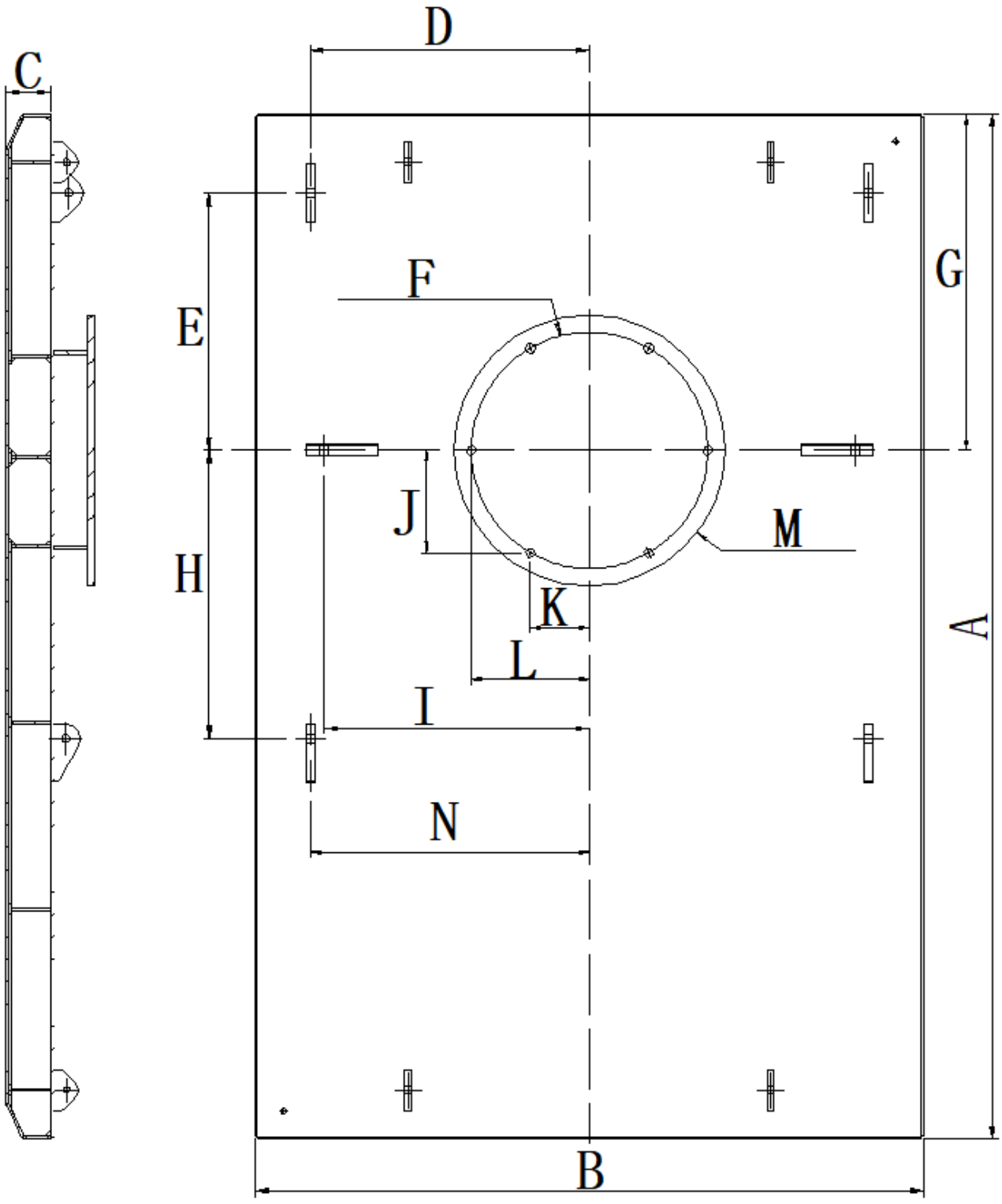
Date: _____

Carboline Dalian Paint Company Ltd. Houshicun,Daweijiazhen,Jinzhouqu,Dalian City P.R.C. Tel:0411-87898441, Fax: 0411-87898445
卡宝拉因（大连）油漆有限公司 大连市金州区大魏家镇后石村 电话：0411-87898441 传真：0411-87898445

SECTION 3. Fender Panels and Spools

3-B:

Dimensional Reports



Inspector: 李迪

Checked By:

Date: Apr. 16th.2022

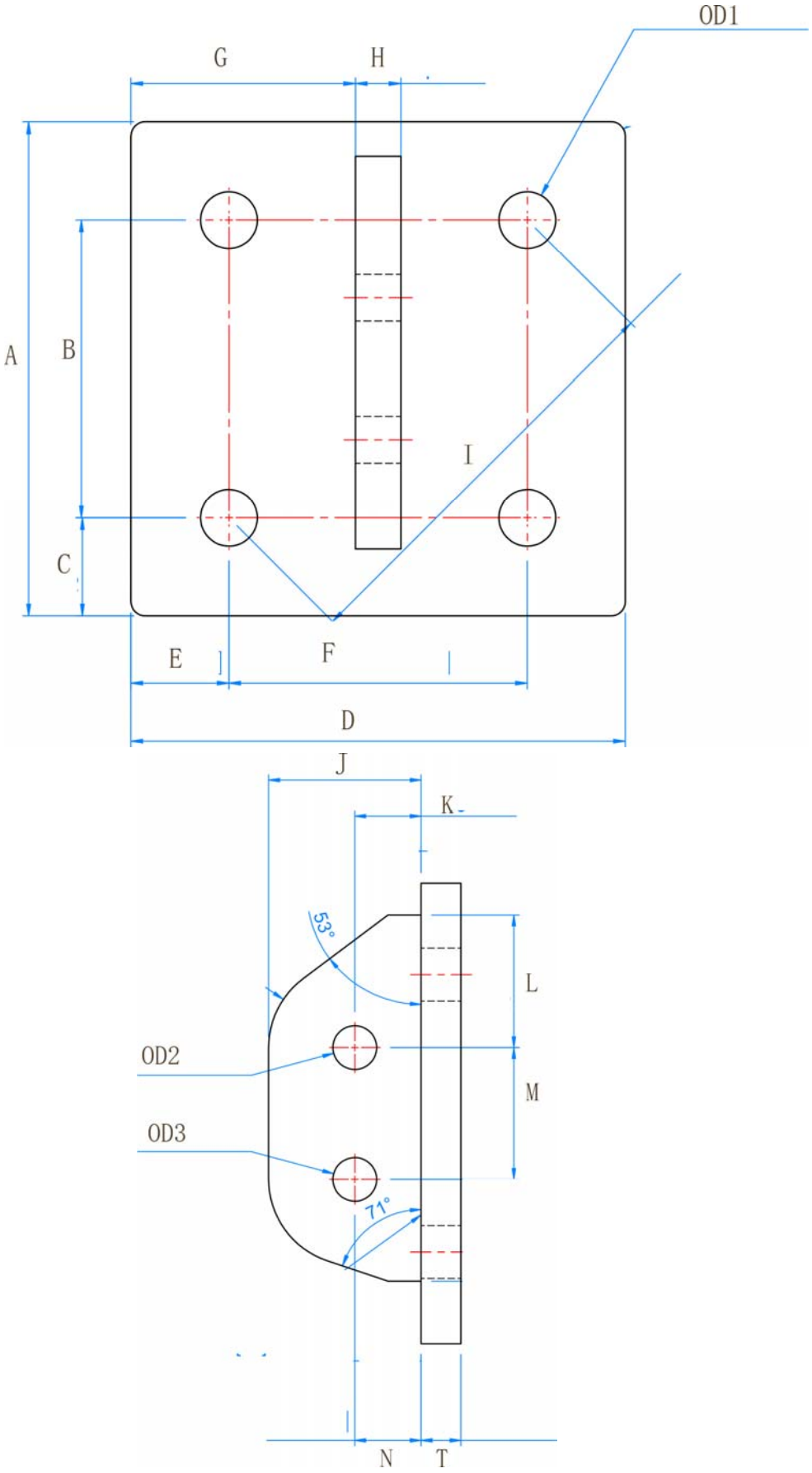
Date:

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-1M Unit: mm

Panel No.	Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N
		3708	2413	170	1011	932	855	1219	1043	960	370	214	428	980	1009
	Tolerance	±11	±11	±4	±1	±1	±2	±8	±1	±1	±1	±1	±1	±6	±1
F1		3710	2414	172	1010	931	856	1220	1044	960	370	214	428	981	1009
F2		3711	2414	170	1012	933	857	1219	1043	960	371	214	429	982	1009
F3		3711	2415	170	1012	933	856	1220	1043	961	369	214	428	981	1009
F4		3709	2416	170	1011	931	856	1219	1043	959	370	213	428	981	1010
F5		3711	2414	172	1012	933	857	1220	1042	961	371	213	429	981	1009
F6		3708	2413	173	1010	932	856	1220	1044	960	370	215	429	980	1008
F7		3710	2414	171	1011	931	856	1220	1043	959	370	214	428	981	1010
F8		3712	2414	173	1010	931	856	1219	1042	961	369	213	427	981	1010
F9		3711	2414	170	1011	932	856	1219	1043	960	370	214	429	980	1010
F10		3710	2413	170	1011	931	855	1221	1043	961	370	214	428	981	1009
F11		3710	2415	171	1011	931	857	1220	1043	959	369	214	428	980	1008
F12		3712	2413	170	1011	933	855	1219	1044	960	370	214	428	981	1009
F13		3709	2413	172	1012	932	855	1220	1042	960	370	214	428	982	1009


OD1
G
H
A
B
C
I
E
F
D
J
K
53°
L
OD2
M
OD3
71°
N
T

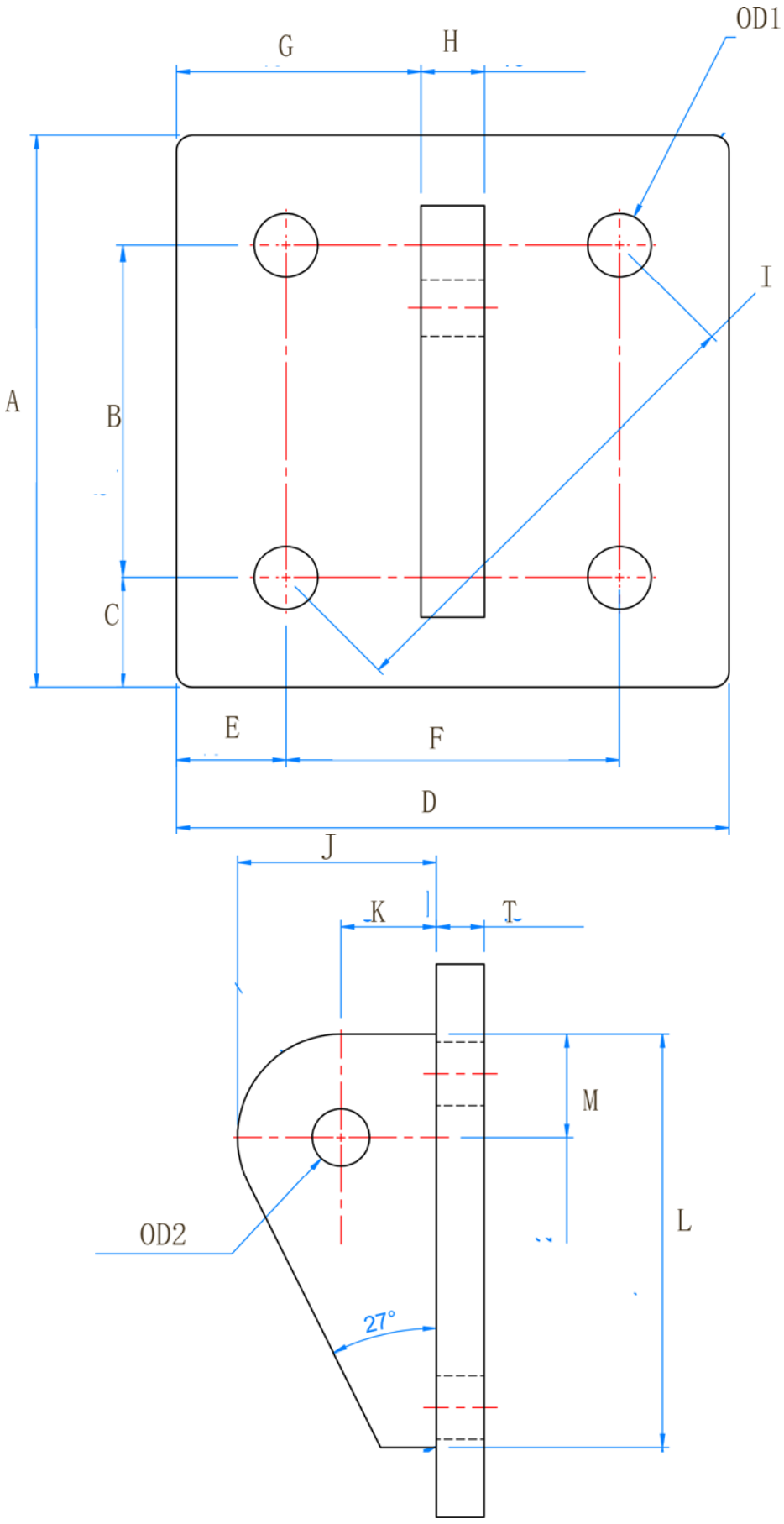
TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-1M06 Unit: mm

TENSION CHAIN & WEIGHT CHAIN PAD EYE																			
No.	**Size**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**T**	**OD 1**	**OD 2**	**OD 3**
		348	210	69	348	69	210	158	32	297	115	50	100	100	50	30	40	33	33
	Tolerance	±4	±1	±3	±4	±3	±1	±4	±3	±1	±3	±3	±3	±3	±3	±1	±1	±1	±1
1		349	209	70	349	70	210	157	32.3	297	115	49	100	101	50	30.3	40.5	33.3	33.5
2		349	210	68	347	70	210	158	32.1	297	115	51	101	101	50	30.1	40.3	33.3	33.6
3		349	210	70	348	68	209	157	32.2	298	116	51	100	101	49	30.3	40.5	33.4	33.2
4		347	209	68	347	70	210	158	32.2	296	114	49	100	99	51	30.2	40.3	33.3	33.6
5		349	210	70	348	68	209	157	32.2	296	115	51	101	99	49	30.2	40.2	33.4	33.5
6		349	210	68	349	68	210	158	32.3	296	114	50	99	100	50	30.3	40.4	33.5	33.2
7		349	209	68	349	69	209	158	32.3	298	114	49	99	101	50	30.2	40.4	33.5	33.6
8		347	209	68	347	69	210	158	32.3	297	116	49	100	101	50	30.3	40.3	33.5	33.5
9		349	209	68	349	68	210	157	32.1	297	116	50	101	100	49	30.2	40.3	33.5	33.2
10		349	209	68	347	69	209	159	32.2	296	114	50	100	99	50	30.2	40.5	33.4	33.2
11		347	210	70	347	68	210	158	32.2	296	114	51	99	99	51	30.1	40.4	33.5	33.2
12		348	209	68	349	68	209	157	32.1	298	114	49	101	101	51	30.1	40.4	33.5	33.6
13		349	210	68	349	69	210	158	32.2	297	116	50	99	99	49	30.3	40.2	33.4	33.4
14		348	210	68	348	68	209	158	32.1	297	116	51	100	100	51	30.1	40.2	33.3	33.6
15		349	210	69	349	70	210	159	32.2	297	114	49	101	100	49	30.1	40.4	33.3	33.6
16		349	210	69	347	68	209	157	32.2	296	115	50	101	101	51	30.2	40.5	33.5	33.2
17		348	210	69	348	69	210	158	32.1	297	116	51	99	101	50	30.1	40.5	33.3	33.2
18		347	210	69	347	69	209	158	32.1	296	115	49	101	101	49	30.2	40.2	33.4	33.3
19		348	210	69	347	70	210	157	32.2	297	114	51	99	99	50	30.1	40.2	33.6	33.6
20		348	209	70	347	70	210	159	32.3	297	116	49	99	100	51	30.1	40.2	33.3	33.5
21		348	210	68	348	68	210	158	32.2	296	116	50	99	101	49	30.3	40.2	33.5	33.4
22		349	210	70	347	70	209	158	32.3	298	114	50	101	100	51	30.1	40.2	33.3	33.4
23		348	210	68	349	69	209	157	32.3	296	114	50	99	101	50	30.3	40.2	33.4	33.5
24		347	209	68	349	69	209	157	32.1	296	114	50	101	100	50	30.1	40.2	33.2	33.6

HDG thickness check								
ASTM A153	Minimum 100 microns	Actual value（um）	112	115	108	112	117


OD1
G
H
I
A
B
C
E
F
D
J
K
T
M
L
OD2
27°

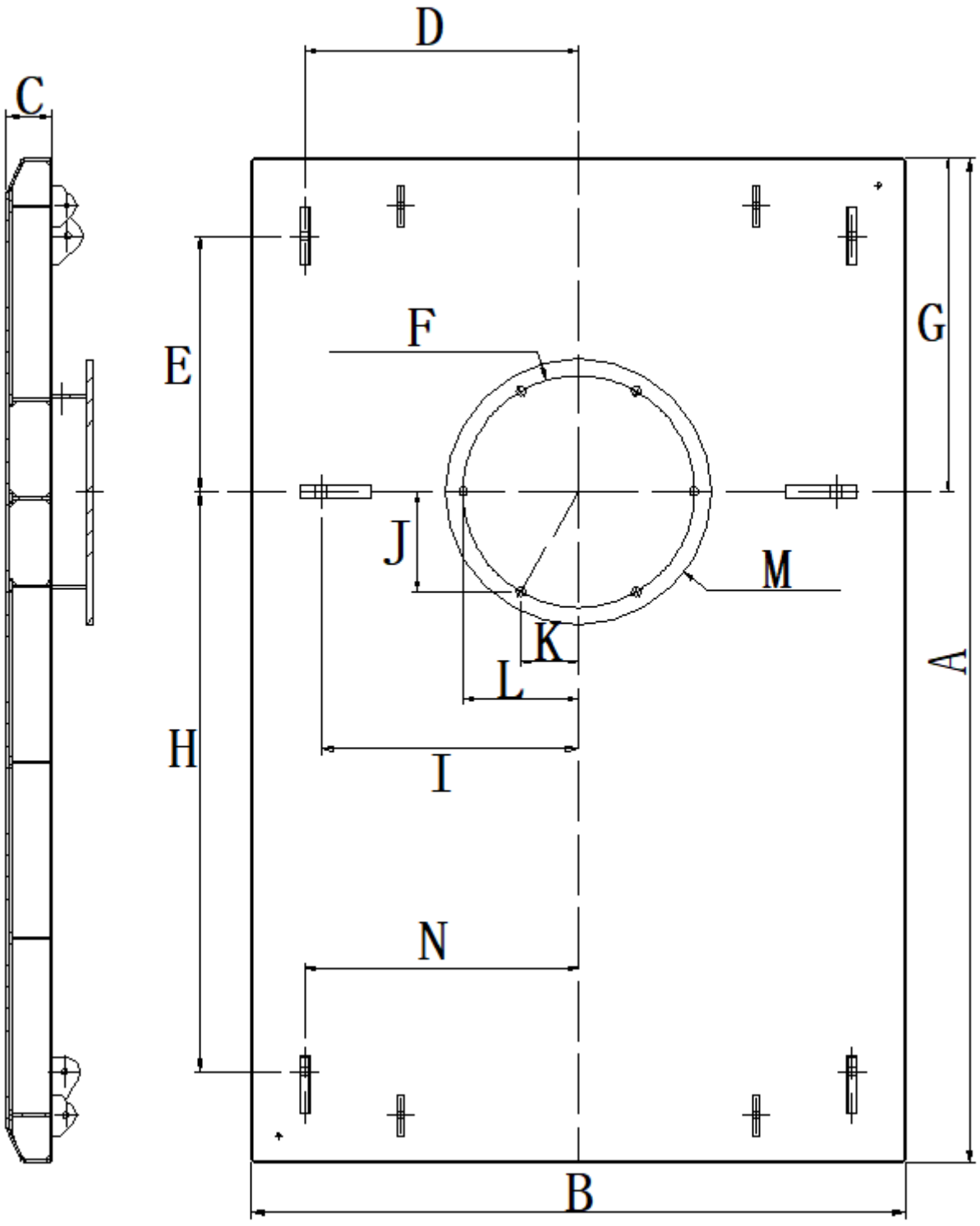
TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-1M06 Unit: mm

SHEAR CHAIN PAD EYE																	
No.	**Size**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**T**	**OD 1**	**OD 2**
		348	210	69	348	69	210	154	40	297	125	60	260	65	30	40	36
	Tolerance	±4	±1	±3	±4	±3	±1	±4	±3	±1	±3	±3	±3	±3	±1	±1	±1
1		348	210	70	349	70	210	153	40.1	297	124	60	260	64	30.3	40.4	36.5
2		348	209	69	348	70	209	153	40.4	297	124	60	261	66	30.2	40.2	36.5
3		348	210	68	349	68	210	154	40.2	296	125	61	261	64	30.2	40.4	36.6
4		348	209	70	347	70	209	154	40.3	297	124	59	261	65	30.4	40.3	36.5
5		349	209	69	347	68	210	155	40.1	296	126	61	260	64	30.2	40.3	36.4
6		349	210	70	349	68	210	154	40.1	298	126	61	259	65	30.4	40.2	36.4
7		347	209	69	348	70	210	153	40.1	298	125	60	259	65	30.3	40.5	36.3
8		348	210	69	347	68	210	155	40.1	298	126	61	261	64	30.3	40.4	36.3
9		347	210	69	348	69	209	155	40.2	298	124	59	261	64	30.4	40.4	36.2
10		347	210	70	348	69	210	155	40.4	297	125	59	260	65	30.2	40.3	36.4
11		347	210	69	349	69	210	154	40.3	297	124	59	260	66	30.4	40.5	36.5
12		348	209	69	347	69	209	154	40.2	297	124	59	260	64	30.3	40.4	36.2
13		348	209	69	349	68	209	153	40.2	298	125	60	261	64	30.3	40.3	36.2
14		347	210	69	347	68	209	155	40.1	298	126	59	259	64	30.3	40.2	36.2
15		347	210	68	347	70	209	153	40.2	297	124	60	259	66	30.1	40.5	36.2
16		349	209	70	347	70	210	154	40.1	298	125	61	260	66	30.3	40.2	36.4
17		347	209	70	347	68	210	153	40.1	296	126	59	260	65	30.3	40.3	36.3
18		349	209	69	349	69	210	155	40.3	296	126	60	259	64	30.1	40.3	36.4
19		349	209	68	347	68	209	155	40.2	298	125	61	260	66	30.4	40.3	36.5
20		349	210	69	347	68	209	155	40.3	298	125	61	259	65	30.4	40.5	36.3
21		348	209	70	347	68	210	155	40.2	296	125	59	259	66	30.4	40.2	36.6
22		347	210	68	348	69	210	155	40.2	298	125	60	261	65	30.3	40.3	36.4
23		348	210	70	348	69	210	153	40.3	298	126	61	260	66	30.4	40.5	36.4
24		348	210	70	349	69	210	155	40.2	298	126	61	259	64	30.4	40.3	36.4

HDG thickness check							
ASTM A153	Minimum 100 microns	Actual value（um）	122	112	111	102	109

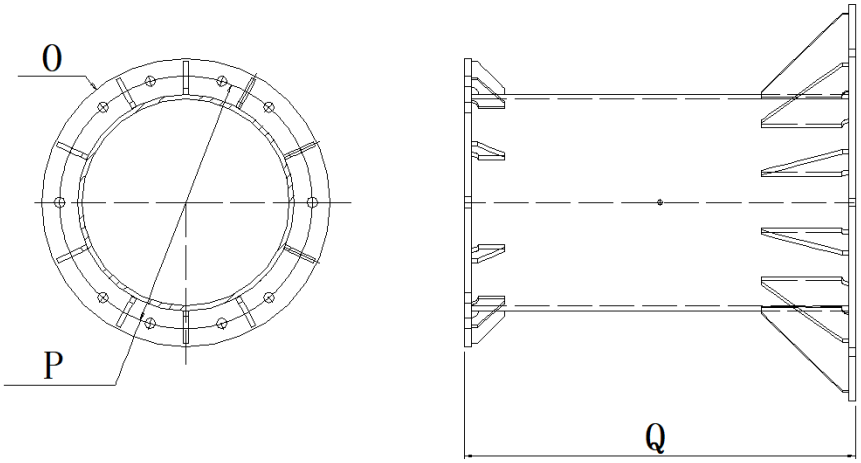

D
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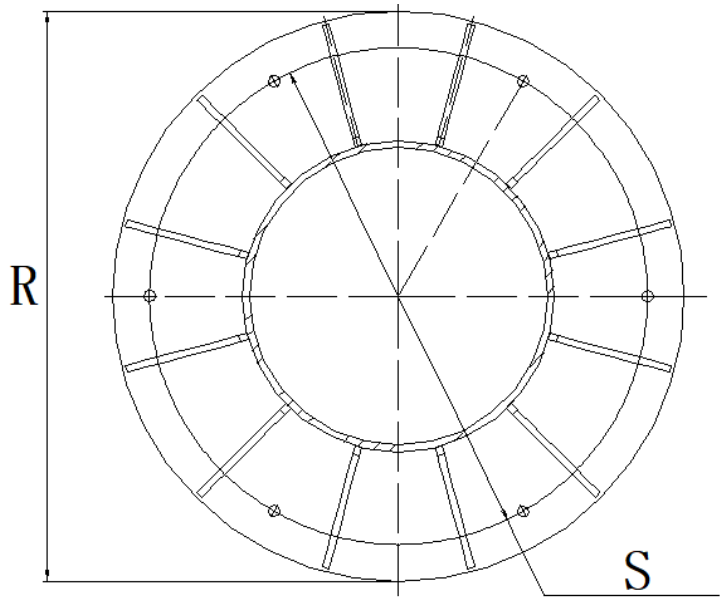
Project No. 25135 Drawing No. 25135-2M Unit: mm

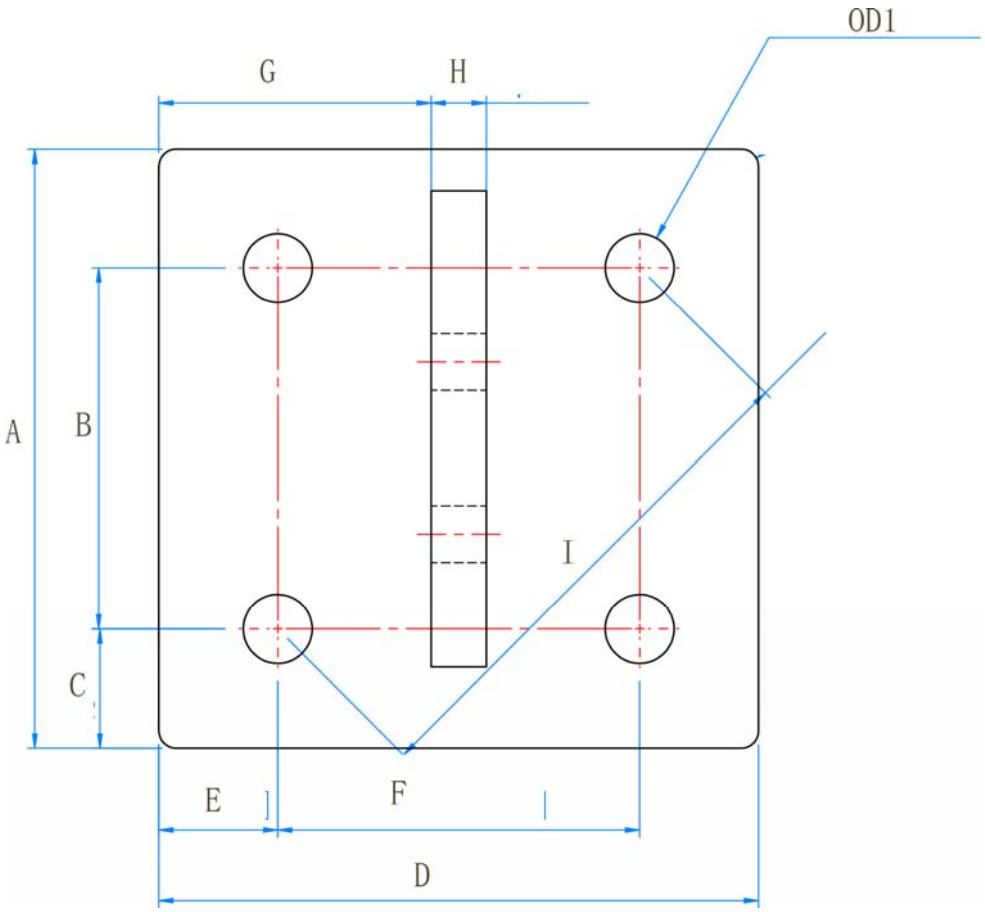
Panel No.	Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N
		3708	2413	170	1009	945	855	1232	2140	950	370	214	428	980	1009
	Tolerance	±11	±11	±4	±1	±1	±2	±8	±1	±1	±1	±1	±1	±6	±1
F1		3703	2416	171	1009	944	857	1232	2140	950	371	214	427	981	1008
F2		3704	2414	171	1008	944	856	1233	2140	951	370	214	428	981	1009
F3		3703	2414	170	1010	945	856	1231	2140	950	369	214	428	982	1009
F4		3704	2414	171	1010	945	855	1234	2140	950	370	213	427	983	1009
F5		3701	2416	172	1008	945	856	1233	2140	950	370	214	427	981	1009
F6		3704	2415	171	1010	945	857	1232	2141	951	370	213	427	982	1010
F7		3703	2416	170	1009	946	857	1233	2140	951	370	214	428	982	1009
F8		3703	2415	172	1009	945	856	1231	2141	950	369	214	429	981	1008
F9		3704	2414	170	1010	945	855	1232	2141	950	370	214	428	981	1009
F10		3703	2416	173	1010	945	856	1234	2140	951	370	215	428	982	1010

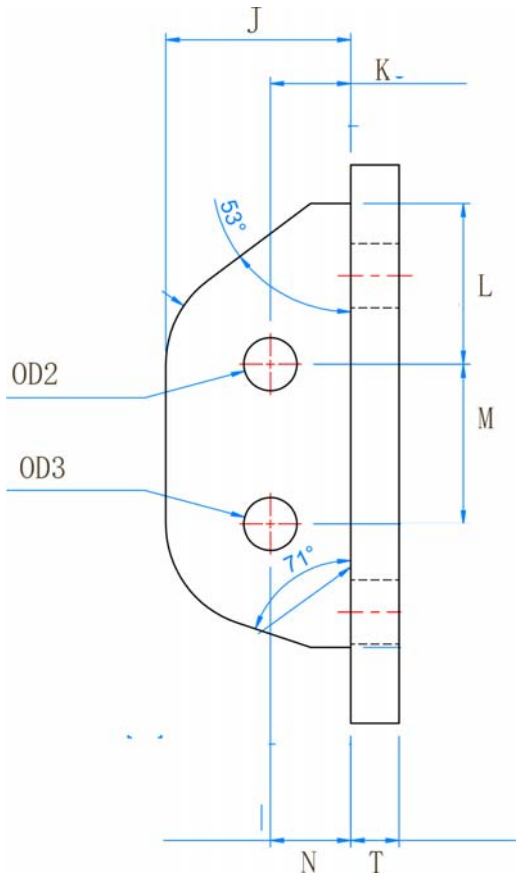
Project No. 25135 Drawing No. 25135-2M07 Unit: mm

Panel No.	Size	O	P	Q	R	S
		1219	1067	1501	1676	1460
	Tolerance	±9	±2	±9	±9	±2
1		1220	1067	1502	1677	1461
2		1219	1067	1504	1676	1460
3		1220	1067	1503	1676	1460
4		1220	1066	1502	1678	1460
6		1221	1067	1501	1678	1461
7		1221	1067	1503	1677	1462
8		1220	1068	1502	1677	1461
9		1219	1067	1501	1678	1462
10		1219	1068	1503	1678	1460






OD1
G
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A
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E
F
D


J
K
53°
L
OD2
M
OD3
71°
N
T

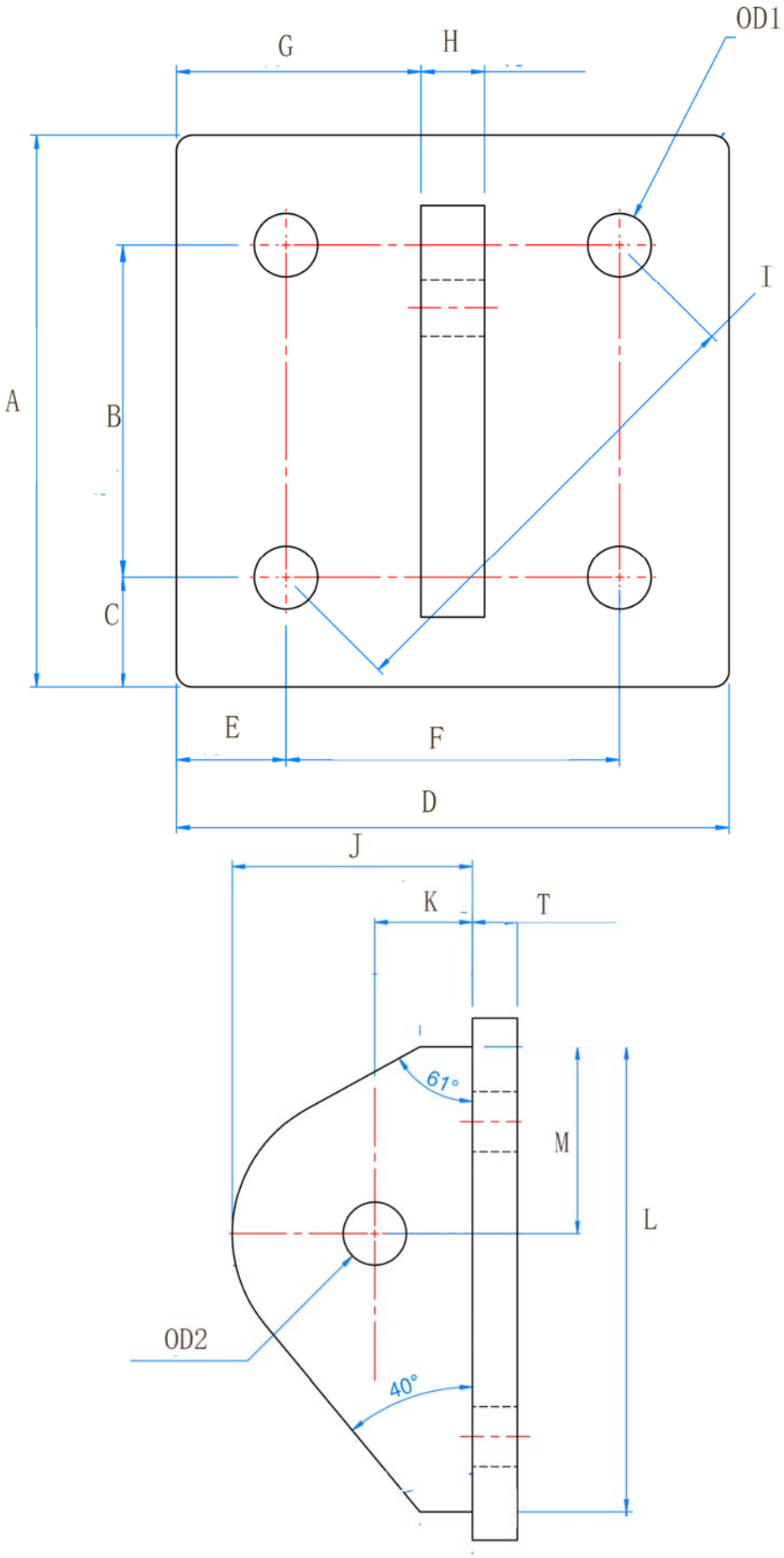
TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-2M06 Unit: mm

TENSION CHAIN & WEIGHT CHAIN PAD EYE																			
No.	**Size**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**T**	**OD 1**	**OD 2**	**OD 3**
		348	210	69	348	69	210	158	32	297	115	50	100	100	50	30	40	33	33
	Tolerance	±4	±1	±3	±4	±3	±1	±4	±3	±1	±3	±3	±3	±3	±3	±1	±1	±1	±1
1		348	210	70	349	68	210	157	32.3	296	116	49	100	100	50	30.1	40.2	33.3	33.6
2		347	210	69	348	69	209	159	32.2	298	114	49	99	99	50	30.4	40.4	33.2	33.6
3		347	210	70	347	69	209	157	32.3	296	116	50	100	100	50	30.2	40.4	33.3	33.5
4		349	210	70	348	69	209	158	32.2	298	115	51	100	101	49	30.1	40.4	33.6	33.5
5		347	209	68	349	69	209	158	32.1	296	114	50	99	99	49	30.2	40.3	33.3	33.2
6		348	209	69	348	69	210	158	32.2	298	116	50	100	101	50	30.1	40.2	33.2	33.3
7		348	209	68	347	68	209	157	32.3	297	116	49	101	101	51	30.4	40.5	33.2	33.2
8		349	210	70	348	68	210	157	32.2	296	114	51	100	101	50	30.3	40.3	33.2	33.6
9		348	210	68	348	68	210	158	32.3	297	116	50	100	99	50	30.2	40.4	33.5	33.4
10		348	210	70	348	68	209	158	32.1	297	115	50	101	100	50	30.1	40.5	33.4	33.6
11		348	210	69	348	70	210	159	32.1	298	115	50	99	99	51	30.4	40.5	33.2	33.5
12		348	210	70	349	68	209	159	32.4	298	114	49	99	100	51	30.3	40.5	33.6	33.3
13		347	210	69	349	69	209	159	32.3	298	115	50	100	100	51	30.2	40.5	33.3	33.3
14		349	210	68	349	69	210	159	32.3	296	115	49	99	99	50	30.4	40.4	33.5	33.2
15		348	210	69	347	70	209	159	32.3	297	116	51	99	99	50	30.4	40.4	33.4	33.6
16		348	209	68	349	68	210	157	32.3	298	114	49	101	101	50	30.2	40.2	33.6	33.3
17		349	210	68	347	70	210	158	32.2	297	115	50	100	101	49	30.1	40.2	33.2	33.5
18		349	209	68	347	69	209	158	32.1	298	116	49	99	101	50	30.4	40.3	33.2	33.2
19		349	209	69	348	68	210	157	32.4	296	115	50	99	101	51	30.3	40.3	33.2	33.2
20		349	210	70	348	69	210	159	32.4	298	114	51	99	101	49	30.3	40.2	33.3	33.3

HDG thickness check								
ASTM A153	Minimum 100 microns	Actual value（um）	115	107	121	107	108


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OD2
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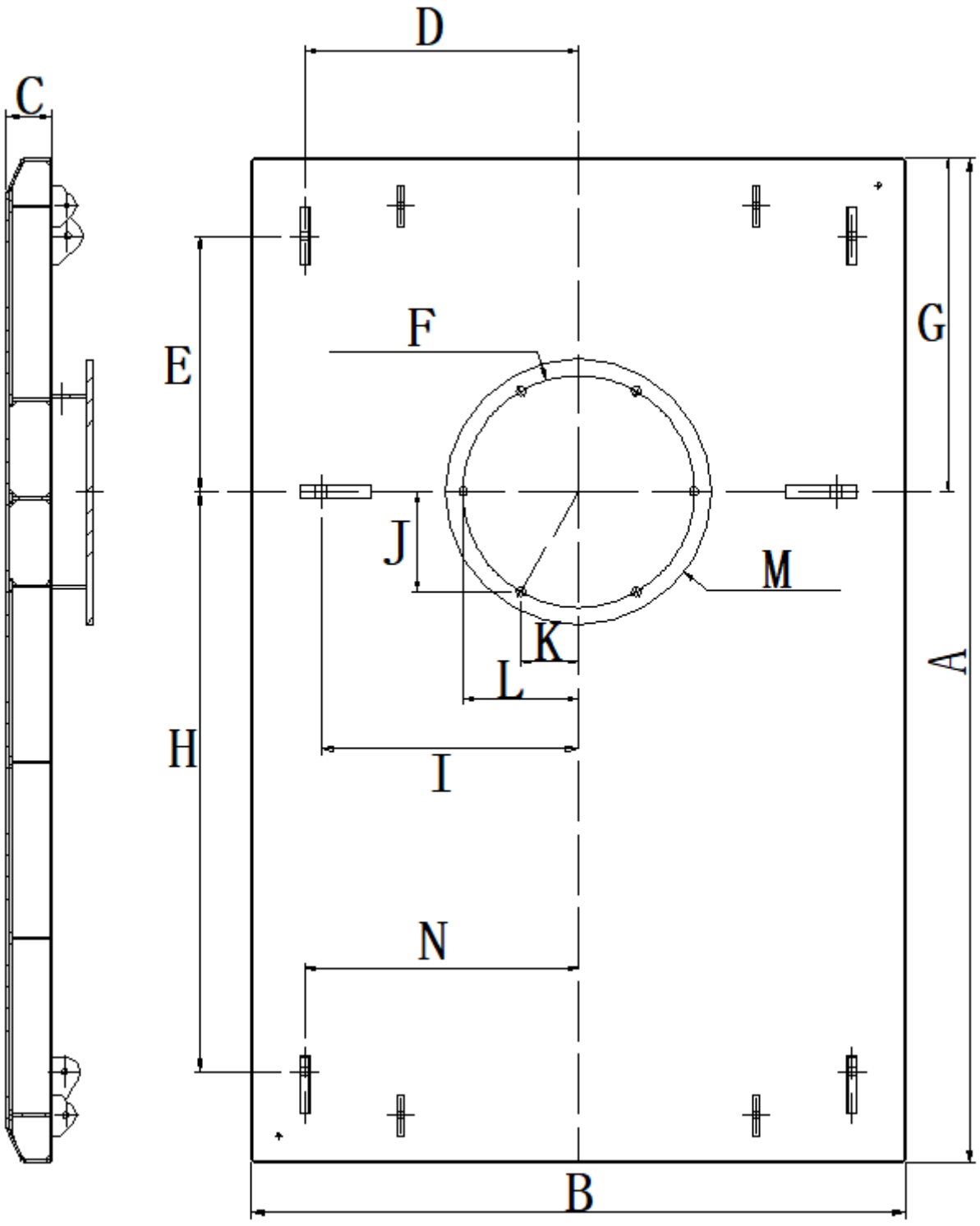
TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-2M06 Unit: mm

SHEAR CHAIN PAD EYE																	
No.	**Size**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**T**	**OD 1**	**OD 2**
		348	210	69	348	69	210	149	50	297	160	65	310	125	30	40	42
	Tolerance	±4	±1	±3	±4	±3	±1	±4	±3	±1	±3	±3	±3	±3	±1	±1	±1
1		347	210	69	348	70	209	148	50.3	297	159	66	311	124	30.3	40.4	42.4
2		347	209	69	347	68	210	149	50.4	298	160	66	310	124	30.2	40.3	42.2
3		347	210	70	347	70	210	150	50.3	296	159	64	310	125	30.4	40.5	42.2
4		349	210	69	348	68	209	148	50.2	297	161	65	311	125	30.4	40.5	42.5
5		349	210	70	348	68	209	149	50.3	298	161	66	309	124	30.3	40.4	42.3
6		348	209	69	348	68	210	150	50.2	298	161	64	310	124	30.2	40.3	42.2
7		347	209	70	348	69	210	150	50.3	298	159	65	309	125	30.2	40.5	42.2
8		349	210	70	349	68	210	150	50.2	296	161	65	311	126	30.3	40.5	42.2
9		348	209	69	349	69	209	149	50.4	298	160	65	311	126	30.1	40.4	42.3
10		348	209	69	347	69	209	149	50.1	297	159	66	310	126	30.3	40.5	42.2
11		347	210	70	348	70	209	149	50.2	297	159	65	311	125	30.3	40.3	42.2
12		349	210	69	348	70	210	150	50.3	298	161	65	309	126	30.4	40.5	42.2
13		349	210	68	349	70	210	148	50.4	298	160	65	310	124	30.4	40.2	42.2
14		349	209	68	348	69	209	148	50.3	296	160	66	309	125	30.2	40.4	42.2
15		349	210	70	347	70	209	148	50.1	298	159	64	311	124	30.2	40.3	42.5
16		347	210	70	349	69	210	148	50.2	297	161	66	311	125	30.1	40.2	42.4
17		347	210	70	348	70	210	148	50.1	298	159	66	311	126	30.3	40.5	42.4
18		347	209	70	348	68	209	148	50.2	296	160	65	309	124	30.4	40.2	42.5
19		349	209	69	348	70	210	149	50.4	296	159	64	310	126	30.2	40.5	42.4
20		349	210	68	347	69	209	150	50.1	297	160	66	311	125	30.2	40.3	42.5

HDG thickness check							
ASTM A153	Minimum 100 microns	Actual value（um）	111	104	110	107	111

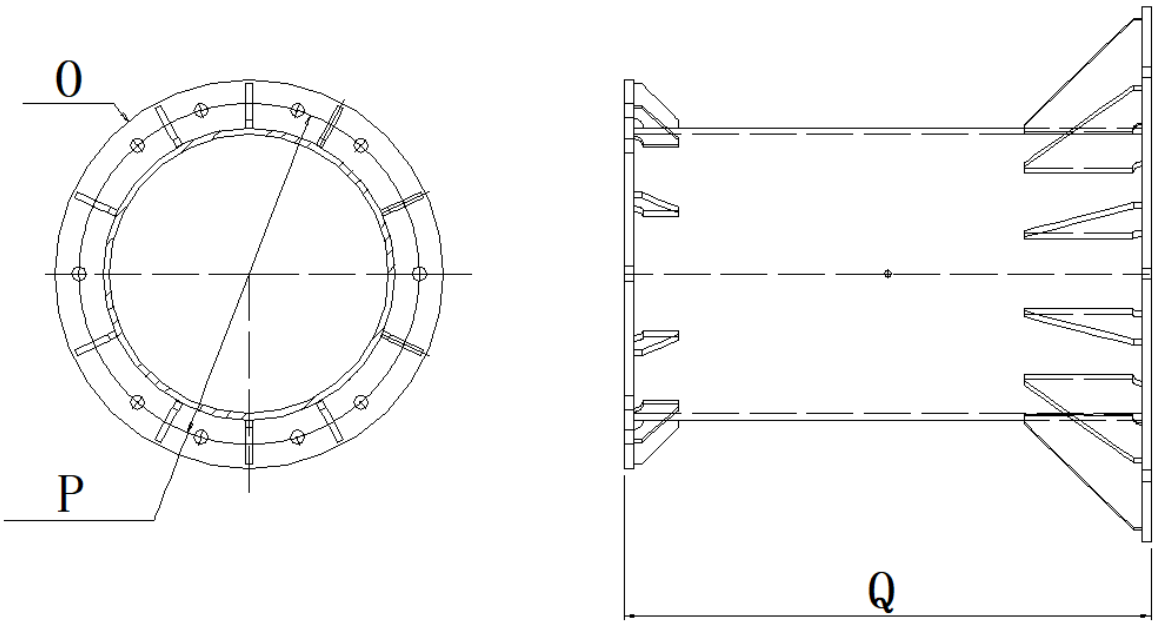

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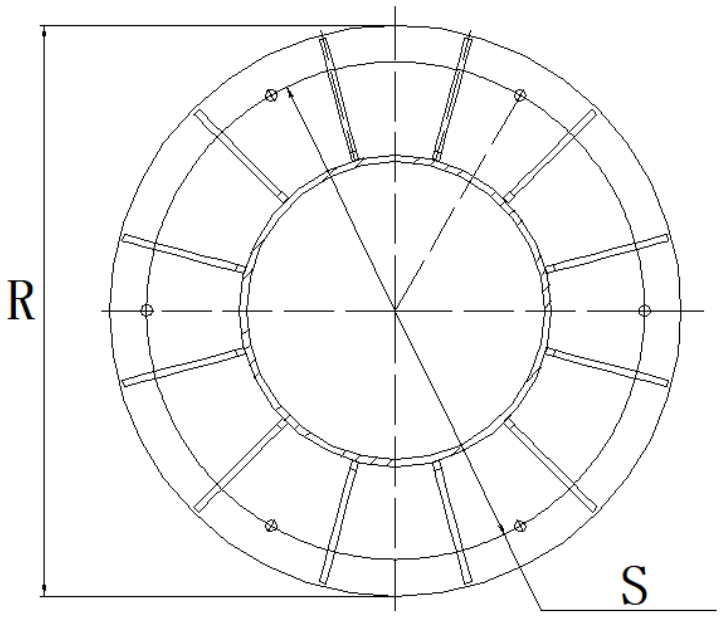
Project No. 25135 Drawing No. 25135-5M Unit: mm

Panel No.	Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N
		3708	2413	170	1009	700	855	987	2384	950	370	214	428	980	1009
	Tolerance	±11	±11	±4	±1	±1	±2	±6	±1	±1	±1	±1	±1	±6	±1
F1		3709	2414	172	1009	699	855	988	2384	951	371	213	427	982	1009
F2		3711	2413	171	1009	701	856	989	2383	950	370	213	427	981	1009
F3		3708	2415	171	1009	700	856	987	2384	950	371	214	428	980	1010
F4		3710	2415	171	1009	699	855	988	2385	950	370	214	427	982	1009
F5		3708	2413	172	1008	699	855	988	2384	951	371	215	428	981	1009
F6		3711	2413	172	1010	701	857	989	2383	951	370	215	429	980	1009
F7		3709	2415	171	1008	700	857	988	2384	950	370	213	428	982	1010

Project No. 25135 Drawing No. 25135-5M07 Unit: mm

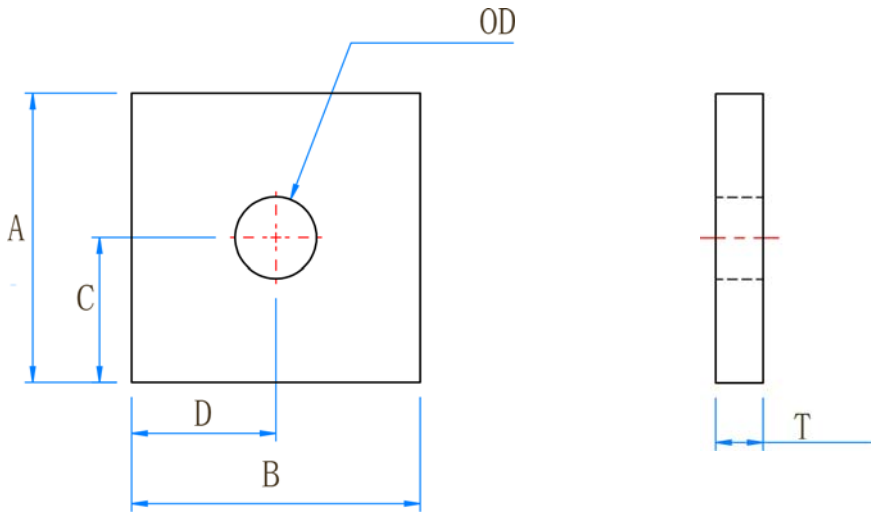
Panel No.	Size	O	P	Q	R	S
		1219	1067	1501	1676	1460
	Tolerance	±9	±2	±9	±9	±2
1		1220	1068	1504	1680	1461
2		1219	1067	1502	1679	1460
3		1220	1067	1501	1680	1461
4		1219	1067	1502	1680	1460
5		1220	1068	1501	1675	1461
6		1220	1066	1503	1678	1462





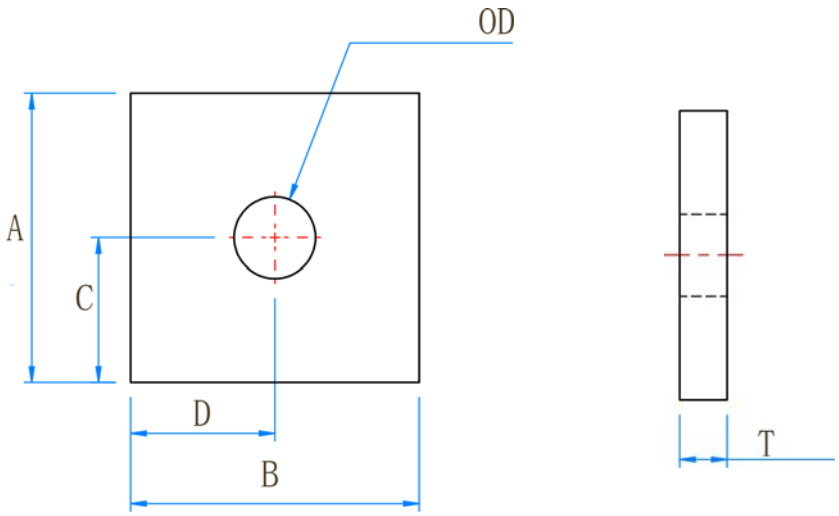
Project No. 25135 Drawing No. 25135-5M06 & 6M06 Unit: mm

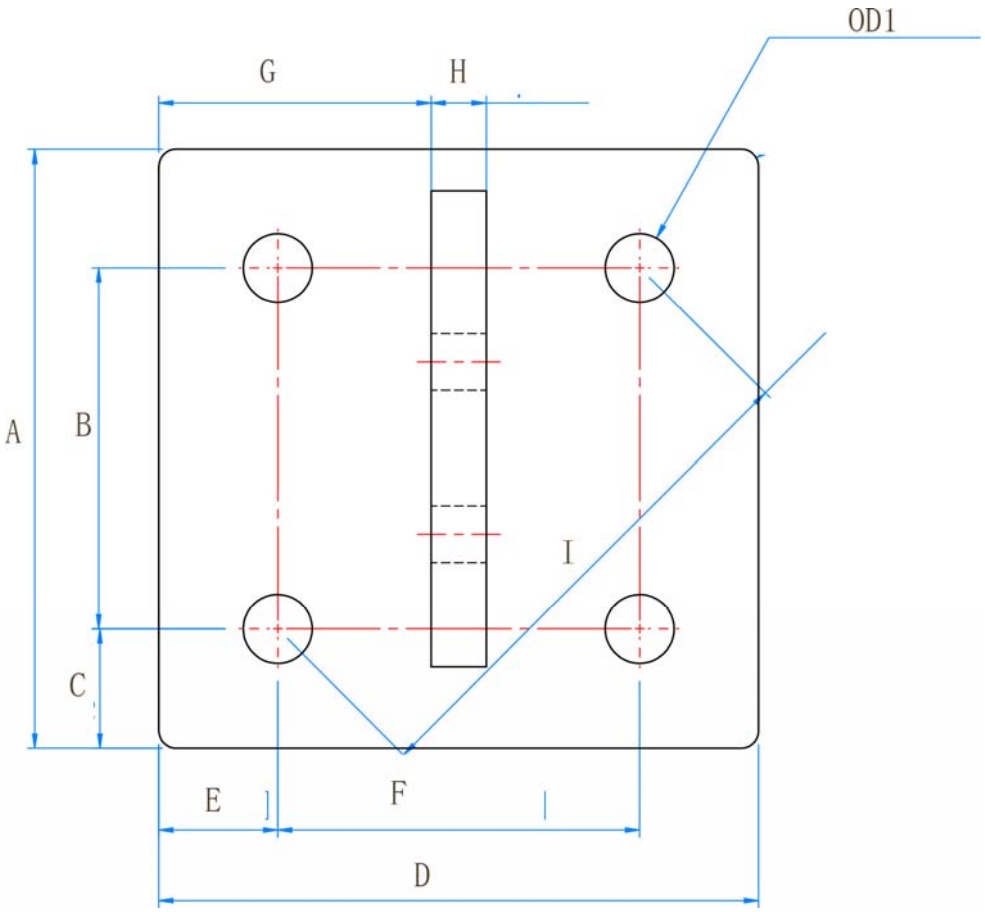
Bearing plate for fender spools quantity：24pcs dimension check 10%							
No.	**Size**	**A**	**B**	**C**	**D**	**T**	**OD**
		152	152	76	76	25	43
	Tolerance	±4	±4	±3	±3	±1	±1
1		151	152	76	76	25.3	43.4
2		151	152	75	76	25.2	43.4
3		152	153	76	76	25.3	43.5

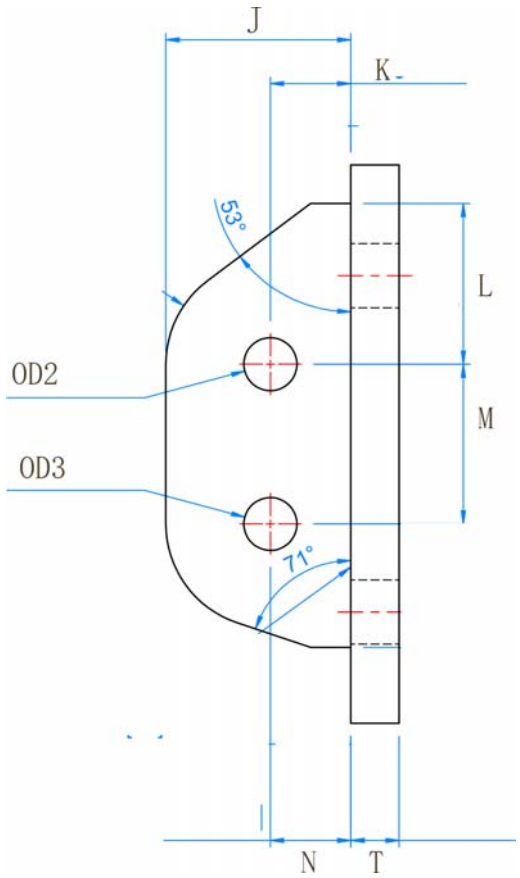


Project No. 25135 Drawing No. 25135-5M06 & 6M06 Unit: mm

Bearing plate for chain padeyes quantity：176pcs dimension check 10%							
No.	**Size**	**A**	**B**	**C**	**D**	**T**	**OD**
		152	152	76	76	25	40
	Tolerance	±4	±4	±3	±3	±1	±1
1		153	152	77	77	25.3	40.6
2		151	152	76	75	25.4	40.6
3		153	153	77	75	25.6	40.4
4		153	152	77	75	25.3	40.5
5		151	152	75	75	25.3	40.3
6		151	152	77	77	25.6	40.5
7		153	153	75	76	25.6	40.4
8		153	151	75	76	25.6	40.4
9		153	153	76	77	25.4	40.6
10		151	153	76	75	25.6	40.6
11		151	153	75	77	25.3	40.4
12		151	153	75	76	25.5	40.3
13		152	151	75	76	25.3	40.5
14		151	153	76	75	25.4	40.3
15		152	151	76	77	25.6	40.3
16		151	152	77	75	25.4	40.4
17		153	153	76	76	25.4	40.4
18		151	151	76	77	25.5	40.5




OD1
G
H
A
B
C
I
E
F
D


J
K
53°
L
OD2
M
OD3
71°
N
T

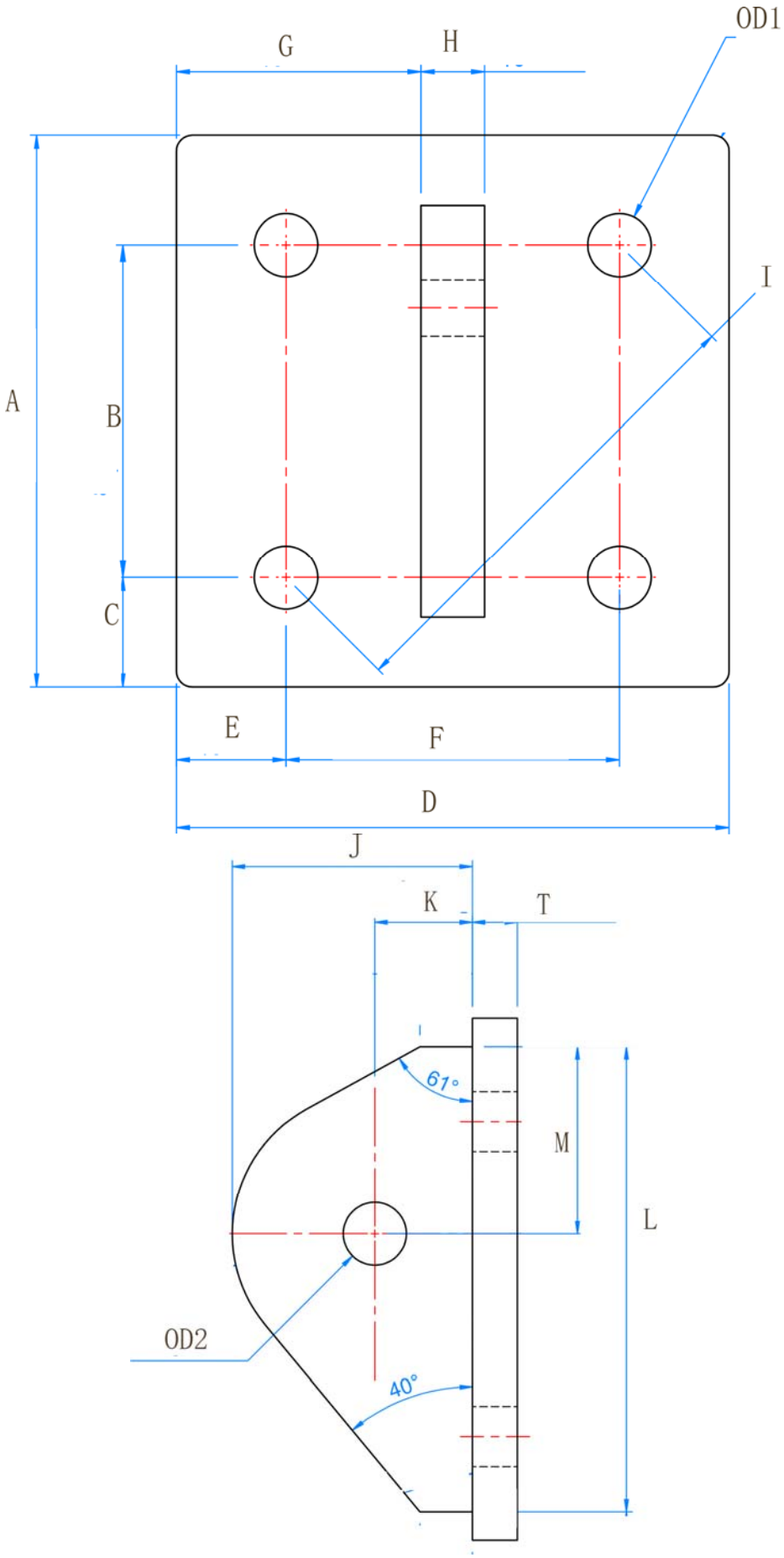
TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-5M06&6M06 Unit: mm

TENSION CHAIN & WEIGHT CHAIN PAD EYE																			
No.	**Size**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**T**	**OD 1**	**OD 2**	**OD 3**
		348	210	69	348	69	210	158	32	297	115	50	100	100	50	30	40	33	33
	Tolerance	±4	±1	±3	±4	±3	±1	±4	±3	±1	±3	±3	±3	±3	±3	±1	±1	±1	±1
1		347	210	69	347	70	210	159	32.4	297	116	51	100	101	49	30.2	40.2	33.4	33.2
2		347	210	70	348	70	210	157	32.3	297	116	50	101	101	50	30.1	40.5	33.2	33.6
3		348	210	68	349	69	209	159	32.2	298	116	49	99	100	51	30.2	40.2	33.2	33.3
4		348	209	68	347	69	209	157	32.3	296	116	51	100	101	51	30.1	40.5	33.2	33.6
5		347	210	70	349	69	210	157	32.4	298	116	51	100	101	51	30.2	40.5	33.3	33.5
6		348	209	68	348	69	209	158	32.1	298	114	51	101	100	50	30.3	40.5	33.2	33.5
7		347	209	68	348	70	209	159	32.1	297	116	49	99	99	50	30.3	40.2	33.5	33.6
8		347	209	69	349	70	210	159	32.1	297	115	51	101	99	50	30.4	40.3	33.5	33.4
9		349	209	68	347	70	210	157	32.1	297	115	51	100	101	50	30.2	40.5	33.2	33.2
10		347	210	70	348	68	209	158	32.1	297	114	49	101	101	49	30.4	40.3	33.3	33.3
11		349	210	70	348	68	209	157	32.1	297	115	50	101	101	50	30.4	40.3	33.5	33.2
12		349	210	68	349	70	209	157	32.1	296	115	51	100	99	50	30.3	40.3	33.3	33.2
13		349	210	70	348	68	210	157	32.4	297	116	49	100	101	49	30.1	40.2	33.3	33.2
14		347	209	68	347	70	209	159	32.1	296	114	49	101	99	51	30.1	40.4	33.5	33.2
15		348	210	68	348	68	209	159	32.1	296	114	50	99	99	50	30.3	40.2	33.4	33.4
16		349	209	69	348	69	210	157	32.2	296	114	49	100	101	51	30.1	40.2	33.5	33.3
17		348	209	68	347	68	209	157	32.2	297	116	51	101	101	51	30.1	40.2	33.5	33.6
18		349	209	70	348	68	209	158	32.3	296	115	49	101	101	51	30.1	40.4	33.4	33.6
19		347	210	68	348	69	210	157	32.4	298	114	51	101	99	51	30.3	40.2	33.2	33.4
20		349	210	70	348	68	210	158	32.1	298	115	50	99	100	51	30.2	40.2	33.4	33.5
21		347	209	69	348	69	210	157	32.4	298	114	50	101	99	50	30.4	40.5	33.3	33.2
22		349	210	69	347	70	209	159	32.1	296	114	51	101	99	51	30.3	40.3	33.4	33.6

HDG thickness check								
ASTM A153	Minimum 100 microns	Actual value（um）	120	105	101	114	106


OD1
G
H
I
A
B
C
E
F
D
J
K
T
61°
M
L
OD2
40°

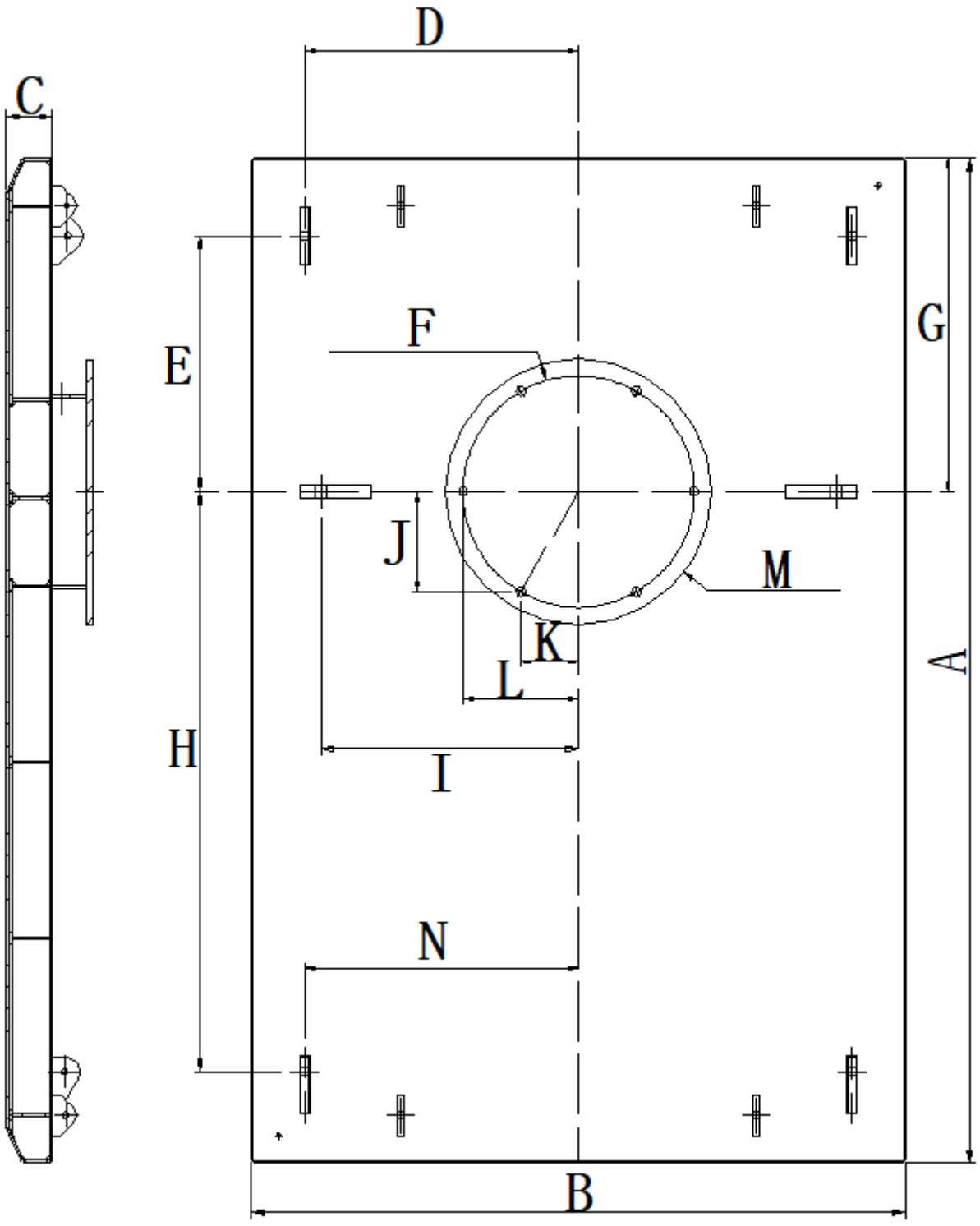
TRELLEBORG

DIMENSIONAL INSPECTION REPORT

Project No. 25135 Drawing No. 25135-5M06 &6M06 Unit: mm

SHEAR CHAIN PAD EYE																	
No.	**Size**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**T**	**OD 1**	**OD 2**
		348	210	69	348	69	210	149	50	297	160	65	310	125	30	40	42
	Tolerance	±4	±1	±3	±4	±3	±1	±4	±3	±1	±3	±3	±3	±3	±1	±1	±1
1		349	210	69	348	69	210	149	50.1	297	159	65	310	124	30.1	40.4	42.2
2		348	210	70	349	69	209	150	50.1	298	159	66	311	124	30.3	40.4	42.2
3		347	209	69	349	70	210	150	50.2	297	161	65	309	124	30.4	40.1	42.3
4		348	210	68	347	68	209	150	50.3	296	159	65	310	126	30.2	40.4	42.4
5		347	210	68	348	68	209	148	50.2	298	159	65	309	125	30.3	40.2	42.2
6		349	210	68	348	69	210	148	50.4	297	161	64	309	126	30.2	40.2	42.2
7		349	210	70	347	68	210	149	50.4	296	160	66	311	125	30.3	40.1	42.3
8		349	210	68	349	68	210	149	50.3	297	161	66	311	124	30.1	40.2	42.4
9		347	209	68	349	70	210	149	50.1	296	161	64	310	124	30.4	40.4	42.3
10		347	209	69	348	69	209	150	50.1	296	160	65	309	126	30.3	40.2	42.4
11		348	210	70	349	69	210	150	50.1	298	159	64	309	126	30.2	40.2	42.3
12		348	210	68	349	69	210	150	50.4	296	160	64	310	126	30.3	40.4	42.5
13		347	209	69	348	70	210	149	50.2	297	159	64	310	125	30.4	40.4	42.2
14		347	210	69	347	68	210	148	50.1	296	159	64	310	124	30.3	40.3	42.2
15		348	210	68	347	68	209	149	50.3	298	160	66	309	124	30.3	40.4	42.4
16		349	209	70	348	70	209	148	50.1	296	159	64	310	125	30.3	40.1	42.5
17		347	209	68	348	70	209	148	50.1	296	160	64	309	126	30.4	40.2	42.2
18		349	210	69	348	68	209	150	50.4	298	160	64	310	126	30.3	40.3	42.5
19		348	210	68	347	69	210	148	50.4	296	159	65	310	125	30.3	40.3	42.4
20		348	209	68	349	69	210	150	50.1	296	159	64	310	125	30.4	40.4	42.4
21		348	209	68	349	68	210	148	50.4	297	160	66	310	124	30.2	40.3	42.5
22		348	209	69	348	68	209	149	50.1	297	160	64	311	126	30.1	40.4	42.2

HDG thickness check								
ASTM A153	Minimum 100 microns	Actual value（um）	108	114	117	108	105

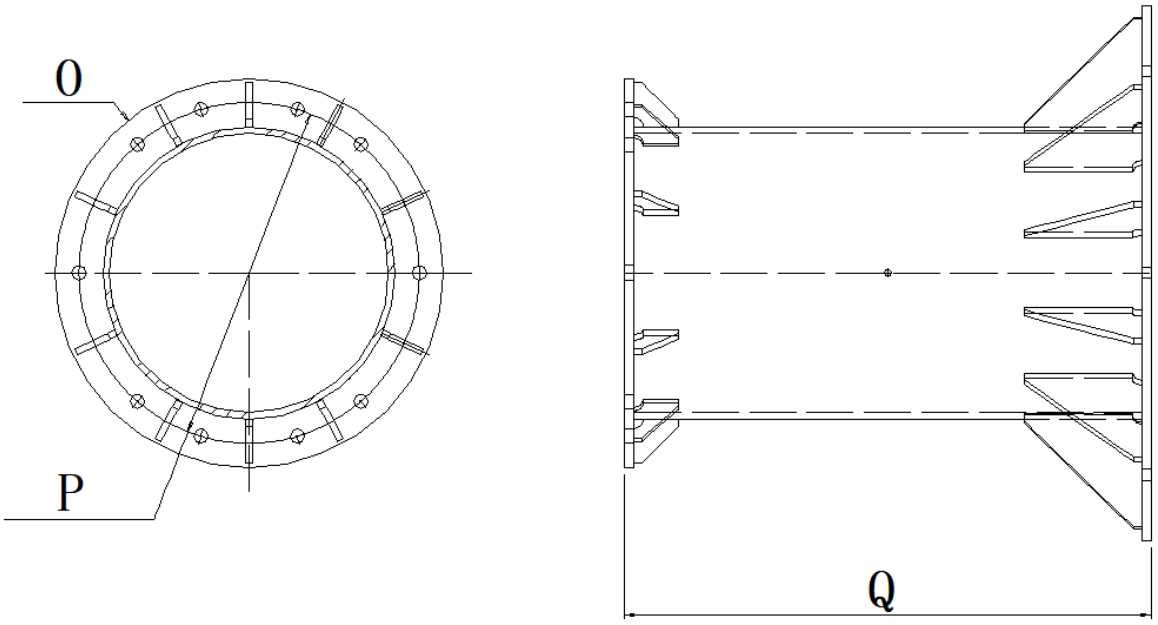

D
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I
N
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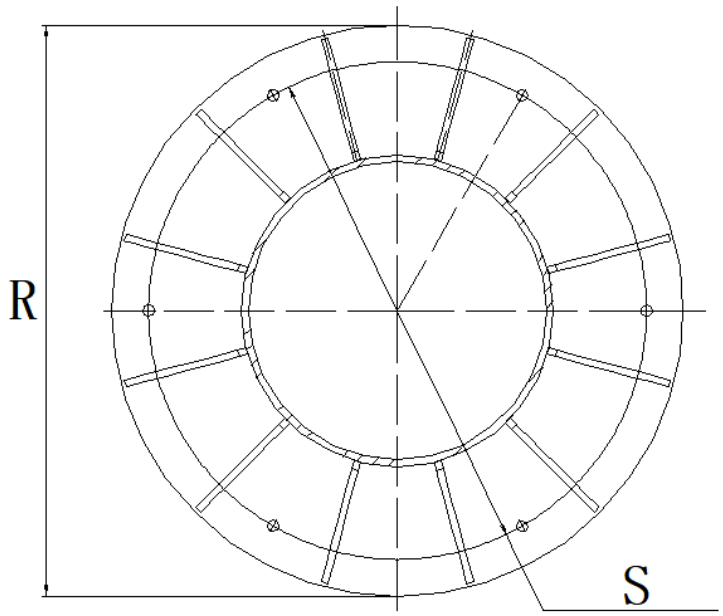
Project No. 25135 Drawing No. 25135-6M Unit: mm

Panel No.	Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N
		3708	2413	170	1009	700	855	987	2384	950	370	214	428	980	1009
	Tolerance	±11	±11	±4	±1	±1	±2	±6	±1	±1	±1	±1	±1	±6	±1
F1		3709	2415	172	1009	699	856	988	2384	950	369	214	427	981	1009
F2		3710	2415	171	1009	699	856	988	2383	950	371	215	428	981	1008
F3		3710	2414	171	1008	700	857	987	2383	949	369	214	429	982	1010
F4		3708	2415	172	1010	700	856	988	2384	950	371	213	427	981	1009
F5		3709	2413	172	1009	700	856	989	2383	949	371	214	429	982	1009

Project No. 25135 Drawing No. 25135-6M07 Unit: mm

Panel No.	Size	O	P	Q	R	S
		1219	1067	1653	1676	1460
	Tolerance	±9	±2	±9	±9	±2
1		1220	1066	1654	1678	1460
2		1219	1068	1654	1677	1461
3		1219	1067	1653	1677	1460
4		1220	1066	1654	1676	1460
5		1221	1067	1655	1678	1460





Inspector: **Checked By:**

Date: Sep. 16th.2022 **Date:**

SECTION 3. Fender Panels and Spools

3-C:

Welding Record

TRELLEBORG

WPS LIST

No.	WPS Number	PQR No. of Supporting	Base Metal	Welding Method	Position	Welding Consumable	Joint	Range Qualified	Standard Cord
1	GMAW-B-2G/3G-δ25-CS-100	GMAW-B-PQR-100 Rev.1 GMAW-B-PQR-101 Rev.1	Q345B	GMAW	1G/2G/3G	ER50-6 φ1.2	Buttjoint T-joint CornerjointLap joint	1G/2G:175.5-204A 3G:148-180A	AWS D1.1
2	FCAW-BTC-δ10-CS-100	FCAW-B-PQR-200 Rev.1 FCAW-B-PQR-300 Rev.1	Q355B/S316L	FCAW	1G/2G 1F/2F/3F4F	E309LT1-16		1G/2G:159-286A 1F/2F/3F/4F:148-280A	AWS D1.6

TRELLEBORG MARINE SYSTEMS

REVIEWED.....

TRELLEBORG

WELDERS LIST

No.	Welder name	ID No.	Welding Method	Position	WPS Number	Base Metal	Standard Cord	Qualification	Re-qualification
1	Sun jincheng	HFCW520	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
2	Wang yunhai	HFCW498	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
3	Song xianzhong	HFCW169	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
4	Tang wentao	HFCW458	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
5	Lv xiaofei	HFCW454	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
6	Dong jiacheng	HFCW543	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
7	Gao wenjie	HFCW590	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
8	Zhao xinhao	HFCW223	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
9	Wang longyou	HFCW324	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-100	Q355B	AWS D1.1	CNEC24	TRELLEBORG
10	Xianhai Sun	HFCW399	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
11	Benqing Yang	HFCW501	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
12	Jingzhou Xu	HFCW374	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
13	Jie Liu	HFCW382	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
14	Haifeng Mao	HFCW475	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
15	Yongbo Cheng	HFCW540	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
16	Xiaobo Liu	HFCW535	GMAW	F、H、V	GMAW-B-2G/3G-25-CS-101	Q355B	AWS D1.1	CNEC24	TRELLEBORG
17	Xianhai Sun	HFCW399	FCAW	F、H、V	FCAW-BTC-δ10-CS-100	Q355B/S316L	AWS D1.6	CNEC24	TRELLEBORG
18	Jingzhou Xu	HFCW374	FCAW	F、H、V	FCAW-BTC-δ10-CS-100	Q355B/S316L	AWS D1.6	CNEC24	TRELLEBORG
19	Haifeng Mao	HFCW475	FCAW	F、H、V	FCAW-BTC-δ10-CS-100	Q355B/S316L	AWS D1.6	CNEC24	TRELLEBORG
20	Yongbo Cheng	HFCW540	FCAW	F、H、V	FCAW-BTC-δ10-CS-100	Q355B/S316L	AWS D1.6	CNEC24	TRELLEBORG

TRELLEBORG MARINE SYSTEMS
REVIEWED Zhou

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TRELLEBORG MARINE SYSTEMS Quality Department

中核二四核电安装公司
受控文件
2020 年09月11日

焊接工艺规程（WPS）

免除评定 PREQUALIFIED □　　试验评定 QUALIFIED BY TESTING ■　　规范/CODE：AWS D1.1-2000

中国核工业二四建设有限公司核电安装公司 China Nuclear Industry 24 Construction Corporation Ltd. Nuclear Power Project Department	编号No：GMAW-B-2G/3G-δ25-CS-100　版本 Rev.1 编制人 Prepared by: 杨奇　日期 Date: 2020.09.10 审核人 Reviewed by: 黄金鑫　日期 Date: 2020.09.10 批准人 Approved by: 张洋　日期 Date: 2020.09.10
焊接方法 Welding Process(es)：GMAW PQR 编号（PQR NO）：GMAW-B-PQR-100 Rev.1 GMAW-B-PQR-101 Rev.1	类型 Type：手工 Manual □　半自动 Semi-Auto ■ 机械 Machine □　自动 Automatic □
采用的接头设计JOINT DESIGN USED 类型Type：Butt joint/T-joint/Corner Joint/Lap joint 单面焊 Single ■　双面焊缝 Double Weld ■ 衬垫 Backing：YES ■　NO ■ 衬垫材料Backing Material：Q235B/Q345B 根部间隙 Root Opening：见附图 See The Attached Figure 钝边尺寸 Root Face Dimension：见附图 See The Attached Figure 坡口角度 Groove Angle：40°-50° 半径 Radius (J–U)：N/A 背部清根 Back Gouging　YES ■　NO ■ 方法 Method：打磨 Grinding	位置POSITION 坡口位置 Position of Groove F、H、V 角焊缝 Fillet F、H、V 立焊位置 Vertical Progression：Up 上行■　Down 下行□ 电特性ELECTRICAL CHARACTERISTICS 过渡形式（GMAW）：喷射 spray□　熔滴 Globular□ 短路 short-Circuiting ■ 电流Current：交流 AC □　脉冲 pulsed □ 直流反接 DCEP■　直流正接 DCEN □ 其它 Other N/A 钨极Tungsten Electrode（GTAW）N/A 尺寸Size：N/A　类型Type：N/A
母材 BASE METALS 母材牌号 material Spec：Q345B to Q345B、Q235B to Q235B、Q345B to Q235B 规格 Specification：①CJP:平焊、横焊、立焊 F、H、V δ≥3mm ②PJP、Fillet：δ≥3mm	焊接技术TECHNIQUE 直线或横向摆动焊道:Stringer or Weave Bead：直线或横向摆动焊道 Stringer or Weave Bead 多道或单道（每边）Multi-pass or Single Pass (per side):: 多道 Multi-pass 焊丝数Number of Electrodes：单丝 single 焊丝间隔Electrode Spacing：N/A 导电嘴到工件的距离：15-25mm Contact Tube to Work Distance 捶击Peening：无 none 道间清理Interpass Cleaning：刷或打磨 Brushing or Grinding
填充金属 FILLER METALS AWS spec：AWS A5.18 焊条/焊丝牌号 AWS 等级：MQ70S-6 Filler metal/electrode tag No：MQ70S-6 AWS classification：MQ70S-6	
保护SHIELDING	

焊剂 flux N/A 气体Gas: CO_2 组分Composition: 99.9% 流速 flow Rate 15-20L/min 气体喷嘴尺寸Gas Cup Size: φ20mm 焊丝焊剂等级 Electrode-Flux （CLASS）: N/A	焊后热处理 POSTWELD HEAT TREATMENT 温度Temp.: N/A 时间Time: N/A

预热PREHEAT

①母材厚度the bsae metal thickness 3≤ δ ≤38mm，最低Min 20℃，最高 260℃。

Metal shall be preheated to minimum of 70°F [20℃]。

②母材厚度the bsae metal thickness 38≤ δ ≤65mm，最低Min 65℃，最高 260℃。

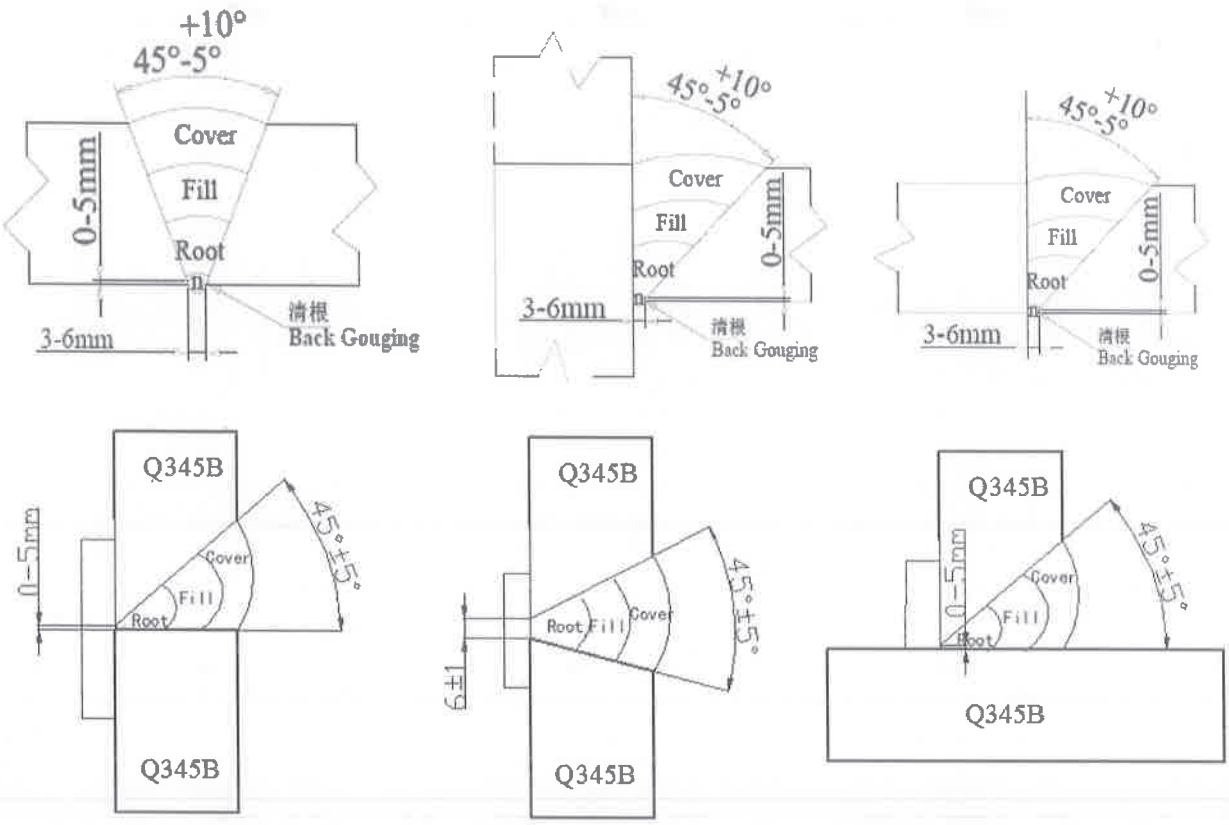
③母材厚度the bsae metal thickness δ >65mm，最低Min 110℃，最高 260℃。

层间温度 Interpass Temp.

最低The Min 层间温度不低于预热温度 最高Max 260℃

焊接工艺 WELDING PROCEDURE

焊道或焊层 Pass or Weld Layer(s)	方法 Process	填充金属 Filler Metals		电流Current					
		类别 Class	直径 Dia.	类型或极性 Type & Polarity	安培 Amps	电压 Volts (V)	焊接速度 Travel Speed （cm/min）	焊接位置	接头详图 Joint Details
Root	GMAW	MQ70S-6	Ø1.2	DCEP	157.5-204.6A	10.8-33	10.8-30.8	1G/2G	见附图 See The Attached Figure
Fill	GMAW	MQ70S-6	Ø1.2	DCEP	159-286A	16.2-34	10.8-33		
Cover	GMAW	MQ70S-6	Ø1.2	DCEP	198-256A	10.8-33	16.2-30.8		
Root	GMAW	MQ70S-6	Ø1.2	DCEP	148.5-187	16.2-33	10.8-33	3G	见附图 See The Attached Figure
Fill	GMAW	MQ70S-6	Ø1.2	DCEP	157.5-280.5	16.2-35.2	10.8-35.2		
Cover	GMAW	MQ70S-6	Ø1.2	DCEP	189-242	16.2-35.2	10.8-35.2		

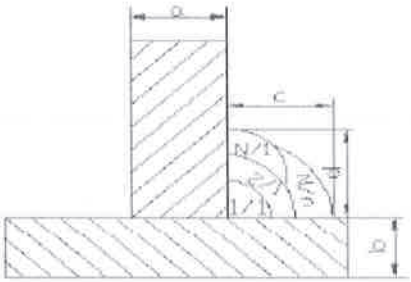


用于全熔透焊缝 Use to CJP Weld



用于部分熔透坡口焊缝，a 和 b 数值根据施工图纸确定

Use to PJP weld，the numerical value of a and b could be confirmed by drawing



a or b（mm）	c or d（mm）
a or b≤6	c or d≥3
6<a or b≤12	c or d≥5
12<a or b≤20	c or d≥6
20<a or b	c or d≥8

N、n、a、b、c 和 d 数值根据施工图纸确定。C 和 d 值应为图纸设计高度+根部间隙值

The numerical value of N、n、a、b、c and d could be confirmed by drawing。 The value of c、d should be the design height of drawing plus the root opening。

工艺评定记录（PQR）

规范/CODE：AWS D1.1-2000

中核集团

中国核工业二四建设有限公司核电安装公司

China Nuclear Industry 24 Construction Corporation Ltd.

Nuclear Power Project Department

编号No：GMAW-B-PQR-100　　版本 Rev.1

编制人 Prepared by: 杨哥　　日期 Date: 2020.09.10

审核人 Reviewed by: 苟金鑫　　日期 Date: 2020.09.10

批准人 Approved by: 张洋　　日期 Date: 2020.09.10

焊接方法 Welding Process(es)：GMAW

类型 Type：手工 Manual ☐　半自动 Semi-Auto ■

机械 Machine ☐　自动 Automatic ☐

采用的接头设计JOINT DESIGN USED

类型Type：对接接头 Butt joint

单面焊 Single ☐　双面焊缝 Double Weld ■

衬垫 Backing：YES ☐　NO ■

衬垫材料Backing Material: N/A

根部间隙 Root Opening: 2mm

钝边尺寸 Root Face Dimension: 0

坡口角度 Groove Angle: 45°

半径 Radius (J-U): N/A

背部清根 Back Gouging　YES ■　NO ☐

方法 Method: 打磨 Grinding

位置POSITION

坡口位置 Position of Groove 2G　角焊缝 Fillet N/A

立焊位置 Vertical Progression：Up 上行☐　Down 下行☐

电特性ELECTRICAL CHARACTERISTICS

过渡形式（GMAW）：喷射 spray☐　熔滴 Globular☐

短路 short-Circuiting ■

电流Current：交流 AC ☐　脉冲 pulsed ☐

直流反接 DCEP■　直流正接 DCEN ☐

其它 Other N/A

钨极Tungsten Electrode（GTAW）N/A

尺寸Size：N/A　类型Type：N/A

母材 BASE METALS

母材牌号 material Spec：Q345B/Q345B

规格 Specification：δ=25mm

焊接技术TECHNIQUE

直线或横向摆动焊道:Stringer or Weave Bead: 直线或横向摆动焊道 Stringer or Weave Bead

填充金属 FILLER METALS

AWS spec：AWS A5.18

焊条/焊丝牌号 AWS 等级：MQ70S-6

Filler metal/electrode tag No：MQ70S-6

AWS classification：MQ70S-6

多道或单道（每边）Multi-pass or Single Pass (per side):：

多道 Multi-pass

焊丝数Number of Electrodes：单丝 single

焊丝间隔Electrode Spacing：N/A

导电嘴到工件的距离：15-25mm

Contact Tube to Work Distance

保护SHIELDING

焊剂 flux N/A　气体Gas：CO_2

组分Composition：99.9%　流速 flow Rate 15-20L/min

气体喷嘴尺寸Gas Cup Size：Φ20mm

焊丝焊剂等级 Electrode-Flux （CLASS）：N/A

捶击Peening：无 none

道间清理Interpass Cleaning：刷或打磨 Brushing or Grinding

焊后热处理

POSTWELD HEAT TREATMENT

温度Temp.：N/A　时间Time：N/A

预热PREHEAT

预热温度 Preheat Temp：20℃

层间温度 Interpass Temp. 最低Min 20℃ 最高Max 260℃

焊接工艺 WELDING PROCEDURE

焊道或焊层 Pass or Weld Layer(s)	方法 Process	填充金属 Filler Metals		电流Current				
		类别 Class	直径 Dia.	类型或极性 Type & Polarity	安培 Amps	电压 Volts (V)	焊接速度 Travel Speed (cm/min)	接头详图 Joint Details
Root	GMAW	MQ70S-6	Ø1.2	DCEP	175-186A	18-30	12-28	
Fill	GMAW	MQ70S-6	Ø1.2	DCEP	177-260A	18-31	12-30	
Cover	GMAW	MQ70S-6	Ø1.2	DCEP	220-233A	18-30	18-28	

工艺评定记录（PQR）

试验结果 Test Results

无损检测 NDE			
检验项目 Inspection methods	报告编号 report No.		评定结果 Result
目视检测 VT	2020-HJPWT-AZGY-VT-0001		合格 acceptable
超声波检测 UT	2020-HJPWT-AZGY-UT-0001		合格 acceptable
弯曲试验 BEND TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
侧弯 side bend	2020-GY001-CW-03	HB2020C00319	合格 acceptable
	2020-GY001-CW-04		合格 acceptable
	2020-GY001-CW-05		合格 acceptable
	2020-GY001-CW-06		合格 acceptable
拉伸试验 TENSION TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
抗拉强度 tensile strength	2020-GY001-LS-01	HB2020C00319	合格 acceptable
	2020-GY001-LS-02		
宏观浸蚀/MACROETCH TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
N/A	N/A	N/A	N/A

其他检验 Other inspections

检验方法（标准、结果）N/A

Inspection methods(Standards, results)

焊缝熔敷金属化学成分分析（结果）Deposited metal composition（result） N/A

其它 others N/A

焊工姓名/Welder'S Name 弥岗涛 焊工代号/Stamp#： HS504

我们在此证明此记录的内容是正确的，焊缝的准备，焊缝和试验符合 AWS D1.1-2000 的要求。签字：

We certify that the statements here are correct and that the welds prepared, welding and testing is in accordance with the requirement of AWS D1.1-2000 .Signed：

工艺评定记录（PQR）

规范/CODE：AWS D1.1-2000

中核集团

中国核工业二四建设有限公司核电安装公司

China Nuclear Industry 24 Construction Corporation Ltd.

Nuclear Power Project Department

编号No：GMAW-B-PQR-101　　版本 Rev.1

编制人 Prepared by:　　日期 Date: 2020.09.10

审核人 Reviewed by:　　日期 Date: 2020.09.10

批准人 Approved by:　　日期 Date: 2020.09.11

焊接方法 Welding Process(es)：GMAW

类型 Type：手工 Manual ☐　半自动 Semi-Auto ■

机械 Machine ☐　自动 Automatic ☐

采用的接头设计JOINT DESIGN USED

类型Type：对接接头 Butt joint

单面焊 Single ☐　双面焊缝 Double Weld ■

衬垫 Backing：YES ☐　NO ■

衬垫材料Backing Material: N/A

根部间隙 Root Opening: 2mm

钝边尺寸 Root Face Dimension: 0

坡口角度 Groove Angle: 45°

半径 Radius (J-U): N/A

背部清根 Back Gouging　YES ■　NO ☐

方法 Method: 打磨 Grinding

位置POSITION

坡口位置 Position of Groove 3G　角焊缝 Fillet N/A

立焊位置 Vertical Progression：Up 上行■　Down 下行☐

电特性ELECTRICAL CHARACTERISTICS

过渡形式（GMAW）：喷射 spray☐　熔滴 Globular☐

短路 short-Circuiting■

电流Current：交流 AC ☐　脉冲 pulsed ☐

直流反接 DCEP■　直流正接 DCEN ☐

其它 Other N/A

钨极Tungsten Electrode（GTAW）N/A

尺寸Size：N/A　类型Type：N/A

母材 BASE METALS

母材牌号 material Spec：Q345B/Q345B

规格 Specification：δ=25mm

填充金属 FILLER METALS

AWS spec：AWS A5.18

焊条/焊丝牌号 AWS 等级：MQ70S-6

Filler metal/electrode tag No：MQ70S-6

AWS classification：MQ70S-6

保护SHIELDING

焊剂 flux N/A　气体Gas：CO_2

组分Composition：99.9%　流速 flow Rate 15-20L/min

气体喷嘴尺寸Gas Cup Size：φ20mm

焊丝焊剂等级 Electrode-Flux （CLASS）：N/A

焊接技术TECHNIQUE

直线或横向摆动焊道:Stringer or Weave Bead：直线或横向摆动焊道 Stringer or Weave Bead

多道或单道（每边）Multi-pass or Single Pass (per side)::

多道 Multi-pass

焊丝数Number of Electrodes：单丝 single

焊丝间隔Electrode Spacing：N/A

导电嘴到工件的距离：15-25mm

Contact Tube to Work Distance

捶击Peening：无 none

道间清理Interpass Cleaning：刷或打磨 Brushing or Grinding

焊后热处理

POSTWELD HEAT TREATMENT

温度Temp.：N/A　时间Time：N/A

预热PREHEAT

预热温度 Preheat Temp：20℃

层间温度 Interpass Temp. 最低Min 20℃ 最高Max 260℃

焊接工艺 WELDING PROCEDURE

焊道或焊层 Pass or Weld Layer(s)	方法 Process	填充金属 Filler Metals		电流Current				
		类别 Class	直径 Dia.	类型或极性 Type & Polarity	安培 Amps	电压 Volts (V)	焊接速度 Travel Speed (cm/min)	接头详图 Joint Details
Root	GMAW	MQ70S-6	Ø1.2	DCEP	165-170A	18-30	12-30	
Fill	GMAW	MQ70S-6	Ø1.2	DCEP	175-255A	18-32	12-32	
Cover	GMAW	MQ70S-6	Ø1.2	DCEP	210-220A	18-32	12-32	

工艺评定记录（PQR）

试验结果 Test Results

无损检测 NDE		
检验项目 Inspection methods	报告编号 report No.	评定结果 Result
目视检测 VT	2020-HJPWT-AZGY-VT-0002	合格 acceptable
超声波检测 UT	2020-HJPWT-AZGY-UT-0002	合格 acceptable

弯曲试验 BEND TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
侧弯 side bend	2020-GY002-CW-03	HB2020C00320	合格 acceptable
	2020-GY002-CW-04		合格 acceptable
	2020-GY002-CW-05		合格 acceptable
	2020-GY002-CW-06		合格 acceptable

拉伸试验 TENSION TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
抗拉强度 tensile strength	2020-GY002-LS-01	HB2020C00320	合格 acceptable
	2020-GY002-LS-02		

宏观浸蚀/MACROETCH TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
N/A	N/A	N/A	N/A

其他检验 Other inspections

检验方法（标准、结果）__N/A__

Inspection methods(Standards, results)

焊缝熔敷金属化学成分分析（结果）Deposited metal composition（result） __N/A__

其它 others __N/A__

焊工姓名/Welder'S Name__弥岗涛__焊工代号/Stamp#：__HS504__

我们在此证明此记录的内容是正确的，焊缝的准备，焊缝和试验符合 __AWS D1.1-2000__ 的要求。签字：

We certify that the statements here are correct and that the welds prepared, welding and testing is in accordance with the requirement of __AWS D1.1-2000__.Signed：

中核二四核电安装公司
CNFC NUCLEAR POWER PROJECT
焊工资格卡
Welder Certification Card



焊工姓名/Welder Name：刘振军
焊工号/welder No.：HFCW596
项目编号 No：GMAW-B-GW-3G-δ25-CS-hb
考核日期/Test Date：2020.09.23
焊工资格评定报告编号/WQR No.：
[2020]HYG-GV10-WQR-001

焊工资格卡
Welder Certification Card

	考核内容 Examination content	等效范围/QUALIFIED LIMITS
母材 Base Metal：	Q345B	碳钢和低合金钢
规格 size：	25mm	CJP:3~∞，PJP：任意厚度
焊材 Electrode：	MQ70S-6	MQ70S-6
焊接位 Position：	3G	平焊、横焊、立焊、
QC1（签字/Signature）： 日期/Date 2020.09.23		QC2(签字/Signature) 日期/Date 2020.09.23

中核二四核电安装公司
CNFC NUCLEAR POWER PROJECT
焊工资格卡
Welder Certification Card



焊工姓名/Welder Name：孙进成
焊工号/welder No.：HFCW520
项目编号 No：GMAW-B-GW-3G-δ25-CS-hb
考核日期/Test Date：2020.09.23
焊工资格评定报告编号/WQR No.：
[2020]HYG-GV10-WQR-002

焊工资格卡
Welder Certification Card

	考核内容 Examination content	等效范围/QUALIFIED LIMITS
母材 Base Metal：	Q345B	碳钢和低合金钢
规格 size：	25mm	CJP:3~∞，PJP：任意厚度
焊材 Electrode：	MQ70S-6	MQ70S-6
焊接位 Position：	3G	平焊、横焊、立焊、
QC1（签字/Signature）： 日期/Date 2020.09.23		QC2(签字/Signature) 日期/Date 2020.09.23

中核二四核电安装公司
CNFC NUCLEAR POWER PROJECT
焊工资格卡
Welder Certification Card



焊工姓名/Welder Name：毛海丰
焊工号/welder No.：HFCW475
项目编号 No：GMAW-B-GW-3G-δ25-CS-hb
考核日期/Test Date：2021.04.05
焊工资格评定报告编号/WQR No.：
HB2021C00652

焊工资格卡
Welder Certification Card

	考核内容 Examination content	等效范围/QUALIFIED LIMITS
母材 Base Metal：	Q345B	碳钢和低合金钢
规格 size：	25mm	CJP:3~∞，PJP：角焊缝：任意厚度
焊材 Electrode：	ER70S-6	ER70S-6
焊接位 Position：	3G	平焊、横焊、立焊、
QC1（签字/Signature）： 日期/Date 2021.04.15		QC2(签字/Signature) 日期/Date 2021.04.15

中核二四核电安装公司
CNFC NUCLEAR POWER PROJECT
焊工资格卡
Welder Certification Card



焊工姓名/Welder Name：程永波
焊工号/welder No.：HFCW540
项目编号 No：GMAW-B-GW-3G-δ25-CS-hb
考核日期/Test Date：2021.04.05
焊工资格评定报告编号/WQR No.：
HB2021C00651

焊工资格卡
Welder Certification Card

	考核内容 Examination content	等效范围/QUALIFIED LIMITS
母材 Base Metal：	Q345B	碳钢和低合金钢
规格 size：	25mm	CJP:3~∞，PJP：角焊缝：任意厚度
焊材 Electrode：	ER70S-6	ER70S-6
焊接位 Position：	3G	平焊、横焊、立焊、
QC1（签字/Signature）： 日期/Date 2021.04.15		QC2(签字/Signature) 日期/Date 2021.04.15

中核二四核电安装公司
受控文件
2021 年 09 月 30 日

焊接工艺规程（WPS）

免除评定 PREQUALIFIED □　　试验评定 QUALIFIED BY TESTING ■　　规范/CODE：AWS D1.6-2017

中核集团 中国核工业二四建设有限公司核电安装公司 China Nuclear Industry 24 Construction Corporation Ltd. Nuclear Power Project Department	编号No：FCAW-BTC -δ10-CS-100　版本 Rev.1 编制人 Prepared by:　日期 Date:2021.09.17 审核人 Reviewed by:　日期 Date: 2021.09.17 批准人 Approved by:　日期 Date:2021.09.17
焊接方法 Welding Process(es)：FCAW PQR 编号 （PQR NO）：FCAW-B-PQR-200 Rev.1 FCAW-B-PQR-300 Rev.1	类型 Type：手工 Manual □　半自动 Semi-Auto ■ 机械 Machine □　自动 Automatic □
采用的接头设计JOINT DESIGN USED 类型Type：Butt joint/T-joint 单面焊 Single ■　双面焊缝 Double Weld ■ 衬垫 Backing：YES □　NO ■ 衬垫材料Backing Material：S316L/Q355B 根部间隙 Root Opening：见附图 See The Attached Figure 钝边尺寸 Root Face Dimension：见附图 See The Attached Figure 坡口角度 Groove Angle：45° 半径 Radius (J–U)：N/A 背部清根 Back Gouging　YES ■　NO ■ 方法 Method：打磨 Grinding	位置POSITION 坡口位置 Position of Groove 1G/2G 角焊缝 Fillet 1F/2F/3F/4F 立焊位置 Vertical Progression：Up 上行□　Down 下行□ 电特性ELECTRICAL CHARACTERISTICS 过渡形式（GMAW）：喷射 spray□　熔滴 Globular□ 短路 short-Circuiting ■ 电流Current：交流 AC □　脉冲 pulsed □ 直流反接 DCEP■　直流正接 DCEN □ 其它 Other N/A 钨极Tungsten Electrode（GTAW）N/A 尺寸Size：N/A　类型Type：N/A
母材 BASE METALS 母材牌号 material Spec：S316L to Q355B 规格 Specification：①CJP:平焊、横焊、立焊 F、H、V δ=3-20mm ②PJP、Fillet：δ≥3mm	焊接技术TECHNIQUE 直线或横向摆动焊道:Stringer or Weave Bead：直线或横向摆动焊道 Stringer or Weave Bead 多道或单道（每边）Multi-pass or Single Pass (per side):: 多道 Multi-pass
填充金属 FILLER METALS AWS spec：AWS A5.22 焊条/焊丝牌号 AWS 等级：E309LT1-1 Filler metal/electrode tag No：E309LT1-1 AWS classification：E309LT1-16	焊丝数Number of Electrodes：单丝 single 焊丝间隔Electrode Spacing：N/A 导电嘴到工件的距离：15-25mm Contact Tube to Work Distance 捶击Peening：无 none
保护SHIELDING	道间清理Interpass Cleaning：刷或打磨 Brushing or Grinding

中核二四核电安装公司
受控文件
2021 年 09 月 30 日

焊剂 flux N/A 气体Gas: CO_2 组分Composition: 99.9% 流速 flow Rate 15-20L/min 气体喷嘴尺寸Gas Cup Size: Φ20mm 焊丝焊剂等级 Electrode-Flux （CLASS）: N/A	焊后热处理 POSTWELD HEAT TREATMENT 温度Temp.: N/A 时间Time: N/A

预热PREHEAT

预热温度 ≥10℃

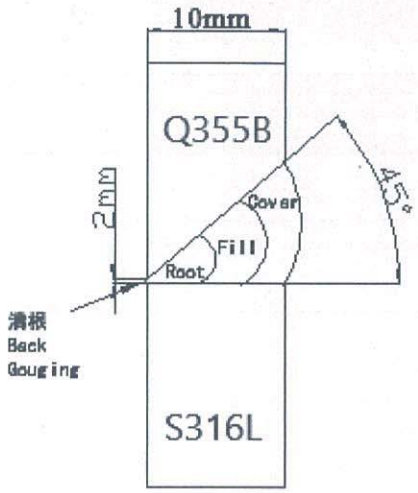
层间温度 Interpass Temp.

最低The Min 层间温度不低于预热温度 最高Max 175℃

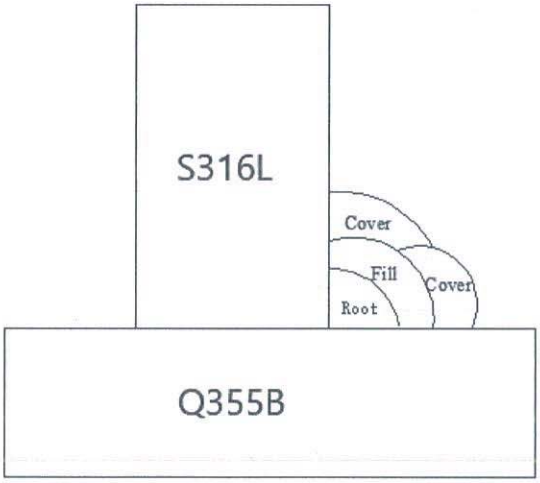
焊接工艺 WELDING PROCEDURE

焊道或焊层 Pass or Weld Layer(s)	方法 Process	填充金属 Filler Metals		电流Current					
		类别 Class	直径 Dia.	类型或极性 Type & Polarity	安培 Amps (A)	电压 Volts (V)	焊接速度 Travel Speed （cm/min）	焊接位置	接头详图 Joint Details
Root	FCAW	E309LT 1-1	Ø1.2	DCEP	169-208	25-29	10.8-30.8	1G/2G	见附图 See The Attached Figure
Fill	FCAW	E309LT 1-1	Ø1.2	DCEP	159-286	25-29	10.8-33		
Cover	FCAW	E309LT 1-1	Ø1.2	DCEP	198-256	25-29	16.2-30.8		
Root	FCAW	E309LT 1-1	Φ1.2	DCEP	148-187	25-29	10.8-33	1F/2F/3F/4F	见附图 See The Attached Figure
Fill	FCAW	E309LT 1-1	Φ1.2	DCEP	157-280	25-29	10.8-35.2		
Cover	FCAW	E309LT 1-1	Φ1.2	DCEP	189-242	25-29	10.8-35.2		

中核二四核电安装公司
受控文件
2021 年 09 月 30 日



用于全熔透焊缝 Use to CJP Weld



用于角焊缝 Use to Fillet Weld

中核 四核电安装公司
受控文件
2021 年 09 月 30 日

工艺评定记录（PQR）

规范/CODE：AWS D1.6-2017

中国核工业二四建设有限公司核电安装公司 China Nuclear Industry 24 Construction Corporation Ltd. Nuclear Power Project Department	编号No：FCAW-B-PQR-200　版本 Rev.1 编制人 Prepared by:　日期 Date: 2021.09.08 审核人 Reviewed by:　日期 Date: 2021.09.08 批准人 Approved by:　日期 Date: 2021.09.08
焊接方法 Welding Process(es)：FCAW	类型 Type：手工 Manual ☐　半自动 Semi-Auto ■ 机械 Machine ☐　自动 Automatic ☐
采用的接头设计JOINT DESIGN USED 类型Type：对接接头 Butt joint 单面焊 Single ☐　双面焊缝 Double Weld ■ 衬垫 Backing：YES ☐　NO ■ 衬垫材料Backing Material: N/A 根部间隙 Root Opening: 2mm 钝边尺寸 Root Face Dimension: 0 坡口角度 Groove Angle: 45° 半径 Radius (J–U): N/A 背部清根 Back Gouging　YES ■　NO ☐ 方法 Method: 打磨 Grinding	位置POSITION 坡口位置 Position of Groove 1G/2G 角焊缝 Fillet N/A 立焊位置 Vertical Progression：Up 上行☐　Down 下行☐ 电特性ELECTRICAL CHARACTERISTICS 过渡形式（GMAW）：喷射 spray☐　熔滴 Globular☐ 短路 short-Circuiting ■ 电流Current：交流 AC ☐　脉冲 pulsed ☐ 直流反接 DCEP■　直流正接 DCEN ☐ 其它 Other N/A 钨极Tungsten Electrode（GTAW）N/A 尺寸Size: N/A　类型Type: N/A
母材 BASE METALS 母材牌号 material Spec: S316L/Q355B 规格 Specification: δ=10mm/δ=10mm 填充金属 FILLER METALS AWS spec: AWS A5.22 焊条/焊丝牌号 AWS 等级: E309LT1-1 Filler metal/electrode tag No: E309LT1-1 AWS classification: E309LT1-1 保护SHIELDING 焊剂 flux N/A 气体Gas: CO_2 组分Composition: 99.9% 流速 flow Rate 15-20L/min	焊接技术TECHNIQUE 直线或横向摆动焊道:Stringer or Weave Bead: 直线或横向摆动焊道 Stringer or Weave Bead 多道或单道（每边）Multi-pass or Single Pass (per side):： 多道 Multi-pass 焊丝数Number of Electrodes: 单丝 single 焊丝间隔Electrode Spacing: N/A 导电嘴到工件的距离: 15-25mm Contact Tube to Work Distance 捶击Peening: 无 none 道间清理Interpass Cleaning: 刷或打磨 Brushing or Grinding

核二四核电安装公司
受控文件
2021 年09 月30 日

气体喷嘴尺寸Gas Cup Size: φ20mm 焊丝焊剂等级 Electrode-Flux （CLASS）: N/A	焊后热处理POSTWELD HEAT TREATMENT 温度Temp.: N/A 时间Time: N/A
预热PREHEAT 预热温度 Preheat Temp: ≥10℃ 层间温度 Interpass Temp. 最低Min 10℃ 最高Max 175℃	

焊接工艺 WELDING PROCEDURE

焊道或焊层 Pass or Weld Layer(s)	方法 Process	填充金属 Filler Metals 类别 Class	直径 Dia.	电流Current 类型或极性 Type & Polarity	安培 Amps (A)	电压 Volts (V)	焊接速度 Travel Speed （cm/min）	接头详图 Joint Details
Root	FCAW	E309LT 1-1	Ø1.2	DCEP	181	26.5	16	
Fill	FCAW	E309LT 1-1	Ø1.2	DCEP	184-207	26.8-27.2	18-20	
Cover	FCAW	E309LT 1-1	Ø1.2	DCEP	192-211	26.5-27.1	18-21.5	

中核.四核电安装公司
受控文件
2024 年 09 月 30 日

工艺评定记录（PQR）

试验结果 Test Results

无损检测 NDE		
检验项目 Inspection methods	报告编号 report No.	评定结果 Result
目视检测 VT	2021-FCB-VT-004	合格 acceptable
超声波检测 UT	2021-FCB-UT-012	合格 acceptable

弯曲试验 BEND TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
侧弯 side bend	FCAW-B-2G-δ10-YG-002-S1	HB2021C01326	合格 acceptable
	FCAW-B-2G-δ10-YG-002-S2		合格 acceptable
	FCAW-B-2G-δ10-YG-002-S3		合格 acceptable
	FCAW-B-2G-δ10-YG-002-S4		合格 acceptable

拉伸试验 TENSION TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
抗拉强度 tensile strength	FCAW-B-2G-δ10-YG-002-T1	HB2021C01326	合格 acceptable
	FCAW-B-2G-δ10-YG-002-T2		

宏观浸蚀/MACROETCH TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
N/A	N/A	N/A	N/A

其他检验 Other inspections

检验方法（标准、结果） N/A

Inspection methods(Standards, results)

焊缝熔敷金属化学成分分析（结果）Deposited metal composition（result） N/A

其它 others N/A

焊工姓名/Welder'S Name 李进明 焊工代号/Stamp#: H001214R0

我们在此证明此记录的内容是正确的，焊缝的准备，焊缝和试验符合 AWS D1.6-2017 的要求。签字：李进明

We certify that the statements here are correct and that the welds prepared, welding and testing is in accordance with the requirement of AWS D1.1-2000 .Signed: 李进明

中核 四核电安装公司
受控文件
2021 年 09 月 30 日

工艺评定记录（PQR）

规范/CODE：AWS D1.6-2017

中国核工业二四建设有限公司核电安装公司 China Nuclear Industry 24 Construction Corporation Ltd. Nuclear Power Project Department	编号No：FCAW-B-PQR-300　　版本 Rev.1 编制人 Prepared by:　　日期 Date: 2021.09.03 审核人 Reviewed by:　　日期 Date: 2021.09.08 批准人 Approved by:　　日期 Date: 2021.09.08
焊接方法 Welding Process(es)：FCAW	类型 Type：手工 Manual ☐　半自动 Semi-Auto ■ 机械 Machine ☐　自动 Automatic ☐
采用的接头设计JOINT DESIGN USED 类型Type：T型接头 T joint 单面焊 Single ■　双面焊缝 Double Weld ☐ 衬垫 Backing：YES ☐　NO ■ 衬垫材料Backing Material: N/A 根部间隙 Root Opening: N/A 钝边尺寸 Root Face Dimension: 0 坡口角度 Groove Angle: N/A 半径 Radius (J–U): N/A 背部清根 Back Gouging　YES ☐　NO ■ 方法 Method: N/A	位置POSITION 坡口位置 Position of Groove N/A 角焊缝 Fillet 1F/2F/3F/4F 立焊位置 Vertical Progression：Up 上行☐　Down 下行☐ 电特性ELECTRICAL CHARACTERISTICS 过渡形式（GMAW）：喷射 spray☐　熔滴 Globular☐ 短路 short-Circuiting ■ 电流Current：交流 AC ☐　脉冲 pulsed ☐ 直流反接 DCEP■　直流正接 DCEN ☐ 其它 Other N/A 钨极Tungsten Electrode（GTAW） N/A 尺寸Size: N/A 类型Type: N/A
母材 BASE METALS 母材牌号 material Spec: S316L/Q355B 规格 Specification: δ=10mm/δ=10mm 填充金属 FILLER METALS AWS spec: AWS A5.22 焊条/焊丝牌号 AWS 等级：E309LT1-1 Filler metal/electrode tag No: E309LT1-1 AWS classification: E309LT1-1 保护SHIELDING 焊剂 flux N/A 气体Gas: CO_2 组分Composition: 99.9% 流速 flow Rate 15-20L/min	焊接技术TECHNIQUE 直线或横向摆动焊道:Stringer or Weave Bead: 直线或横向摆动焊道 Stringer or Weave Bead 多道或单道（每边）Multi-pass or Single Pass (per side):： 多道 Multi-pass 焊丝数Number of Electrodes: 单丝 single 焊丝间隔Electrode Spacing: N/A 导电嘴到工件的距离：15-25mm Contact Tube to Work Distance 捶击Peening: 无 none 道间清理Interpass Cleaning: 刷或打磨 Brushing or Grinding

中核 四核电安装公司
受控文件
2021 年 09 月 30 日

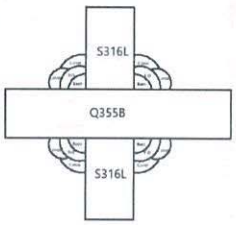
气体喷嘴尺寸Gas Cup Size: Φ20mm	焊后热处理POSTWELD HEAT TREATMENT
焊丝焊剂等级 Electrode-Flux （CLASS）: N/A	温度Temp.: N/A 时间Time: N/A

预热PREHEAT

预热温度 Preheat Temp: ≥10℃

层间温度 Interpass Temp. 最低Min 10℃ 最高Max 175℃

焊接工艺 WELDING PROCEDURE

焊道或焊层 Pass or Weld Layer(s)	方法 Process	填充金属 Filler Metals		电流Current				
		类别 Class	直径 Dia.	类型或极性 Type & Polarity	安培 Amps (A)	电压 Volts (V)	焊接速度 Travel Speed （cm/min）	接头详图 Joint Details
Root	FCAW	E309LT 1-1	Ø1.2	DCEP	178	25.4	14	
Fill	FCAW	E309LT 1-1	Ø1.2	DCEP	189	25.5	21.5	
Cover	FCAW	E309LT 1-1	Ø1.2	DCEP	220-234	25.3-25.8	21	

中核二四核电安装公司
受控文件
2021年09月30日

工艺评定记录（PQR）

试验结果 Test Results

无损检测 NDE		
检验项目 Inspection methods	报告编号 report No.	评定结果 Result
目视检测 VT	2021-FCB-VT-004	合格 acceptable
超声波检测 UT	2021-FCB-UT-012	合格 acceptable

弯曲试验 BEND TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
侧弯 side bend	FCAW-B-2G-δ10-YG-002-S1	HB2021C01326	合格 acceptable
	FCAW-B-2G-δ10-YG-002-S2		合格 acceptable
	FCAW-B-2G-δ10-YG-002-S3		合格 acceptable
	FCAW-B-2G-δ10-YG-002-S4		合格 acceptable

拉伸试验 TENSION TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
抗拉强度 tensile strength	FCAW-B-2G-δ10-YG-002-T1	HB2021C01326	合格 acceptable
	FCAW-B-2G-δ10-YG-002-T2		

宏观浸蚀/MACROETCH TEST			
检验项目 Inspection methods	试样编号 Specimen NO.	报告编号 report No.	评定结果 Result
N/A	N/A	N/A	N/A

其他检验 Other inspections

检验方法（标准、结果） N/A

Inspection methods(Standards, results)

焊缝熔敷金属化学成分分析（结果）Deposited metal composition（result） N/A

其它 others N/A

焊工姓名/Welder'S Name 李进明 焊工代号/Stamp#: H001214R0

我们在此证明此记录的内容是正确的，焊缝的准备，焊缝和试验符合 AWS D1.6-2017 的要求。签字: 李进明

We certify that the statements here are correct and that the welds prepared, welding and testing is in accordance with the requirement of AWS D1.1-2000 .Signed: 李进明

中核集团

中核二四核电安装公司
CNFC NUCLEAR POWER PROJECT
焊工资格卡
Welder Certification Card



焊工姓名/Welder Name：孙贤海
焊工号/welder No.：HFCW399
项目编号 No：FCAW-2G-δ10-CS-hb
考核日期/Test Date：2021.11.26
焊工资格评定报告编号/WQR No.：
HB2021C01799

焊工资格卡
Welder Certification Card

	考核内容 Examination content	等效范围/QUALIFIED LIMITS
母材 Base Metal：	S316L/Q355B	不锈钢和低合金结构钢
规格 size：	10mm	CJP:3~∞，PJP：角焊缝：任意厚度
焊材 Electrode：	E309LT1-1	E309LT1-1
焊接位 Position：	2G	平焊、横焊、

QC1（签字/Signature）：
日期/Date 2021.11.29

QC2(签字/Signature)
日期/Date 2021.11.29

中核集团

中核二四核电安装公司
CNFC NUCLEAR POWER PROJECT
焊工资格卡
Welder Certification Card



焊工姓名/Welder Name：徐敬州
焊工号/welder No.：HFCW374
项目编号 No：FCAW-2G-δ10-CS-hb
考核日期/Test Date：2021.11.26
焊工资格评定报告编号/WQR No.：
HB2021C01800

焊工资格卡
Welder Certification Card

	考核内容 Examination content	等效范围/QUALIFIED LIMITS
母材 Base Metal：	S316L/Q355B	不锈钢和低合金结构钢
规格 size：	10mm	CJP:3~∞，PJP：角焊缝：任意厚度
焊材 Electrode：	E309LT1-1	E309LT1-1
焊接位 Position：	2G	平焊、横焊、

QC1（签字/Signature）：
日期/Date 2021.11.29

QC2(签字/Signature)
日期/Date 2021.11.29

SECTION 3. Fender Panels and Spools

3-D:

NDT & Pneumatic Test Reports

TRELLEBORG

WELDING VT INSPECTION REPORT	
Project No. 25135	Date: Sep. 17th.2022
Drawing No.: 25135	Quantity: 35 Sets panels+21 pcs spools

Inspection Stage: Panels and spools before Closing & after closing

All the welding joints in the above-mentioned drawing were checked visually and found to be satisfactory. After welding all the specified welds were subjected to thorough NDE test and found to be free of objectionable surface bearing discontinuities. Hence acceptable.

Inspector: 牛迪

Date: Sep. 17th.2022

Checked By:

Date:

TRELLEBORG

MT REPORT

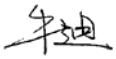
Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-1M			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	F1,F2,F3,F4,F5,F6,F7, F8,F9,F10,F11,F12, F13	**Unit**	Set			
Title	Frontal Frames			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Mar. 13th.2022	Mar. 25th.2022

MT RESULT

INSTRUMENT MODEL	B310		**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS		**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND		**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD			
MAGNETIZED TIME	MORE THAN 0.5S		**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS		**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015		**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied

Inspector: 

Checked By:

Date: Mar. 25th .2022

Date:

TRELLEBORG

MT REPORT

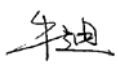
Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-2M			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	F1,F2,F3,F4F5,F6,F7,F8,F9,F10	**Unit**	Set			
Title	Frontal Frames			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Mar. 4th.2022	Mar. 13th.2022

MT RESULT

INSTRUMENT MODEL	B310	**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS	**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND	**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD		
MAGNETIZED TIME	MORE THAN 0.5S	**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS	**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015	**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied.

Inspector: 

Date: Mar.13th .2022

Checked By:

Date:

TRELLEBORG

MT REPORT

Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-2M07			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	1,2,3,4,5,6,7,8,9,10	**Unit**	Set			
Title	Spools			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Aug. 15th.2022	Aug. 22nd.2022

MT RESULT

INSTRUMENT MODEL	B310	**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS	**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND	**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD		
MAGNETIZED TIME	MORE THAN 0.5S	**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS	**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015	**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied.

Inspector: 

Date: Aug. 22nd .2022

Checked By:

Date:

TRELLEBORG

MT REPORT

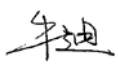
Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-5M			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	F1,F2,F3,F4,F5,F6,F7	**Unit**	Set			
Title	Frontal Frames			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Apr. 4th.2022	Apr. 12th.2022

MT RESULT

INSTRUMENT MODEL	B310	**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS	**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND	**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD		
MAGNETIZED TIME	MORE THAN 0.5S	**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS	**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015	**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied.

Inspector: 

Date: Apr. 12th .2022

Checked By:

Date:

TRELLEBORG

MT REPORT

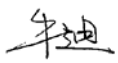
Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-5M07			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	1,2,3,4,5,6	**Unit**	Set			
Title	Spools			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Aug. 4th.2022	Aug. 18th.2022

MT RESULT

INSTRUMENT MODEL	B310	**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS	**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND	**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD		
MAGNETIZED TIME	MORE THAN 0.5S	**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS	**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015	**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied.

Inspector: 

Date: Aug. 18th .2022

Checked By:

Date:

TRELLEBORG

MT REPORT

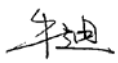
Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-6M			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	F1,F2,F3,F4,F5	**Unit**	Set			
Title	Frontal Frames			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Apr. 23rd.2022	Apr. 30th.2022

MT RESULT

INSTRUMENT MODEL	B310		**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS		**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND		**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD			
MAGNETIZED TIME	MORE THAN 0.5S		**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS		**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015		**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied.

Inspector: 

Date: Apr. 30th .2022

Checked By:

Date:

TRELLEBORG

MT REPORT

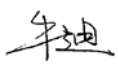
Project No.	25135			**Report No.**	NDE-FCB-MT-001	
Drawing No.	25135-6M07			**Testing Range**	All the welds between carbon-steel members	All critical welds
Serial No.	1,2,3,4,5	**Unit**	Set			
Title	Frontal Frames			**Percentage**	10%	100%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	Aug. 10th.2022	Aug. 22nd.2022

MT RESULT

INSTRUMENT MODEL	B310		**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS		**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND		**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD			
MAGNETIZED TIME	MORE THAN 0.5S		**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS		**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1-2015		**ACCEPTANCE STANDARD**	AWS D1.1-2015

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.
Tested area is generally satisfied.

Inspector: 

Date: Aug. 22nd .2022

Checked By:

Date:

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-1M **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-001 **Inspection Date:** Apr.10th.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: F1, F2, F3,F4,F5,F6,F7,F8,F9,F10,F11,F12,F13	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Date: Mar.25th.2022	Checked By: Date:

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-2M(PANELS) **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-003 **Inspection Date:** Mar.24th.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: F1,F2,F3,F4,F5,F6,F7,F8,F9,F10	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Checked By: Date: Mar.24th.2022 Date:	

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-2M07(SPOOLS) **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-002 **Inspection Date:** Aug.25th.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: 6,7,8,9,10	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Checked By: Date: Aug.25th.2022 Date:	

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-5M(PANELS) **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-002 **Inspection Date:** Apr.17th.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: F1, F2, F3,F4, F5,F6,F7	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Checked By: Date: Apr.17th.2022 Date:	

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-5M07(SPOOLS) **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-001 **Inspection Date:** Aug.18th.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: 1,2,3,4,5,6	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Checked By: Date: Aug.18th.2022 Date:	

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-6M(PANELS) **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-002 **Inspection Date:** May.5th.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: F1,F2,F3,F4,F5	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Checked By: Date: May.5th.2022 Date:	

TRELLEBORG

UT Test Report

Project No.: 25135 **Drawing No.:** 25135-6M07(SPOOLS) **Test content:** Butt welds	**Report No. :** NDE-FCB-UT-001 **Inspection Date:** Aug.22nd.2022 **Specification:**AWS D1.1-2015
Material: Q355B **Welding Process:** GMAW	**Weld Type:** Penetration Butt Weld **Weld Prep:** SP2
ULTRASONIC TEST	
Test Method: UMB-2 **Equipment:** CTS-9008 **Compensate:** 3dB **Couplant:** Chemical paste **Scanning Pattern:** Overlapping scans, 10mm centers (max.) **Probe index:** 11mm **Scanning adjustment:** Depth 1:1	**Probe size:** 9*9 K2.5 **Probe type:** Angle probes **Frequency width:** 5 MHz **Sensitivity:** Angle probe 1.5mm side drilled hole +6dB, 80%FSH **Time of detection:** 24 hours after welding **Sizing method of discontinuities:** 6 dB technique
Frame No.: 1,2,3,4,5	
INSPECTION RESULT：	
UT was performed as per ITP. No evidence of defects was found during inspection. Tested areas generally satisfied. Inspector: Checked By: Date: Aug.22nd.2022 Date:	

TRELLEBORG

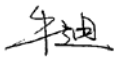
PNEUMATIC TEST REPORT

Project No.: 25135	**Report No. :** YL-FCB-001
Drawing No.: 25135-1M	**Test Date:** Mar. 25th.2022

We hereby certify that the mentioned item(s) has been pneumatic tested in accordance with the requirements of design and specifications and no leakages.

ITEM DESCRIPTION	Frontal Frame
SPECIFICATION	As per “PNEUMATIC TEST PROCEDURE “
Panel No.	F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,F11,F12,F13
TEST MEDIUM	Air
TEST PRESSURE	1.0KG/SQ.CM
HOLDING TIME	30 Minutes
TEST RESULT	ACCEPTED

REMARKS:
After successful pneumatic testing according to relevant requirements, then checked to make sure the hex bolt was welded at place.

Inspector: 

Checked By:

Date: Mar. 25th.2021

Date:

TRELLEBORG

PNEUMATIC TEST REPORT

Project No.: 25135	**Report No. :** YL-FCB-003
Drawing No.: 25135-2M	**Test Date:** Mar. 24th.2021

We hereby certify that the mentioned item(s) has been pneumatic tested in accordance with the requirements of design and specifications and no leakages.

ITEM DESCRIPTION	Frontal Frame
SPECIFICATION	As per “PNEUMATIC TEST PROCEDURE “
Panel No.	F1,F2,F3,F4,F5,F6,F7,F8,F9,F10
TEST MEDIUM	Air
TEST PRESSURE	1.0KG/SQ.CM
HOLDING TIME	30 Minutes
TEST RESULT	ACCEPTED

REMARKS:
After successful pneumatic testing according to relevant requirements, then checked to make sure the hex bolt was welded at place.

Inspector: 

Checked By:

Date: Mar. 24th.2021

Date:

TRELLEBORG

PNEUMATIC TEST REPORT

Project No.: 25135	**Report No. :** YL-FCB-002
Drawing No.: 25135-5M	**Test Date:** Apr. 17th.2022

We hereby certify that the mentioned item(s) has been pneumatic tested in accordance with the requirements of design and specifications and no leakages.

ITEM DESCRIPTION	Frontal Frame
SPECIFICATION	As per “PNEUMATIC TEST PROCEDURE “
Panel No.	F1,F2,F3,F4,F5,F6,F7
TEST MEDIUM	Air
TEST PRESSURE	1.0KG/SQ.CM
HOLDING TIME	30 Minutes
TEST RESULT	ACCEPTED

REMARKS:
After successful pneumatic testing according to relevant requirements, then checked to make sure the hex bolt was welded at place.

Inspector:

Checked By:

Date: Apr. 17th.2022

Date:

TRELLEBORG

PNEUMATIC TEST REPORT

Project No.: 25135	**Report No. :** YL-FCB-002
Drawing No.: 25135-6M	**Test Date:** May.5th.2022

We hereby certify that the mentioned item(s) has been pneumatic tested in accordance with the requirements of design and specifications and no leakages.

ITEM DESCRIPTION	Frontal Frame
SPECIFICATION	As per “PNEUMATIC TEST PROCEDURE “
Panel No.	F1,F2,F3,F4,F5
TEST MEDIUM	Air
TEST PRESSURE	1.0KG/SQ.CM
HOLDING TIME	30 Minutes
TEST RESULT	ACCEPTED

REMARKS:
After successful pneumatic testing according to relevant requirements, then checked to make sure the hex bolt was welded at place.

Inspector: 

Checked By:

Date: May. 5th.2022

Date:

SECTION 3. Fender Panels and Spools

3-E:

Painting & Coating

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-1M	**panels**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
F1	50-75 µ m	65-84	Accepted
F2	50-75 µ m	66-87	Accepted
F3	50-75 µ m	65-87	Accepted
F4	50-75 µ m	64-86	Accepted
F5	50-75 µ m	64-85	Accepted
F6	50-75 µ m	63-86	Accepted
F7	50-75 µ m	65-88	Accepted
F8	50-75 µ m	66-87	Accepted
F9	50-75 µ m	64-87	Accepted
F10	50-75 µ m	64-89	Accepted
F11	50-75 µ m	63-88	Accepted
F12	50-75 µ m	64-85	Accepted
F13	50-75 µ m	64-86	Accepted

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-2M	**panels**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
F1	50-75 μ m	65-84	Accepted
F2	50-75 μ m	66-87	Accepted
F3	50-75 μ m	65-87	Accepted
F4	50-75 μ m	64-86	Accepted
F5	50-75 μ m	64-85	Accepted
F6	50-75 μ m	63-86	Accepted
F7	50-75 μ m	65-84	Accepted
F8	50-75 μ m	66-87	Accepted
F9	50-75 μ m	64-87	Accepted
F10	50-75 μ m	63-87	Accepted

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-2M07	**Spools**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
1	50-75 µ m	65-87	Accepted
2	50-75 µ m	64-88	Accepted
3	50-75 µ m	65-87	Accepted
4	50-75 µ m	64-85	Accepted
5	50-75 µ m	63-87	Accepted
6	50-75 µ m	67-84	Accepted
7	50-75 µ m	64-88	Accepted
8	50-75 µ m	63-86	Accepted
9	50-75 µ m	65-84	Accepted
10	50-75 µ m	66-87	Accepted

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-5M	**panels**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
F1	50-75 µ m	64-86	Accepted
F2	50-75 µ m	64-85	Accepted
F3	50-75 µ m	63-86	Accepted
F4	50-75 µ m	65-84	Accepted
F5	50-75 µ m	66-87	Accepted
F6	50-75 µ m	64-87	Accepted
F7	50-75 µ m	64-85	Accepted

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-5M	**Spools**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
1	50-75 µ m	65-84	Accepted
2	50-75 µ m	66-87	Accepted
3	50-75 µ m	65-87	Accepted
4	50-75 µ m	64-86	Accepted
5	50-75 µ m	64-85	Accepted
6	50-75 µ m	64-86	Accepted

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-6M	**Panels**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
F1	50-75 μ m	65-87	Accepted
F2	50-75 μ m	64-86	Accepted
F3	50-75 μ m	64-85	Accepted
F4	50-75 μ m	65-84	Accepted
F5	50-75 μ m	66-87	Accepted

Surface Preparation & Profile Inspection Report 表面处理和粗糙度检验报告			
Project No.	25135		
Drawing No.	25135-6M	**Spools**	
Surface Pre-Treatment **表面预处理**		**Solvent Cleaning.:** **溶剂清洗**	Cleaned
		Surface Defect.: **表面缺陷**	No

Surface Preparation And Surface Profile			
Test Standard **检验标准**	ISO8504-2 & ISO8503-1		
Abrasive Type **磨料类型**	Steel Grit And Shot		
Specified Cleanliness **指定洁净度**	Sa2.5	**Actual Average Cleanliness** **实际平均洁净度**	Sa2.5
Object No. **工件编号**	**Specified Profile** **规定粗糙度轮廓**	**Actual Average Profile** **实际粗糙度轮廓**	**Result** **结果**
1	50-75 μ m	64-87	Accepted
2	50-75 μ m	65-88	Accepted
3	50-75 μ m	65-85	Accepted
4	50-75 μ m	65-87	Accepted
5	50-75 μ m	63-85	Accepted

TRELLEBORG

PAINTING INSPECTION REPORT

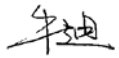
Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-1M	panels	**Report Date:** Apr. 15th.2022
Items: F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,F11,F12,F13		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	Apr. 11th.2022	Apr. 13th.2022	Apr. 15th.2022	**Required**	**Actual**
Air Temperature	18˚C	17˚C	15˚C	Sa2.5	Sa2.5
Relative Humidity	48%	43%	45%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	16˚C	16˚C	13˚C	50-75 μm	64-87 μm
Dew Point	6.84˚C	4.34˚C	3.18˚C	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	144-161	75	95-106
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	285-326	280	291-326
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	128-149	355	374-405

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 

Date: Apr.15th,.2022

Checked By :

Date:

TRELLEBORG

PAINTING INSPECTION REPORT

Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-2M	panels	**Report Date:** Mar. 31st.2022
Items: F1,F2,F3,F4,F5,F6,F7,F8,F9,F10		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	Mar. 26th.2022	Mar. 28th.2022	Mar. 31st.2022	**Required**	**Actual**
Air Temperature	18˚C	17˚C	15˚C	Sa2.5	Sa2.5
Relative Humidity	48%	43%	45%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	16˚C	16˚C	13˚C	50-75 μm	64-87 μm
Dew Point	6.84˚C	4.34˚C	3.18˚C	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	138-156	75	91-103
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	281-309	280	296-304
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	114-131	355	379-402

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 李迪

Checked By :

Date: Mar. 31st.2022

Date:

TRELLEBORG

PAINTING INSPECTION REPORT

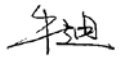
Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-2M07	Spools	**Report Date:** Sep. 2nd.2022
Items: 1,2,3,4,5,6,7,8,9,10		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	Aug.29th.2022	Aug.31st.2022	Sep. 2nd.2022	**Required**	**Actual**
Air Temperature	26˚C	27˚C	29˚C	Sa2.5	Sa2.5
Relative Humidity	53%	51%	48%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	24˚C	26˚C	27˚C	50-75 μm	63-88 μm
Dew Point	15.69˚C	16.01˚C	16.89˚C	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	138-158	75	91-104
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	301-324	280	288-329
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	113-127	355	366-405

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 

Checked By :

Date: Sep. 2nd.2022

Date:

TRELLEBORG

PAINTING INSPECTION REPORT

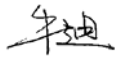
Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-5M	panels	**Report Date:** Apr. 24th.2022
Items: F1,F2,F3,F4,F5,F6,F7		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	Apr. 19th.2022	Apr. 21st.2022	Apr. 24th.2022	**Required**	**Actual**
Air Temperature	18˚C	20˚C	29˚C	Sa2.5	Sa2.5
Relative Humidity	48%	46%	42%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	17˚C	18˚C	28˚C	50-75 μm	63-86 μm
Dew Point	6.84˚C	8.04˚C	14.8˚C	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	135-155	75	89-102
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	285-306	280	288-320
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	120-144	355	360-405

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 

Date: Apr. 24th.2022

Checked By :

Date:

TRELLEBORG

PAINTING INSPECTION REPORT

Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-5M	Spools	**Report Date:** Sep.6th.2022
Items: 1,2,3,4,5,6		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	Aug.31st.2022	Sep.3rd.2022	Sep.6th.2022	**Required**	**Actual**
Air Temperature	24˚C	26˚C	26˚C	Sa2.5	Sa2.5
Relative Humidity	48%	52%	53%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	22˚C	25˚C	24˚C	50-75 μm	65-87 μm
Dew Point	12.32˚C	15.39˚C	15.69˚C	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	136-156	75	90-103
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	284-305	280	288-320
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	113-137	355	362-407

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 李迪

Date: Sep.6th.2022

Checked By :

Date:

TRELLEBORG

PAINTING INSPECTION REPORT

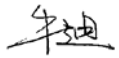
Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-6M	panels	**Report Date:** May.9th.2022
Items: F1,F2,F3,F4,F5		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	May.5th.2022	May.7th.2022	May.9th.2022	**Required**	**Actual**
Air Temperature	24˚C	19˚C	22˚C	Sa2.5	Sa2.5
Relative Humidity	48%	42%	44%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	22˚C	18˚C	20˚C	50-75 μm	64-87 μm
Dew Point	12.32˚C	5.81˚C	9.25˚C	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	138-158	75	91-104
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	288-310	280	253-264
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	119-141	355	366-405

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 

Checked By :

Date: May.9th.2022

Date:

TRELLEBORG

PAINTING INSPECTION REPORT

Project No.: 25135		**Report No.:** FF-FCB-001
Drawing No.: 25135-6M07	Spools	**Report Date:** Sep.14th.2022
Items: 1,2,3,4,5		

Climatic Condition in Work Area				**Surface Preparation**	
Time	**First Coat**	**Second Coat**	**Third Coat**		
	Sep.8th.2022	Sep.11th.2022	Sep.14th.2022	**Required**	**Actual**
Air Temperature	24℃	26℃	26℃	Sa2.5	Sa2.5
Relative Humidity	48%	52%	53%	**Surface Profile**	
				Required	**Actual**
Steel Temperature	22℃	25℃	24℃	50-75 μm	63-88 μm
Dew Point	12.32℃	15.39℃	15.69℃	/	/

Painting

Coating NO.	**Brand Name**	**Type of paint**	**Batch No.**	**Color**	**Mixing**	**Ratio of Thinning**	**Application Method**	**WFT(Microns)**		**DFT(Microns)**	
								Required	**Actual**	**Required**	**Actual**
First Coat	Carboline	Carbozinc 859	BLD010464	Gray	1.77:1	/	Airless Spray	114	141-161	75	93-106
Second Coat		Carboguard 890	BLD010462	Gray	1:1	10%		274	288-310	280	285-336
Third Coat		Carbothane 134 Hg	BLD010466	Ral 9005	4:1	20%		108	114-143	355	369-404

Remarks:
We here by certify that painting was performed and checked as per the requirements of Design and specs.

Inspector: 牛迪

Checked By :

Date: Sep.14th.2022

Date:

SECTION 3. Fender Panels

3-F:

Calibration Certificates

TRELLEBORG

CALIBRATION CERTIFICATES SUMMARY

No.	Equipment Name	Type	S/N	Valid Data
1	Tape	10m	H06-2022-0010	12th, Mar. 2023
2	Welding inspection guage	HJC60	2206629	16th, May. 2023
3	Thickness tester	MP0	2150404	14th, Nov. 2022
4	Roughness measuring instrument	HL0918	2150405	14th, Nov. 2022
5	Infrared thermometer	62MAX+	H51-2021-0013	15th, Nov. 2022
6	Hygrothermograph	WS2080B	H38-2022-0155	19th, May. 2023
7	Vernier caliper	(0-200)mm	H02-2021-0345	02nd, Dec. 2022
8	Pressure guage	0-1.6Mpa	H10-2022-2967	08h, Nov. 2022
9	Ultrasonic flaw detector	CTS-9008	539330121050	21st, Feb. 2023
10	Magnetic defect detector	B310	2101252	21st, Feb. 2023

Note:

All Equipment were calibrated by independent third party and checked by TRELLEORG QC; they all are in the period of validity where is listed in the spreadsheet above.



Jun. 29th, 2022

海阳市检验检测中心

检 定 证 书

证书编号： H06-2022-0010 号

送 检 单 位	中国核工业二四建设有限公司
计量器具名称	钢卷尺 Tape
型 号/ 规 格	10m
出 厂 编 号	/
制 造 单 位	长城精工
检 定 依 据	JJG4-2015 《钢卷尺检定规程》
检 定 结 论	准予该器具作Ⅱ级使用

批 准 人 张 福 涛

（检定专用章）

核 验 员 张 福 涛

检 定 员 刘 晓 林

检 定 日 期 2022 年 03 月 13 日

有 效 期 至 2023 年 03 月 12 日

计量检定机构授权证书号：（鲁）海计授20150001号
地址：海阳市海阳路247号
传真：0535-3266577
电话：0535-3222074
邮编：265100
EMAIL:haiyangjls@163.com

海阳市检验检测中心

计量标准名称	测量范围	不确定度或准确度等级或最大允许误差	计量标准证书号	有效期至
钢卷尺标准装置	（0～5）m	U=0.15mm ； k=2	[2015]烟计量标计证字第022号	2023-05-14

温度： 18℃ 湿度： 40%RH 地点： 本实验室 大气压 /

检定所使用的主要标准器：

标准器名称	测量范围	准确度等级	检定证书编号	有效期至
标准钢卷尺	(0-5)m	U=0.15mm k=2	CDjx2020-02102	2022-06-03

检定结果

检定项目	检定结果
外观及个部分相互作用	合格
线纹宽度（mm）	合格
零值误差（mm）	/
示值误差（mm）	-0.50

以下空白

下次送检请带此证

检 定 证 书

Verification Certificate

证书编号：
Certificate No. 长 检字第 2150404 号

委 托 方 Client	中国核工业二四建设有限公司
器 具 名 称 Name of Instrument	涂层测厚仪 Thickness tester
型 号 / 规 格 Type /Specification	MP0
器 具 编 号 Serial No.	110007604
制 造 单 位 Manufacturer	Fischer
检 定 依 据 Reference for Verification	JJG 818-2018《磁性、电涡流式覆层厚度测量仪检定规程》
客 户 地 址 Customer Address	海阳市开发区深圳街 50 号
检 定 结 论 Conclusion	符合 B 级

发证单位（专用章）
Issued by(Stamp)

批 准 人 Authorized by 王建生 王建生

核 验 员 Inspected by 单文春 单文春

检 定 员 Verificated by 胡锦睿 胡锦睿

检 定 日 期：Date of Verification 2021 年 Year 11 月 Month 15 日 Day

有 效 期 至：Valid until 2022 年 Year 11 月 Month 14 日 Day

地址(Address)：烟台市莱山区新苑路 17 号
电子邮件(Email)：Shoufashi2010@126.com
传真(Fax)：0535-6926169
邮编(Postcode)：264003
咨询电话(Inquire Line)：0535-6920212
投诉电话(Tel for complaint)：0535-6920697

本次检定所使用的计量标准：

Measurement standard used in the verification:

名　称 Name	测量范围 Measurement Range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Max Permissible Error	计量标准证书号 Certificate No.	有效日期 Valid Date
测厚仪检定装置	(0～200)mm	U =3 μm　k =2	[2018]烟计量标计证字第009 号	2022/8/19

本次检定所使用主要计量标准仪器：

Major measurement standards used in the verification:

名　称 Name	测量范围 Measurement Range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Max Permissible Error	溯源机构及证书号 Traceability Mechanism and Certificate No.	有效日期 Valid Date
标准厚度片	(49.4～1001) μm	A 级	烟台市计量所长一 校字第2100051 号	2022/1/5

检定地点和环境条件：

Place and environmental conditions of the verification:

地点：Place　新苑路 17 号 3 号楼 109 室　温度：Temperature　20.2℃　湿度：Humidity　46.0%RH

其他说明：Remarks　/

说明：1、未经本所批准，部分采用本证书内容无效。
Partly using this certificate will not be admitted unless allowed by the lab.
2、本证书检定结果仅对本次检定的测量仪器有效。
The results are valid only for the measuring instrument verificated.

检 定 结 果

Results of the verification

1	外观及各部分相互作用	无影响计量特性的缺陷	合格
2	测量重复性	符合检定规程表1要求	合格
3	示值稳定性	符合检定规程表1要求	-
4	电源电压变化对仪器示值的影响	符合检定规程4.5的要求	-
5	校准用厚度片	符合检定规程4.6表1的要求	-

示值误差（um）

标称值（μm）	示值误差 （μm）
49.4	+1.0
99.3	-0.8
245.1	-1
502.9	-3

以下空白/Following blank

1、我所仅对加盖“烟台市计量所检定专用章”的完整证书负责。 2、本证书的检定结果仅对本次所检定的计量器具有效。

3、被检定计量器具修理后，应立即重新检定。 4、在使用过程中，如对被检定计量器具的技术指标产生怀疑，请重新检定。

烟台市计量所

YANTAI INSTITUTE OF METROLOGY

校 准 证 书

Calibration Certificate

证书编号：
Certificate No. 长 校字第 2150405 号

委 托 方 Client	中国核工业二四建设有限公司
联 络 信 息 Contact Information	海阳市开发区深圳街 50 号
器 具 名 称 Name of Instrument	锚纹仪 Roughness measuring instrument
型 号 / 规 格 Type / Specification	(0～2) mm
器 具 编 号 Serial No.	S1117823
制 造 单 位 Manufacturer	/

（校准专用章）
Stamp

批准人/职务 Authorized by/Functions	王建生	王建生
核 验 员 Inspected by	单文春	单文春
校 准 员 Calibrated by	胡锦睿	胡锦睿

接收日期: Date of Receipt	2021	年 Year	11	月 Month	9	日 Day
校准日期: Date of Calibration	2021	年 Year	11	月 Month	15	日 Day
发布日期: Date of Publication	2021	年 Year	11	月 Month	15	日 Day

地址(Address)：烟台市莱山区新苑路 17 号
电子邮件(Email)：Shoufashi2010@126.com
传真(Fax)：0535-6926169
邮编(Postcode)：264003
咨询电话(Inquire Line)：0535-6920212
投诉电话(Tel for complaint)：0535-6920697

校准所依据的技术文件（编号、名称）：

Reference documents for the calibration（code、name):

JJF 1476-2014《表面轮廓表校准规范》

本次校准所使用的主要计量器具：

Main measurement standard used in the calibration:

名 称 Name	测量范围 Measurement Range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Max Permissible Error	溯源机构及证书号 Traceability Mechanism and Certificate No.	有效日期 Valid Date
平面平晶	Φ60mm	1 级	烟台市计量所 长一 检字第 2100066 号	2022/1/5
量块	(0.5～100)mm	3 等	烟台市计量所 长二 检字第 2100166 号	2022/1/9
量块	(0.5～100)mm	3 等	烟台市计量所 长二 检字第 2100164 号	2022/1/9

校准地点和环境条件:

Place and environmental conditions of the calibration

地点： Place 新苑路 17 号 3 号楼 109 室 温度： Temperature 20.2℃ 湿度： Humidity 46.0%RH

其他说明： Remarks /

校准结果
Results of the calibration

1	基座测量面的表面粗糙度	≤Ra:0.8μm	符合要求
2	基座测量面的平面度	≤2.0μm	符合要求
3	触针	触针的宽度、圆锥角、测量力均应符合出厂技术要求	符合要求
4	测量力	应符合出厂技术要求	符合要求
5	测量重复性	应符合规程表2的要求	符合要求
6	示值误差		

校准点(mm)	示值误差(μm)
0.2	-1
0.5	-1
1	0
1.5	+2
2	-2

校准结果的扩展不确定度	分辨力为1μm：U =2μm，k =2，分辨力为0.1μm：U =1.2μm，k =2，分度值为0.002mm：U =4μm，k =2，分度值为0.01mm：U =6μm，k =2。

以下空白/Following blank

1、我所仅对加盖“烟台市计量所校准专用章”的完整证书负责。
2、本证书的校准结果仅对本次所校准的计量器具有效。
3、被校准计量器具修理后，应立即重新校准。
4、在使用过程中，如对被校准计量器具的技术指标产生怀疑，请重新校准。

检 定 证 书

Verification Certificate

证书编号：
Certificate No. 长 检字第 2206629 号

委 托 方 Client	中国核工业二四建设有限公司
器 具 名 称 Name of Instrument	焊接检验尺 Welding inspection guage
型 号 / 规 格 Type /Specification	HJC60
器 具 编 号 Serial No.	21060357
制 造 单 位 Manufacturer	常州市华工刃量具有限公司
检 定 依 据 Reference for Verification	JJG 704-2005《焊接检验尺检定规程》
客 户 地 址 Customer Address	海阳市开发区深圳街 50 号
检 定 结 论 Conclusion	合格

发证单位（专用章）
Issued by(Stamp)

批 准 人 Authorized by 单文春

核 验 员 Inspected by 单文春

检 定 员 Verificated by 盖玫霖

检 定 日 期：Date of Verification 2022 年 Year 5 月 Month 17 日 Day

有 效 期 至：Valid until 2023 年 Year 5 月 Month 16 日 Day

法定计量检定机构授权证书号：（鲁）法计（2018）37006 号
地址(Address)：烟台市莱山区新苑路 17 号
邮编(Postcode)：264003
电子邮件(Email)：Shoufashi2010@126.com
咨询电话(Inquire Line)：0535-6920212
传真(Fax)：0535-6926169
投诉电话(Tel for complaint)：0535-6920697

本次检定所使用的计量标准：

Measurement standard used in the verification:

名 称 Name	测量范围 Measurement Range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Max Permissible Error	计量标准证书号 Certificate No.	有效日期 Valid Date
焊接校验尺检定装置	量块：(0～100)mm；游标卡尺：(0～150)mm；万能工具显微镜：(0～50)mm；万能角度尺：(0～320)°	量块：3 等；游标卡尺 MPE：±0.02mm；万能工具显微镜 MPEV：3μm；万能角度尺 MPE：±2′	[2018]烟计量标计证字第 007 号	2022/8/19

本次检定所使用主要计量标准仪器：

Major measurement standards used in the verification:

名 称 Name	测量范围 Measurement Range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Max Permissible Error	溯源机构及证书号 Traceability Mechanism and Certificate No.	有效日期 Valid Date
万能角度尺	(0～320)°	MPE:≤±2′	烟台市计量所 长检字第 2200028 号	2023/1/3
焊接检验尺专用检具	圆柱棒:(Φ6～Φ10)mm,专用样板:(6~48)mm	圆柱棒:U =0.005mm, k =2;专用样板:U =0.008mm, k =2;宽座直角尺:U =1.5 μm, k =2	烟台市计量所 长 校字第 2200129 号	2023/1/3
万能工具显微镜	(0～200)mm	MPE:≤±(1+L/100) μm	烟台市计量所 长 检字第 2200301 号	2023/1/3

检定地点和环境条件：

Place and environmental conditions of the verification

地点： Place 新苑路 17 号 3 号楼 109 室 温度： Temperature 20.2℃ 湿度： Humidity 46.0%RH

其他说明： Remarks /

说明：1、未经本所批准，部分采用本证书内容无效。

Partly using this certificate will not be admitted unless allowed by the lab.

2、本证书检定结果仅对本次检定的测量仪器有效。

The results are valid only for the measuring instrument verificated.

检 定 结 果

Results of the verification

序号	检定项目	检定记录	检定结果
1	外观	无影响其计量性能的缺陷	合格
2	各部分相互作用	尺框：合格　紧固螺丝：松紧适当	合格
3	多用尺指标线棱边至主尺刻线面距离	表面距离：≤0.3mm	合格
4	刻线宽度和宽度差	刻线宽度：(0.15±0.05)mm，宽度差：0.05mm	合格
5	测量面的表面粗糙度	≤Ra0.8μm	合格
6	测量面的平面度	≤0.02mm	合格
7	角度样板及测角尺的示值误差	≤±30′	合格
8	主尺边缘刻线的示值误差	≤±0.2mm	+0.1mm
9	高度尺示值误差	≤±0.3mm	+0.1mm
10	咬边深度尺示值误差	≤±0.1mm	-0.1mm
11	宽度尺示值误差	≤±0.3mm	-0.1mm
12	间隙尺示值误差	≤±0.2mm	+0.03mm

以下空白/Following blank

1、我所仅对加盖“烟台市计量所检定专用章”的完整证书负责。
2、本证书的检定结果仅对本次所检定的计量器具有效。
3、被检定计量器具修理后，应立即重新检定。
4、在使用过程中，如对被检定计量器具的技术指标产生怀疑，请重新检定。

海阳市检验检测中心

检 定 证 书

证书编号： H02-2021-0345 号

送 检 单 位	中国核工业二四建设有限公司
计量器具名称	游标卡尺 Vernier caliper
型 号/ 规 格	（0-200）mm
出 厂 编 号	10541
制 造 单 位	哈尔滨量具刃具集团有限责任公司
检 定 依 据	JJG30-2012 《通用卡尺检定规程》
检 定 结 论	准予该器具作合格使用

批 准 人 [illegible]

（检定专用章）

核 验 员 [illegible]

检 定 员 [illegible]

检 定 日 期 2021 年 12 月 03 日

有 效 期 至 2022 年 12 月 02 日

计量检定机构授权证书号：（鲁）海计授20150001号
地址：海阳市海阳路247号
传真：0535-3266577
电话：0535-3222074
邮编：265100
EMAIL:haiyangjls@163.com

海阳市检验检测中心

计量标准名称	测量范围	不确定度或准确度等级或最大允许误差	计量标准证书号	有效期至
卡尺量具检定装置	（0-500）mm	5等	[2015]烟计量标计证字第027号	2023-05-14

温度： 20℃ 湿度： 50%RH 大气压 /

检定结果

检定项目		检定结果
外观		合格
各部分相互作用		符合技术要求
各部分相互位置		符合技术要求
标尺标记的宽度及宽度差		/
测量面的表面粗糙度		合格
测量面的平面度		合格
圆弧内量爪的基本尺寸偏差和平行度		/
刀口内量爪的平行度		/
零值误差	“零”标记	0
	“尾”标记	0
示值变动性		/
漂移		/
示值误差	示值误差	+0.02
	细分误差	/

以下空白

下次送检请带此证

海阳市检验检测中心

检 定 证 书

证书编号：H51-2021-0013 号

送 检 单 位	中国核工业二四建设有限公司
计量器具名称	红外线测温仪 Infrared thermometer
型 号/ 规 格	62MAX+
出 厂 编 号	34490816WS
制 造 单 位	FLUKE
检 定 依 据	JJG856-2015 《工作用辐射温度计检定规程》
检 定 结 论	准予该器具作合格使用

批 准 人 陈柯

（检定专用章）

核 验 员 陈柯

检 定 员 董毅

检 定 日 期 2021 年 11 月 16 日

有 效 期 至 2022 年 11 月 15 日

计量检定机构授权证书号：（鲁）海计授20150001号
地址：海阳市海阳路247号
传真：0535-3266577
电话：0535-3222074
邮编：265100
EMAIL:haiyangjls@163.com

海阳市检验检测中心

计量标准名称	测量范围	不确定度或准确度等级或最大允许误差	计量标准证书号	有效期至
辐射温度计检定装置	（50～600）℃	铂电阻温度计：二等 标准铂铑10—铂热电偶：一等	[2017]烟计量标证字第034号	2021-11-23

温度：　　20℃　　湿度：　　50%RH

检定结果

检定点（℃）	标准示值（℃）	被检示值（℃）	误差
100	95.4	95.4	0.0
200	195.2	195.3	0.1
300	295.4	295.6	0.2
400	396.3	396.8	0.5
500	496.3	497.4	1.1

以下空白

*下次送检请带此证

海阳市检验检测中心

检 定 证 书

证书编号：H38-2022-0155 号

送 检 单 位	中国核工业二四建设有限公司
计量器具名称	温湿度计Hygrothermograph
型 号/ 规 格	WS2080B
出 厂 编 号	/
制 造 单 位	天津市科辉仪表厂
检 定 依 据	JJG205-2005 《机械式温湿度计检定规程》
检 定 结 论	准予该器具作合格使用

批 准 人 程伟平

（检定专用章）

核 验 员 程伟平

检 定 员 [illegible]

检 定 日 期 2022 年 05 月 20 日

有 效 期 至 2023 年 05 月 19 日

计量检定机构授权证书号：（鲁）海计授20150001号
地址：海阳市海阳路247号
传真：0535-3266577
电话：0535-3222074
邮编：265100
EMAIL:haiyangjls@163.com

海阳市检验检测中心

计量标准名称	测量范围	不确定度或准确度等级或最大允许误差	计量标准证书号	有效期至
机械式温湿度计检定装置	温度：(0-60)℃;湿度：(30-90)%RH	二级	[2016]烟计量标计证字第027号	2023-05-14

检定时环境条件： 温度： 20℃ 湿度： 50%RH

检定结果

检定结果： 合格

1）外观： 合格

以下空白

注：下次送检请带此证

山东中准检测技术有限公司

SHANDONG ZHONGZHUN DETECTION TECHNOLOGY CO.,LTD.

中准检测 ZHONG ZHUN TEST

中国认可 国际互认 校准 CALIBRATION CNAS L10994

校 准 证 书

CALIBRATION CERTIFICATE

证 书 编 号 ： ZZTDX202202210003
Certificate No.

2022000981 1

客 户 名 称 ： 四川中核艾瑞特工程检测有限公司
Name Customer

客 户 地 址 ： 山东省海阳市深圳街50号
Address of Customer

器 具 名 称 ： 超声探伤机
Name of Instrument

Ultrasonic flaw detector

型 号 规 格 ： CTS-9008
Type/Specification

制 造 单 位 ： SIUI
Manufacturer

仪 器 编 号 ： 539330121050
Serial No.

管 理 编 号 ： /
Manage No.

山东中准检测技术有限公司 校准专用章 (Stamp)

扫一扫查真伪

批准人 ： 刘伟
Authorized by

接收日期： 2022 年 02 月 21 日
Date of acceptance Year Month Day

核验员 ： 程泽洋
Checked by

校准日期： 2022 年 02 月 21 日
Date Calibration Year Month Day

校准员 ： 柳寒
Tested by

发布日期： 2022 年 02 月 22 日
Date of issue Year Month Day

地址：山东省威海市火炬高技术产业开发区火炬路213号B-501
Address: Room 501, 213 Torch Road, New High-tech Development Zone, Weihai, Shandong
联系电话（Tel.）：0631-3665665 传真（Fax）：0631-3665665
网址（http）：www.zztlab.com 邮政编码（Postcode）：264209

校 准 说 明
DIRECTIONS OF CALIBRATION

证书编号： ZZTDX202202210003
Certificate No.

1.证书中“P”、“合格”代表测量结果在允许范围内，“F”、“不合格”代表测量结果不在允许范围内，“N/A”代表不适用。
"P"and "Pass" in this certificate stand for"Low Limit≤the measruerd value≤High Limit","F"and "Fail" stand for"the measruerd value<Low Limit or the measruerd value>High Limit","N/A"stands for "Not Applicable".

2.本次校准的技术依据：
Technical basis for this calibration:

JJG 746-2004 《超声探伤仪检定规程》 Verification Regulation for Ultrasonic Flaw Detectors

3.校准用所使用的主要测量标准：
The main measurement standards used during the calibration:

名称 Equipment Name	测量范围 measuring range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Maximum Permissible Error	设备编号 Equipment No	溯源单位/证书号 Traceability Unit/Certificate Number	有效期至 Due Date
函数信号发生器	频率1mHz～100MHz 幅度20 mVp-p～20Vp-p	频率：U_{rel} =5.0×10⁻⁶ 频响：U_{rel} =0.5% 直流电压：U_{rel} =0.2% 上升时间：U_{rel} =0.48ns 幅值：U_{rel} =0.5% k=2	C020597	山东中准检测技术有限公司 /ZZTDX20210913001B	2022-09-12
衰减器	0.1dB～101dB	U=0.32dB k=2	630305001	深圳中恒检测技术有限公司 /ZHDX202112200002	2022-12-19

4. 校准地点、环境条件(Place and environmental conditions of the calibration)：

地点 Place 本公司电学实验室 温度 Temperature 19.4 ℃ 相对湿度 Relative Humidity 45 %

5. 未经本机构书面许可，不得部分复制本证书。本证书分离使用无效。
This certificate shall not be reproduced except in full, if not allowed by the laboratory.Invalid for separation using.

6.本校准结果，仅对受校样品的本次校准有效。
It's Effect That The Results Of This Report Relate Only To The Sample(S) Calibrated.

校准数据/结果

Data/Results of Calibration

证书编号：ZZTDX202202210003
(Certificate No.)

1、外观及功能正常性检查：正常

		技术要求
2、水平线性误差：	1.0%	≤2%
3、衰减器衰减误差：	-0.8dB/12dB	每12dB的误差不超过±1dB
4、垂直线性误差：	2.7%	≤6%
5、动态范围校准：	31dB	≥30dB
6、电噪声电平：	15%	≤20%
7、探伤灵敏度余量：	65dB	≥62dB
8、分辨力：	30dB	≥26dB

备注：(Notes)

1. 本次测量结果不确定度：水平线性 U=0.8% k=2 衰减误差 U=0.1dB k=2
垂直线性 U=1.8% k=2

2. 依据《JJF1059.1-2012测量结果不确定度评定与表示》进行测量结果不确定度评定。评定结果以包含因子k的扩展不确定度U或相对扩展不确定度U_{rel}表示。

The evaluation was made according to JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Measurement.The evaluation results were expressed by the extended uncertainty U or relative extended uncertainty U_{rel} with a coverage factor k.

3. 建议复校时间间隔： 12 个月

It is suggested that the time interval for rechecking should be as follows: 12 Months

(以下空白)

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山东中准检测技术有限公司

SHANDONG ZHONGZHUN DETECTION TECHNOLOGY CO.,LTD.

中准检测 ZHONG ZHUN TEST

中国认可 国际互认 校准 CALIBRATION CNAS L10994

校 准 证 书

CALIBRATION CERTIFICATE

证 书 编 号 ： ZZTDX202202220005
Certificate No.

20220009610

客 户 名 称 ： 四川中核艾瑞特工程检测有限公司
Name Customer

客 户 地 址 ： 山东省海阳市深圳街50号
Address of Customer

器 具 名 称 ： 磁粉探伤机
Name of Instrument

Magnetic defect detector

型 号 规 格 ： B310
Type/Specification

制 造 单 位 ： U. S. A
Manufacturer

仪 器 编 号 ： /
Serial No.

管 理 编 号 ： /
Manage No.

山东中准检测技术有限公司 校准专用章

校准专用章
(Stamp)

扫一扫查真伪

批准人 ： 刘伟
Authorizer by

接 收 日 期 ： 2022 年 02 月 22 日
Date of acceptance Year Month Day

核验员 ： 柳勇
Checked by

校 准 日 期 ： 2022 年 02 月 22 日
Date Calibration Year Month Day

校准员 ： 蒋旭
Tested by

发 布 日 期： 2022 年 02 月 23 日
Date of issue Year Month Day

地址：山东省威海市火炬高技术产业开发区火炬路213号B-501
Address: Room 501, 213 Torch Road, New High-tech Development Zone, Weihai, Shandong
联系电话（Tel.）：0631-3665665 传真（Fax）：0631-3665665
网址（http）：www.zztlab.com 邮政编码（Postcode）：264209

校 准 说 明
DIRECTIONS OF CALIBRATION

证书编号： ZZTDX202202220005
Certificate No.

1. 证书中“P”、“合格”代表测量结果在允许范围内，“F”、“不合格”代表测量结果不在允许范围内，“N/A”代表不适用。
"P"and "Pass" in this certificate stand for"Low Limit≤the measruerd value≤High Limit","F"and "Fail" stand for"the measruerd value<Low Limit or the measruerd value>High Limit","N/A"stands for "Not Applicable".
2.本次校准的技术依据：
Technical basis for this calibration:
JJF 1458-2014 《磁轭式磁粉探伤机校准规范》 Calibration Specification for Magnetic Yoke Detectors

3.校准用所使用的主要测量标准：
The main measurement standards used during the calibration:

名称 Equipment Name	测量范围 measuring range	不确定度/准确度等级/最大允许误差 Uncertainty/Accuracy Class/Maximum Permissible Error	设备编号 Equipment No	溯源单位/证书号 Traceability Unit/Certificate Number	有效期至 Due Date
标准测力仪	(20～200)N	0.1级	HHFA-V00121147	广州计量检测技术研究院/LC202107835	2022-07-07

4. 校准地点、环境条件(Place and environmental conditions of the calibration)：

地点 Place 本公司电学实验室 温度 Temperature 19.6 ℃ 相对湿度 Relative Humidity 44 %

5. 未经本机构书面许可，不得部分复制本证书。本证书分离使用无效。
This certificate shall not be reproduced except in full，if not allowed by the laboratory.Invalid for separation using.

6.本校准结果，仅对受校样品的本次校准有效。
It's Effect That The Results Of This Report Relate Only To The Sample(S) Calibrated.

校准数据/结果

Data/Results of Calibration

证书编号：ZZTDX202202220005
(Certificate No.)

1、外观以及一般性检查：正常
In view of External and Generality check : Pass

2、整机对地绝缘电阻： 2.5MΩ

3、提升力校准： 54.8N 可提起 测量不确定度： U_{rel}= 1.6% k=2

4、灵敏度： A30清晰可见

备注 (Notes)：

1. 依据《JJF1059. 1-2012测量结果不确定度评定与表示》进行测量结果不确定度评定。评定结果以包含因子k的扩展不确定度U或相对扩展不确定度U_{rel}表示。

The evaluation was made according to JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Measurement.The evaluation results were expressed by the extended uncertainty U or relative extended uncertainty U_{rel} with a coverage factor k.

2. 建议复校时间间隔： 12 个月

It is suggested that the time interval for rechecking should be as follows: 12 Months

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SECTION 4. Fixing 1

SECTION 4. Fixings 1

4-A:

Material Certs

List of Material Certificates

No.	Position	Description	Mill certificate No.	Heat No.	Mill Company	Grade
1	NC3	M30*3.5p	20200706-068	N200503AW05	TSING TUO GROUP CO.,LTD	316
2	Heat Bolt	M30*3.5P*100mmL	20200706-068	N200503AW05	TSING TUO GROUP CO.,LTD	316
3	L Washer	SCN1000	191204017	1912020	TZhenshi Group Eastern Special Steel Co.,Ltd	316
4	Heat Bolt	M30*3.5P*90mmL	20200706-068	N200503AW05	TSING TUO GROUP CO.,LTD	316
5	Round Washer	M30*56*33*4mm	191121017	1915414	TZhenshi Group Eastern Special Steel Co.,Ltd	316
6	NC3	M36*4p	20220217-023	S211008AA03	TSING TUO GROUP CO.,LTD	316
7	Heat Bolt	M36*4P*100mmL	20220217-023	S211008AA03	TSING TUO GROUP CO.,LTD	316
8	Round Washer	M36*66*39*5mm	191204017	1916186	TZhenshi Group Eastern Special Steel Co.,Ltd	316

TRELLEBORG

青拓集团有限公司
TSING TUO GROUP CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：福建省福安市湾坞镇经济开发区
ADD.: Economic Development Zone of WanWu, Fu'an Fujian
邮编：P.C.：355006
电话：Tel.：0593-5077091
传真：Fax： 0593-5077091

制造厂：福建青拓实业股份有限公司
Factory: Fujian Tsingtuo Nickel Industry Co., Ltd.

订货单位 Order unit：青业

收货单位 Receiving unit：

产品名称 Products:不锈钢棒

执行标准 Execution standard： Q/TTXB001-2018

质保书号 Certificate №： 20200706-068

签发日期 Issue Date：2020/7/6

炉号	牌号	规格	支数	重量	化学成分 Chemical Composition, %										拉伸试验 Tensile Test			硬度试验	判定
Heat №	Steel Grade	Size mm	Pcs	Weight kg	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Ti	抗拉强度 (Mpa)	屈服强度 Rp0.2% (Mpa)	伸长EL (%)	hardness testing (HRB)	
N200606AV06	316L	16		18662	0.020	0.343	0.93	0.034	0.0116	16.49	10.04	2.04							合格
N200417AV06	316L	18		19364	0.013	0.311	0.92	0.031	0.0107	16.29	10.04	2.02							合格
N200307AT02	316L	20		17934	0.019	0.376	0.96	0.033	0.0108	16.28	10.03	2.03							合格
N200417AV08	316L	17		14682	0.012	0.336	0.92	0.030	0.0132	16.38	10.01	2.02							合格
N200407AX01	316L	19		12367	0.014	0.316	0.94	0.029	0.0099	16.25	10.03	2.02							合格
N200503AW07	316L	24		19358	0.011	0.356	1.01	0.033	0.0084	16.39	10.02	2.01							合格
N200417AS06	316L	25		20697	0.017	0.360	0.91	0.030	0.0188	16.35	10.04	2.03							合格
N200417AS09	316L	28		21971	0.015	0.343	0.94	0.026	0.0096	16.33	10.05	2.04							合格
N200503AW05	316L	30		20631	0.014	0.352	0.96	0.034	0.0096	16.30	10.05	2.02							合格
N200503AW07	316L	32		18634	0.011	0.356	1.01	0.033	0.0084	16.39	10.02	2.01							合格
N200503AV02	316L	35		15236	0.017	0.344	0.92	0.033	0.0183	16.37	10.05	2.03							合格
N200503AV06	316L	38		17631	0.015	0.35	0.95	0.032	0.0106	16.27	10.05	2.03							合格
N200407AW05	316L	44		15697	0.011	0.374	0.93	0.035	0.0101	16.30	10.04	2.03							合格
N200418AS02	316L	56		15987	0.014	0.33	0.98	0.026	0.0080	16.29	10.02	2.03							合格

I.熔炼方式 Melting Process ：EAF+AOD II.交货状态 Condition of Delivery ：热轧 Hot rolled

1. 尺寸公差 Size tolerance: 合格 OK 2. 表面质量 Surface quality：合格 OK 3.低倍检验 Macroexamination: 合格 OK 4.放射性检验 Radioactivity test：合格OK

1. 兹证明所列产品经检验均符合合同和标准要求。
The materrial listed above has been tested and complies with the terms of the contract & the standard.
2. 如有质量异议，请来电来函说明情况，并告知质量证明书编号。
If any quality query, please clarify via phone call or fax, indicating the certificate number.
3. 材料制造厂批准证书：PED 4.3 (2014/68/EU) 和AD2000 (Merkblatt W0 Sowie EN 764-5, Absatz 4.2) 证书编号：DGR-0036-QS-W 784/2017/MUC；ASME材料认证证书编号：IS-SHA-250192。
中国船级社 (CCS) 证书编号：FZ16W00004_美国船级社 (ABS) 证书编号：FDRY-T1404881 法国船级社(BV)证书编号：SMS.W.II./106422/A.0 挪威船级社 (DNV) 证书编号： AMMM000006R。
Certificates of approval of manufacturer of materials: PED 4.3 (2014/68/EU) and AD2000 (W2/W10) Certificate No.: DGR-0036-QS-W 804/2017/MUC; ASME Certificate No.: IS-SHA-251078.
China Classification Society(CCS)Certificate No.: FZ16W00004 American Bureau of Shipping(ABS)Certificate No.: FDRY-T1404881
Bureau Veritas (BV) Certificate No.: SMS.W.II./106422/A.0 Det Norske Veritas(DNV)Certificate No.: AMMM000006R.

联系电话 Tel.：0593-5077737

编制：张茹 Typed by　检验员：肖鹏飞 Surveyor　质保工程师： Quanlity engineer

日期 Date：2020 年 7 月6日

福建青拓实业股份有限公司 长材质量专用章

产品质量检验专用章（复印无效）
Quality insp.Stamp (copy is invalid)

TRELLEBORG

振石集团东方特钢有限公司
ZHENSHI GROUP EASTERN SPECIAL STEEL CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：浙江省嘉兴市南湖区新丰镇工业功能区（北区）
ADD: (NORTH) INDUSTRIAL FUNCTION ZONE, XINFENG TOWN, NANHU DISTRICT, JIAXING CITY, ZHEJIANG PROVINCE, CHINA
电话TEL：+86-573-88620897　　邮编(P.C)：314500

订货单位 CUSTOMER	江苏金珊瑚科技有限公司	产品名称 PRODUCT	热轧不锈钢带 HOT-ROLLED STAINLESS STEEL COILS	证书号 CERTIFICATE NO.	191121017
收货单位 PURCHASER	江苏金珊瑚科技有限公司	合同号 CONTRACT NO.	ESS(XS)/XS-JSHZ20191115187	交货日期 DATE OF DELIVERY	2019年11月20日
牌　号 GRADE	316L	订单号 ORDER NO		签发日期 DATE OF ISSUE	2019年11月21日
标准 SPECIFICATION	ASTM A240M 17	交货状态 SOLUTION TREATED AND PICKLING	NO.1	ISO9001证书号 ISO9001 CERTIFICATE NUMBER	CN10/21315

序号	钢卷/板号 COIL/PLATE NO.	炉号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	件数 NUMBER	重量 WEIGHT	化学成分（熔炼分析）% CHEMICAL COMPOSITION (HEAT ANALYSIS) % C	Si	Mn	P	S	Cr	Ti	Ni	Mo	N			
			mm			件	kg													
1	119149970500B	1914997	8.75	1525	C	1	10155	0.025	0.48	1.16	0.031	0.004	16.17		10.10	2.03	0.043			
2	119154472100	1915447	9.75	1525	C	1	25825	0.023	0.44	1.15	0.029	0.005	16.50		10.04	2.00	0.045			
3	119140250300	1914025	15.45	1530	C	1	26945	0.024	0.47	1.20	0.024	0.004	16.70		10.07	2.03	0.039			
4	119154140300B	1915414	4.75	1525	C	1	10445	0.028	0.43	1.14	0.026	0.002	16.11		10.08	2.01	0.047			
5	119158230300B	1915823	7.75	1525	C	1	9990	0.025	0.44	1.13	0.032	0.003	16.16		10.08	2.02	0.048			
合计(TOTAL)						5	83360													

序号	钢卷/板号 COIL/PLATE NO.	拉伸试验TENSILE TEST 屈服强度 (Y.S.)	抗拉强度 (T.S.)	断后伸长率(EL.)	硬度 HARDNESS		冲击试验 IMPACT TEST 方向	宽度	温度	吸收功（J） ABSORBED ENERGY (J)				晶间腐蚀 INTERGRANULAR CORROSION TEST
		Rp0.2	Rm	A50	HRB		DIR.	W.	TEM.	KV				
		Mpa		%	1	2	L./TR.	mm	℃	1	2	3	AVE.	
1	119149970500B	281	607	68	82	81								
2	119154472100	282	562	73	86	87								
3	119140250300	294	604	71	87	86								
4	119154140300B	302	587	70	82	81								
5	119158230300B	295	594	70	82	81								

公司印章 Company Seal

备注 REMARKS	1.本产品已通过ISO9001质量认证许可(THE PRODUCTS HAVE PASSED THE ISO9001 QUALITY CERTIFICATION LICENSE.) 2.谨保证以上所有的内容真实准确(WE HEREBY CERTIFY THE ABOVE STATEMENT TO BE TRUE AND CORRECT IN EVERY DETAIL.) 3.热处理（HEAT TREATMENT）：1050-1100℃固溶-水冷处理（SOLUTION 1050-1100℃ QUENCHING IN WATER） 4.材料无放射性污染（The material is free from Radioactive Contamination.） 5.产品的尺寸公差，外观检查符合ASTM A480M相关要求（Dimension control, visual inspection acc.to ASTM A480M.）
注释 NOTES	TR.：(Transverse)横向，L.：(Longitudinal)纵向，DIR.：(Direction)方向，W.：(Width)宽度，TEM.：(Temperature)温度，EL.：(Elongation)断后伸长率，Y.S.：(Yield Strength)屈服强度，T.S.：(Tensile Strength)抗拉强度，AVE. 平均值

质量负责人 QUALITY MANAGER

TRELLEBORG

青拓集团有限公司
TSINGSHAN TSING TUO GROUP CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：福建省福安市湾坞镇经济开发区
ADD：Economic Development Zone of WanWu, Fu'an Fujian
电话Tel.：0593-6600575
传真Fax：0593-5077091
邮编PC：355006

制造厂：福建青拓实业股份有限公司
Factory: Fujian Tsingtuo Nickel Industry Co. Ltd.
订货单位 Order unit：浙江青业特钢有限公司
产品名称 Products:不锈钢棒

收货单位 Receiving unit：
执行标准 Execution standard：Q/TTXB001-2021

质保书号 Certificate №：20220217-023
签发日期 Issue Date：2022/2/17

炉号	牌号	规格	支数	重量	化学成分 Chemical Composition, %										拉伸试验 Tensile Test			硬度试验	判定
Heat №	Steel Grade	Size mm	Pcs	Weight kg	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Ti	抗拉强度 (Mpa)	屈服强度 Rp0.2% (Mpa)	伸长EL (%)	hardness testing (HBW)	
S210916AA10	316L	16		6165	0.022	0.318	0.94	0.034	0.0187	16.41	10.07	2.08	0.17						合格
S211106AA23	316L	17		8270	0.021	0.342	0.97	0.033	0.0167	16.38	10.02	2.06	0.23						合格
S220107AA19	316L	18		5179	0.015	0.393	1.00	0.032	0.0086	16.28	10.02	2.03	0.08						合格
S211222AA11	316L	19		7146	0.014	0.482	0.92	0.029	0.0059	16.58	10.05	2.00	0.08						合格
S211222AA12	316L	20		8462	0.013	0.375	0.98	0.029	0.0064	16.20	10.04	2.09	0.08						合格
S220107AA17	316L	21		12236	0.015	0.368	0.93	0.032	0.0104	16.24	10.02	2.05	0.08						合格
S211017AA07	316L	22		9364	0.015	0.326	0.95	0.033	0.0050	16.43	10.04	2.01	0.16						合格
S210916AA12	316L	23		10084	0.009	0.390	0.93	0.034	0.0076	16.33	10.03	2.06	0.17						合格
S220107AA16	316L	25		4581	0.019	0.438	0.96	0.032	0.0116	16.05	10.01	2.04	0.09						合格
S211004AA14	316L	26		7284	0.015	0.444	0.98	0.031	0.0086	16.18	10.10	2.09	0.11						合格
S211017AA41	316L	27		2212	0.027	0.560	0.90	0.033	0.0093	16.28	10.05	2.01	0.33						合格
S211114AA02	316L	28		6816	0.016	0.385	0.97	0.035	0.0078	16.26	10.02	2.02	0.16						合格
S211114AA09	316L	30		7053	0.017	0.383	0.97	0.035	0.0082	16.28	10.03	2.04	0.16						合格
S211008AA03	316L	36		11063	0.017	0.353	1.00	0.036	0.0100	16.16	10.02	2.07	0.14						合格

I.熔炼方式 Melting Process：EAF+AOD　II.交货状态 Condition of Delivery：热轧 Hot rolled

1. 尺寸公差 Size tolerance: 合格 OK　2. 表面质量 Surface quality：合格 OK　3.低倍检验 Macroexamination: 合格 OK　4.放射性检验 Radioactivity test：合格OK

1. 兹证明所列产品经检验均符合合同和标准要求。
   The materrial listed above has been tested and complies with the terms of the contract & the standard.
2. 如有质量异议，请来电来函说明情况，并告知质量证明书编号。
   If any quality query, please clarify via phone call or fax, indicating the certificate number.
3. 本公司取得资质证书：1.ISO 9001；2.IATF(TS) 16949；3.压力设备指令 PED 4.3，AD2000 W0和ASME材料认证
   Following quality certification is available: 1.ISO 9001; 2.IATF(TS) 16949; 3.Pressure Equipment Directive 4.3, AD2000 W0 and ASME

编制：张茹　Typed by
判定员：蒋东林　Surveyor
批准：　Quanlity engineer
日期 Date：2022 年 2 月 17 日

Quality Insp.Stamp (copy is invalid)

TRELLEBORG

振石集团东方特钢有限公司
ZHENSHI GROUP EASTERN SPECIAL STEEL CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址:浙江省嘉兴市南湖区新丰镇工业功能区（北区）
ADD: (NORTH) INDUSTRIAL FUNCTION ZONE, XINFENG TOWN, NANHU DISTRICT, JIAXING CITY, ZHEJIANG PROVINCE, CHINA
电话TEL: +86-573-88620697　　邮编(P.C): 314500

订货单位 CUSTOMER	江苏金珊瑚科技有限公司	产品名称 PRODUCT	热轧不锈钢带 HOT-ROLLED STAINLESS STEEL COILS	证书号 CERTIFICATE NO.	191204017
收货单位 PURCHASER	江苏金珊瑚科技有限公司	合同号 CONTRACT NO.	ESS(XS)/XS-JSHS20191203-115	交货日期 DATE OF DELIVERY	2019年12月3日
牌　号 GRADE	316L	订单号 ORDER NO		签发日期 DATE OF ISSUE	2019年12月4日
标准 SPECIFICATION	ASTM A240M-17	交货状态 SOLUTION TREATED AND PICKLING	NO.1	ISO9001证书号 ISO9001 CERTIFICATE NUMBER	CN10/21015

序号	钢卷/板号 COIL/PLATE NO.	炉号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	件数 NUMBER	重量 WEIGHT	化学成分（熔炼分析）/% CHEMICAL COMPOSITION (HEAT ANALYSIS) /% C	Si	Mn	P	S	Cr	Ti	Ni	Mo	N			
			mm			件	kg													
1	119146880400	1914688	7.75	1525	C	1	20505	0.018	0.44	1.16	0.030	0.005	16.09		10.08	2.02	0.053			
2	1191602002008	1916020	6.75	1525	C	1	10885	0.020	0.44	1.13	0.026	0.002	16.10		10.08	2.01	0.046			
3	119161840500	1916184	3.75	1525	C	1	20615	0.017	0.50	1.18	0.022	0.004	16.13		10.07	2.03	0.052			
4	1191618602004	1916186	5.75	1525	C	1	10115	0.020	0.45	1.19	0.024	0.002	16.11		10.00	2.01	0.043			
5	119129470400	1912947	10.75	1530	C	1	26825	0.025	0.45	1.23	0.021	0.004	16.56		10.10	2.06	0.044			
合计(TOTAL)						5	88945													

序号	钢卷/板号 COIL/PLATE NO.	拉伸试验TENSILE TEST 屈服强度 (Y.S.) Rp0.2	抗拉强度 (T.S.) Rm	断后伸长率(EL.) A50	硬度 HARDNESS HRB 1	2	ISO-V冲击试验 IMPACT TEST 方向 DIR.	宽度 W.	温度 TEM.	吸收功（J） ABSORBED ENERGY (J) KV 1	2	3	AVE.	晶间腐蚀 INTERGRANULAR CORROSION TEST
		Mpa		%			L./TR.	mm	℃					
1	119146880400	270	617	65	82	81								
2	1191602002008	293	600	72	82	81								
3	119161840500	274	606	69	81	81								
4	1191618602004	300	619	72	83	82								
5	119129470400	309	612	72	85	83								

公司印章
Company Seal

备注 REMARKS	1. 本产品已通过ISO9001质量认证许可(THE PRODUCTS HAVE PASSED THE ISO9001 QUALITY CERTIFICATION LICENSE.) 2. 谨保证以上所有的内容真实准确(WE HEREBY CERTIFY THE ABOVE STATEMENT TO BE TRUE AND CORRECT IN EVERY DETAIL.) 3. 热处理（HEAT TREATMENT）:1050-1100℃固溶+水冷处理（SOLUTION 1050-1100℃ QUENCHING IN WATER） 4. 材料无放射性污染（The material is free from Radioactive Contamination.） 5. 产品的尺寸公差、外观检查符合ASTM A480M相关要求（Dimension control,visual inspection acc.to ASTM A480M ）
注释 NOTES	TR.：(Transverse)横向, L.：(Longitudinal)纵向, DIR.：(Direction)方向, W.：(Width)宽度, TEM.：(Temperature)温度, EL.：(Elongation)断后伸长率, Y.S.：(Yield Strength)屈服强度, T.S.：(Tensile Strength)抗拉强度, AVE.：平均值

质量负责人
QUALITY MANAGER

SECTION 4. Fixings 1

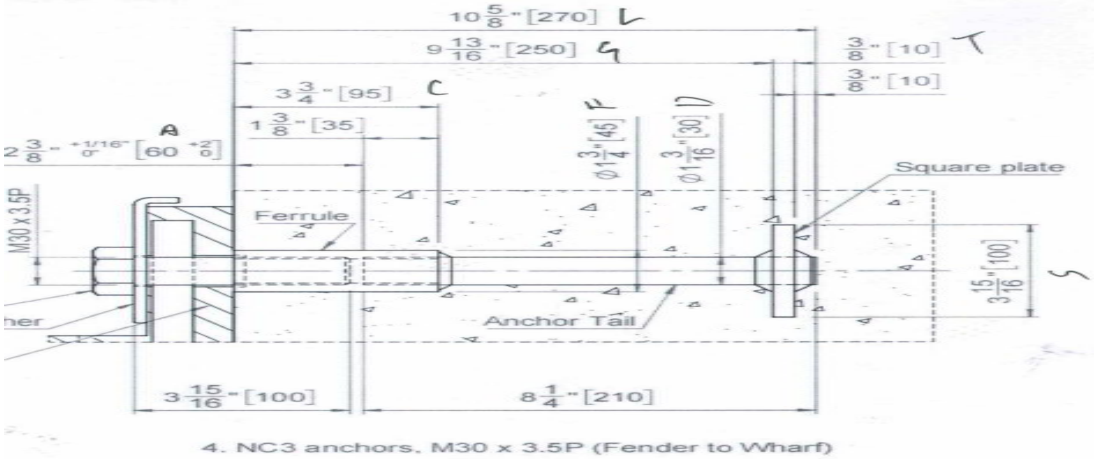
4-B:

Dimensional Report

TRELLEBORG

Dimensional Inspection Report

Product Description	NC3	Size	M30x3.5P
Quantity	78 Pcs	Material	316



4. NC3 anchors, M30 x 3.5P (Fender to Wharf)

Size	M30	L	G	T	C	D	F	S	A
No.	2D	270	250	10	95	30	45	100	60
1	Actual	273.2	253.5	9.58	97.1	30.3	44.72	100.5	62.2
2	Actual	273.24	253.3	9.55	97.12	30.32	44.7	100.55	62.23
3	Actual	273.5	253.32	9.5	96.2	30.35	44.78	100.6	63.2

Size	M30	L	G	T	C	D	F	S	A
No.	2D	270	250	10	95	30	45	100	60
1	Actual	273.55	253.4	9.56	96.26	30.28	44.75	100.85	63.34
2	Actual	273.6	253.25	9.58	96.4	30.4	44.73	101.2	63.4
3	Actual	273.62	253.55	9.6	96.35	30.38	44.7	101.3	63.45

Size	M30	L	G	T	C	D	F	S	A
No.	2D	270	250	10	95	30	45	100	60
1	Actual	273.7	253.6	9.55	96.45	30.25	44.65	100.92	63.5
2	Actual	273.68	253.57	9.5	96.38	30.3	44.72	101.35	63.48
3	Actual	273.76	253.42	9.56	96.25	30.32	44.76	101.24	63.42

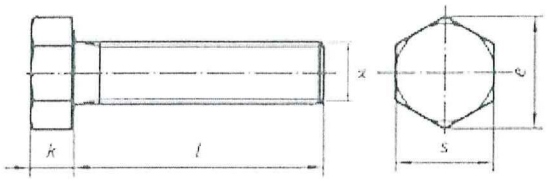
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M30*3.5P*100mmL
Quantity	78 Pcs	Material	316



Size	M30	M	l
No.	2D	30	100
1	Actual	29.6	99.15
2	Actual	29.62	99.12
3	Actual	29.61	99.2

Size	M30	M	l
No.	2D	30	100
1	Actual	29.58	99.22
2	Actual	29.63	99.3
3	Actual	29.6	99.15

Size	M30	M	l
No.	2D	30	100
1	Actual	29.64	99.32
2	Actual	29.62	99.2
3	Actual	29.59	99.24

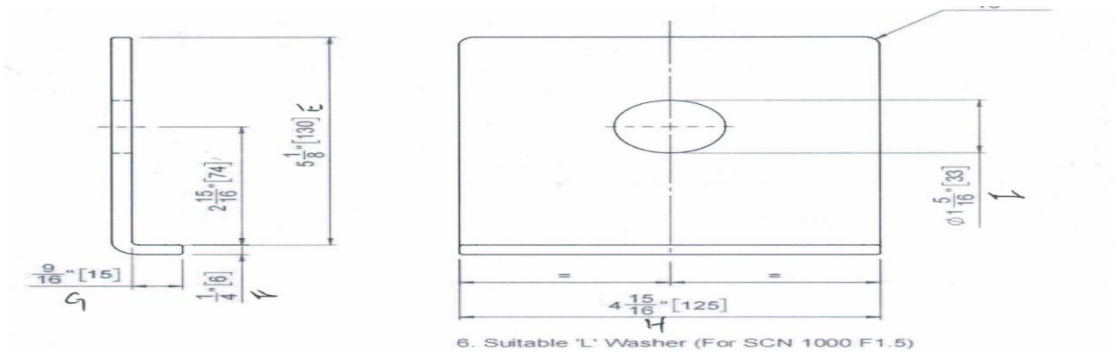
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	L Washer	Size	SCN1000
Quantity	78Pcs	Material	316



6. Suitable 'L' Washer (For SCN 1000 F1.5)

Size	SCN1000	G	H	I	E	F
No.	2D	15	126	33	130	6
1	Actual	14.5	125.4	33.06	137.1	5.87
2	Actual	14.53	125.47	33.1	137.05	5.89
3	Actual	14.6	125.3	33.12	137.2	6

Size	SCN1000	G	H	I	E	F
No.	2D	15	126	33	130	6
1	Actual	14.8	125.38	33.2	137.15	6.02
2	Actual	14.75	125.45	33.15	137.2	5.89
3	Actual	14.82	125.4	33.08	137.22	6.03

Size	SCN1000	G	H	I	E	F
No.	2D	15	126	33	130	6
1	Actual	14.88	125.5	33.12	137.08	5.89
2	Actual	14.85	125.46	33.1	137.12	5.87
3	Actual	14.78	125.34	33.14	137.23	6

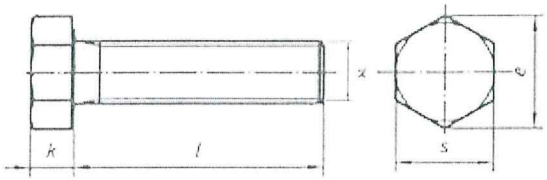
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M30*3.5P*90mmL
Quantity	78 Pcs	Material	316



Size	M30	M	l
No.	2D	30	90
1	Actual	29.48	89.26
2	Actual	29.4	89.4
3	Actual	29.43	89.57

Size	M30	M	l
No.	2D	30	90
1	Actual	29.4	89.5
2	Actual	29.43	89.52
3	Actual	29.52	89.42

Size	M30	M	l
No.	2D	30	90
1	Actual	29.46	89.5
2	Actual	29.5	89.62
3	Actual	29.48	89.64

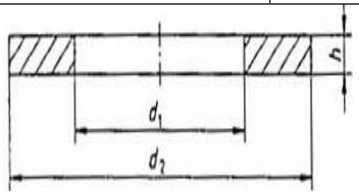
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Round Washer	Size	M30 （OD56*ID33*4mm）
Quantity	78Pcs	Material	316



Size	M30	D1	D2	H
No.	2D	33	56	4
1	Actual	33.01	56.2	3.78
2	Actual	33.02	56.17	3.95
3	Actual	33	56.21	3.8

Size	M30	D1	D2	H
No.	2D	33	56	4
1	Actual	33.04	56.15	3.82
2	Actual	33.06	56.18	3.9
3	Actual	33.03	56.1	3.95

Size	M30	D1	D2	H
No.	2D	33	56	4
1	Actual	33.02	56.16	3.81
2	Actual	33.04	56.1	3.98
3	Actual	33.06	56.22	3.78

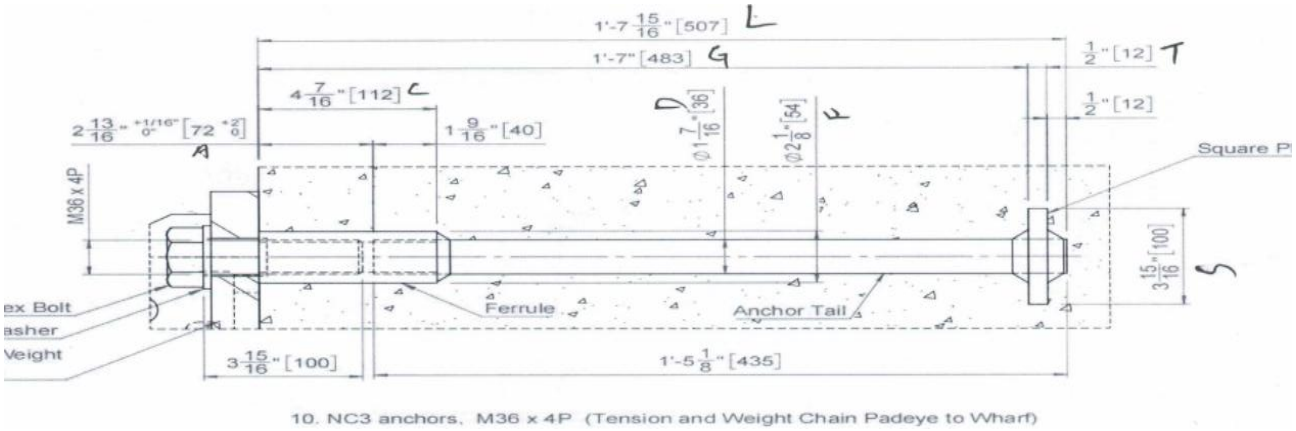
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	NC3	Size	M30x4P
Quantity	192 Pcs	Material	316



10. NC3 anchors, M36 x 4P (Tension and Weight Chain Padeye to Wharf)

Size	M30	L	G	T	C	D	F	S	A
No.	2D	507	483	12	112	36	54	100	72
1	Actual	508.8	485.2	11.46	112.8	35.2	53.8	101.08	73.7
2	Actual	509	486.4	11.4	112.89	35.4	53.85	101.2	73.71
3	Actual	508.92	488.4	11.5	112.81	35.25	53.86	101.55	74.4

Size	M30	L	G	T	C	D	F	S	A
No.	2D	507	483	12	112	36	54	100	72
1	Actual	509.5	488.65	11.43	112.78	35.5	53.82	101.78	74.42
2	Actual	509.6	488.2	11.52	112.6	35.45	53.78	101.8	73.75
3	Actual	508.85	487.6	11.48	112.75	35.52	53.8	101.65	73.65

Size	M30	L	G	T	C	D	F	S	A
No.	2D	507	483	12	112	36	54	100	72
1	Actual	508.9	487.8	11.38	112.84	35.56	53.82	101.12	74.38
2	Actual	508.75	488.5	11.4	112.76	35.6	53.8	101.23	74.25
3	Actual	508.82	488.52	11.45	112.8	35.25	53.84	100.85	74.3

30

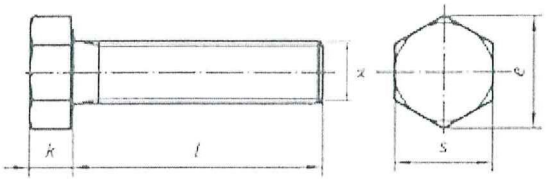
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲 Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M36x4PX100mml
Quantity	192Pcs	Material	316



Size	M36	M	l
No.	2D	36	100
1	Actual	36.1	100.3
2	Actual	36.17	100.32
3	Actual	35.75	100.25

Size	M36	M	l
No.	2D	36	100
1	Actual	35.82	100.4
2	Actual	35.9	100.42
3	Actual	35.74	100.35

Size	M36	M	l
No.	2D	36	100
1	Actual	36.15	100.45
2	Actual	36.2	100.42
3	Actual	35.98	100.3

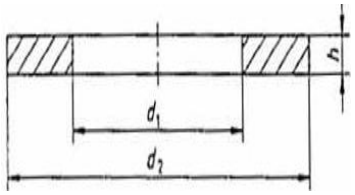
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M36 （OD66*ID39*5mm）
Quantity	192Pcs	Material	316



Size	M30	D1	D2	H
No.	2D	39	66	5
1	Actual	37.2	65.9	4.8
2	Actual	37.35	65.85	4.85
3	Actual	37.3	65.92	4.75

Size	M30	D1	D2	H
No.	2D	39	66	5
1	Actual	37.4	65.92	4.86
2	Actual	37.32	65.8	4.84
3	Actual	37.4	66.15	4.78

Size	M30	D1	D2	H
No.	2D	39	66	5
1	Actual	37.35	65.82	4.88
2	Actual	37.32	65.3	4.81
3	Actual	37.42	65.24	4.73

Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

SECTION 4. Fixings 1

4- C:

Calibration Certificates

青岛市计量技术研究院

校 准 证 书

证书编号：CJ920008598-001

客 户 名 称 ： 青岛万成锚链有限公司

客 户 地 址 ： 即墨市TCL大道7号

器 具 名 称 ： 游标卡尺

型 号 / 规 格 ： （0-1500）mm

出 厂 编 号 ： 02000223

制 造 单 位 ： 无锡锡工

接 收 日 期 ： 2020年04月07日

校 准 日 期 ： 2020年04月07日

发 布 日 期 ： 2020年04月07日

批准人：张泽武

（校准专用章）：

核验员：张泽武

校准员：王兴华

计量检定机构授权证书号： （鲁）法计（2018）37002号 电话：0532-68069221/68069222

地址：青岛市崂山区科苑纬四路77号 邮政编码：266101

传真： 0532-68069202 网址：www.qdjly.cn EMAIL：qimt16766@163.com

2018-jz-c

青岛市计量技术研究院

检 定 证 书

证书编号：CJ820007032-001

送 检 单 位 ： 青岛万成锚链有限公司

计量器具名称： 纤维卷尺

型 号 / 规 格 ： 50m

出 厂 编 号 ： /

制 造 单 位 ： 蓝特工量具

检 定 依 据 ： JJG 5-2001《纤维卷尺、测绳检定规程》

检 定 结 论 ： 1级

批准人：张泽武

（检定专用章）：

核验员：隋桂芝

检定员：李宝春

检定日期 2020 年 04 月 08 日

有效期至 2021 年 04 月 07 日

计量检定机构授权证书号： （鲁）法计（2018）37002号 电话：0532-68069221/68069222

地址：青岛市崂山区科苑纬四路77号 邮政编码：266101

传真： 0532-68069202 网址：www.qdjly.cn EMAIL：qimt16766@163.com

青岛市计量技术研究院

检 定 证 书

证书编号：CJ920008594-001

送 检 单 位： 青岛万成锚链有限公司

计量器具名称： 游标卡尺

型 号 / 规 格： (0-300)mm

出 厂 编 号： 3223

制 造 单 位： 哈量

检 定 依 据： JJG 30-2012《通用卡尺检定规程》

检 定 结 论： 合格

批准人：张泽武

核验员：张泽武

（检定专用章）：

检定员：王兴华

检定日期 2020 年 04 月 07 日

有效期至 2021 年 04 月 06 日

计量检定机构授权证书号： （鲁）法计（2018）37002号 电话：0532-68069221/68069222

地址：青岛市崂山区科苑纬四路77号 邮政编码：266101

传真： 0532-68069202 网址：www.qdjly.cn EMAIL：qimt16766@163.com

2018-jd-c

SECTION 5. Fixings 2

SECTION 5. Fixings 2

5-A:

Material Certs &
Test reports

List of Material Certificates

No.	Position	Description	Mill certificate No.	Heat No.	Mill Company	Grade
1	NC3	M39*4p	20200706-068	N200503AV06	TSING TUO GROUP CO.,LTD	316
2	Heat Bolt	M39*4P*100mmL	20200706-068	N200503AV06	TSING TUO GROUP CO.,LTD	316
3	Round Washer	M39*72*42*6mm	191204017	1912020	TZhenshi Group Eastern Special Steel Co.,Ltd	316
4	Heat Bolt	M30*3.5P*130mmL	20200706-068	N200503AW05	TSING TUO GROUP CO.,LTD	316
5	L Washer	SCN1000	191204017	1912020	TZhenshi Group Eastern Special Steel Co.,Ltd	316
6	Heat Nut	M30*3.5P	20200706-068	N200503AW05	TSING TUO GROUP CO.,LTD	316
7	Round Washer	M30*56*33*4mm	191121017	1915414	TZhenshi Group Eastern Special Steel Co.,Ltd	316
8	Heat Bolt	M30*3.5P*90mmL	20200706-068	N200503AW05	TSING TUO GROUP CO.,LTD	316
9	NC3	M36*4p	20220217-023	S211008AA03	TSING TUO GROUP CO.,LTD	316
10	Heat Bolt	M36*4p*100mmL	20220217-023	S211008AA03	TSING TUO GROUP CO.,LTD	316
11	Round Washer	M36*66*39*5mm	191204017	1916186	TZhenshi Group Eastern Special Steel Co.,Ltd	316
12	Heat Bolt	M39*4P*570mmL	20200706-068	N200503AV06	TSING TUO GROUP CO.,LTD	316
13	EC2	M39*4P*540mmL	20200706-068	N200503AV06	TSING TUO GROUP CO.,LTD	316

List of Material Certificates

No.	Position	Description	Mill certificate No.	Heat No.	Mill Company	Grade
14	Heat Nut	M39*4P	20200706-068	N200503AV06	TSING TUO GROUP CO.,LTD	316
15	Heat Bolt	M39*4P*420mmL	20200706-068	N200503AV06	TSING TUO GROUP CO.,LTD	316
16	Heat Bolt	M36*4p*410mmL	20220217-023	S211008AA03	TSING TUO GROUP CO.,LTD	316
17	Heat Nut	M36*4p	20220217-023	S211008AA03	TSING TUO GROUP CO.,LTD	316

青拓集团有限公司
TSING TUO GROUP CO., LTD.
TSINGSHAN
地址：福建省福安市湾坞镇经济开发区
ADD：Economic Development Zone of WanWu, Fu'an Fujian
邮编：P. C.：355006
电话：Tel.：0593-5077091
传真：Fax：0593-5077091

产品质量证明书
INSPECTION CERTIFICATE

制造厂：福建青拓实业股份有限公司
Factory：Fujian Tsingtuo Nickel Industry Co., Ltd.

订货单位 Order unit：青业　　收货单位 Receiving unit：

质保书号 Certificate No：20200706-068

产品名称 Products:不锈钢棒　　执行标准 Execution standard：Q/TTXB001-2018　　签发日期 Issue Date：2020/7/6

炉号	牌号	规格	支数	重量		化学成分 Chemical Composition, %									拉伸试验 Tensile Test			硬度试验	判定
Heat No	Steel Grade	Size mm	Pcs	Weight kg	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Ti	抗拉强度 (Mpa)	屈服强度 Rp0.2% (Mpa)	伸长EL (%)	hardness testing (HRB)	
N200606AV06	316L	16	18662	0.020	0.343	0.93	0.034	0.0116	16.49	10.04	2.04								合格
N200417AV06	316L	18	19364	0.013	0.311	0.92	0.031	0.0107	16.29	10.04	2.02								合格
N200307AT02	316L	20	17934	0.019	0.376	0.96	0.033	0.0108	16.28	10.03	2.03								合格
N200417AV08	316L	17	14682	0.012	0.336	0.92	0.030	0.0132	16.38	10.01	2.02								合格
N200407AX01	316L	19	12367	0.014	0.316	0.94	0.029	0.0099	16.25	10.03	2.02								合格
N200503AW07	316L	24	19358	0.011	0.356	1.01	0.033	0.0084	16.39	10.02	2.01								合格
N200417AS06	316L	25	20697	0.017	0.360	0.91	0.030	0.0188	16.35	10.04	2.03								合格
N200417AS09	316L	28	21971	0.015	0.343	0.94	0.026	0.0096	16.33	10.05	2.04								合格
N200503AW05	316L	30	20631	0.014	0.352	0.96	0.034	0.0096	16.30	10.05	2.02								合格
N200503AW07	316L	32	18634	0.011	0.356	1.01	0.033	0.0084	16.39	10.02	2.01								合格
N200503AV02	316L	35	15236	0.017	0.344	0.92	0.033	0.0183	16.37	10.05	2.03								合格
N200503AV06	316L	39	17631	0.015	0.35	0.95	0.032	0.0106	16.27	10.05	2.03								合格
N200407AW05	316L	44	15697	0.011	0.374	0.93	0.035	0.0101	16.30	10.04	2.03								合格
N200418AS02	316L	56	15987	0.014	0.33	0.98	0.026	0.0080	16.29	10.02	2.03								合格

I.熔炼方式 Melting Process：EAF+AOD　II.交货状态 Condition of Delivery：热轧 Hot rolled

1. 尺寸公差 Size tolerance：合格 OK　2. 表面质量 Surface quality：合格 OK　3.低倍检验 Macroexamination：合格 OK　4.放射性检验 Radioactivity test：合格 OK

1. 兹证明所列产品经检验均符合合同和标准要求。
The material listed above has been tested and complies with the terms of the contract & the standard.
2. 如有质量异议，请来电来函说明情况，并告知质量证明书编号。
If any quality query, please clarify via phone call or fax, indicating the certificate number.
3. 材料制造厂家准证书：PED 4.3 (2014/68/EU) 和AD2000 (Merkblatt W0 Sowie EN 764-5, Absatz 4.2) 证书编号：DGR-0036-QS-№ 784/2017/MUC；ASME材料认证证书编号：IS-SHA-250192.
中国船级社 (CCS) 证书编号：FZ16M00004美国船级社 (ABS) 证书编号：FDHY-T1404881 法国船级社(BV)证书编号：SMS№ II./106422/A.0 挪威船级社 (DNV) 证书编号：AM000000068.
Certificates of approval of manufacturer of materials: PED 4.3 (2014/68/EU) and AD2000 (№2/№10) Certificate No.: DGR-0036-QS-№ 804/2017/MUC; ASME Certificate No.: IS-SHA-250192.
China Classification Society(CCS)Certificate No.: FZ16M00004 American Bureau of Shipping(ABS)Certificate No.: FDHY-T1404881
Bureau Veritas (BV) Certificate No.: SMS № II./106422/A.0 Det Norske Veritas(DNV)Certificate No.: AM000000068.

产品质量检验专用章（复印无效）

编制：张茹　　检验员：胥鹏飞　　质保工程师：
Typed by　　Surveyor　　Quanlity engineer　　Quality insp.Stamp (copy is invalid)

日期 Date：2020 年 7 月 6日

振石集团东方特钢有限公司
ZHENSHI GROUP EASTERN SPECIAL STEEL CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：浙江省嘉兴市南湖区新丰镇工业功能区（北区）
ADD: (NORTH) INDUSTRIAL FUNCTION ZONE, XINFENG TOWN, NANHU DISTRICT, JIAXING CITY, ZHEJIANG PROVINCE, CHINA
电话TEL：+86-573-88620697　　邮编(P.C)：314508

订货单位 CUSTOMER	江苏金珊瑚科技有限公司	产品名称 PRODUCT	热轧不锈钢带 HOT-ROLLED STAINLESS STEEL COILS	证书号 CERTIFICATE NO.	19112017
收货单位 PURCHASER	江苏金珊瑚科技有限公司	合同号 CONTRACT NO.	ESS(XS)/XS-JSHZ20191115-187	交货日期 DATE OF DELIVERY	2019年11月20日
牌　号 GRADE	316L	订单号 ORDER NO		签发日期 DATE OF ISSUE	2019年11月21日
标准 SPECIFICATION	ASTM A240M-17	交货状态 SOLUTION TREATED AND PICKLING	NO.1	ISO9001证书号 ISO9001 CERTIFICATE NUMBER	CN10/21D15

序号	钢卷/板号 COIL/PLATE NO.	炉号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	件数 NUMBER	重量 WEIGHT	化学成分（熔炼分析）/% CHEMICAL COMPOSITION (HEAT ANALYSIS) /% C	Si	Mn	P	S	Cr	Ti	Ni	Mo	N			
			mm			件	kg													
1	119149970500B	1914997	8.75	1525	C	1	10155	0.025	0.48	1.16	0.031	0.001	16.17		10.10	2.02	0.043			
2	119154472100	1915447	9.75	1525	C	1	25825	0.023	0.44	1.15	0.029	0.005	16.50		10.04	2.00	0.045			
3	119140250300	1914025	15.45	1530	C	1	26945	0.024	0.47	1.20	0.024	0.001	16.70		10.07	2.03	0.039			
4	119154140300B	1915414	4.75	1525	C	1	10445	0.028	0.43	1.14	0.026	0.002	16.11		10.08	2.01	0.047			
5	119158230300B	1915823	7.75	1525	C	1	9990	0.025	0.44	1.17	0.032	0.003	16.16		10.08	2.02	0.048			
合计(TOTAL)						5	83360													

序号	钢卷/板号 COIL/PLATE NO.	拉伸试验TENSILE TEST 屈服强度 (Y.S.) Rp0.2	抗拉强度 (T.S.) Rm	断后伸长率(EL.) A50	硬度 HARDNESS HRB 1	2	ISO V冲击试验 IMPACT TEST 方向 DIR.	宽度 W.	温度 TEM.	吸收功 (J) ABSORBED ENERGY (J) KV 1	2	3	AVE.	晶间腐蚀 INTERGRANULAR CORROSION TEST
		Mpa		%			L./TR.	mm	℃					
1	119149970500B	281	607	68	82	81								
2	119154472100	282	562	73	86	87								
3	119140250300	294	604	71	87	86								
4	119154140300B	302	587	70	82	81								
5	119158230300B	293	594	70	82	81								

公司印章
Company Seal

备注 REMARKS	1.本产品已通过ISO9001质量认证许可(THE PRODUCTS HAVE PASSED THE ISO9001 QUALITY CERTIFICATION LICENSE.) 2.谨保证以上所有的内容真实准确(WE HEREBY CERTIFY THE ABOVE STATEMENT TO BE TRUE AND CORRECT IN EVERY DETAIL.) 3.热处理（HEAT TREATMENT）：1050-1100℃固溶-水冷处理（SOLUTION 1050-1100℃ QUENCHING IN WATER） 4.材料无放射性污染（The material is free from Radioactive Contamination.） 5.产品的尺寸公差、外观检查符合ASTM A480M相关要求（Dimension control, visual inspection acc. to ASTM A480M）
注释 NOTES	TR.：(Transverse)横向，L.：(Longitudinal)纵向，DIR.：(Direction)方向，W.：(Width)宽度，TEM.：(Temperature)温度，EL.：(Elongation)断后伸长率，Y.S.：(Yield Strength)屈服强度，T.S.：(Tensile Strength)抗拉强度，AVE.：平均值

质量负责人
QUALITY MANAGER

青拓集团有限公司
TSING TUO GROUP CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：福建省福安市湾坞镇经济开发区
ADD：Economic Development Zone of WanWu, Fu'an Fujian
电话Tel.：0593-6600575
传真Fax：0593-5077091
邮编PC：355006

制造厂：福建青拓实业股份有限公司
Factory：Fujian Tsingtuo Nickel Industry Co. Ltd.
订货单位 Order unit：浙江青业特钢有限公司
产品名称 Products:不锈钢棒

收货单位 Receiving unit：
执行标准 Execution standard：Q/TTXB001-2021

质保书号 Certificate №：20220217-023
签发日期 Issue Date：2022/2/17

炉号	牌号	规格	支数	重量	化学成分 Chemical Composition, %										拉伸试验 Tensile Test			硬度试验	判定
Heat №	Steel Grade	Size mm	Pcs	Weight kg	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Ti	抗拉强度 (Mpa)	屈服强度 Rp0.2% (Mpa)	伸长EL (%)	hardness testing (HBW)	
S210916AA10	316L	16		6165	0.022	0.318	0.94	0.034	0.0187	16.41	10.07	2.08	0.17						合格
S211106AA23	316L	17		8270	0.021	0.342	0.97	0.033	0.0167	16.38	10.02	2.06	0.23						合格
S220107AA19	316L	18		5179	0.015	0.393	1.00	0.032	0.0086	16.28	10.02	2.03	0.08						合格
S211222AA11	316L	19		7146	0.014	0.482	0.92	0.029	0.0059	16.58	10.05	2.00	0.08						合格
S211222AA12	316L	20		8462	0.013	0.375	0.98	0.029	0.0064	16.20	10.04	2.09	0.08						合格
S220107AA17	316L	21		12236	0.015	0.368	0.93	0.032	0.0104	16.24	10.02	2.05	0.08						合格
S211017AA07	316L	22		9364	0.015	0.326	0.95	0.033	0.0050	16.43	10.04	2.01	0.16						合格
S210916AA12	316L	23		10084	0.009	0.390	0.93	0.034	0.0076	16.33	10.03	2.06	0.17						合格
S220107AA16	316L	25		4581	0.019	0.438	0.96	0.032	0.0116	16.05	10.01	2.04	0.09						合格
S211004AA14	316L	26		7284	0.015	0.444	0.98	0.031	0.0086	16.18	10.10	2.09	0.11						合格
S211017AA41	316L	27		2212	0.027	0.560	0.90	0.033	0.0093	16.28	10.05	2.01	0.33						合格
S211114AA02	316L	28		6816	0.016	0.385	0.97	0.035	0.0078	16.26	10.02	2.02	0.16						合格
S211114AA09	316L	30		7053	0.017	0.383	0.97	0.035	0.0082	16.28	10.03	2.04	0.16						合格
S211008AA03	316L	36		11063	0.017	0.353	1.00	0.036	0.0100	16.16	10.02	2.07	0.14						合格

Ⅰ.熔炼方式 Melting Process：EAF+AOD　Ⅱ.交货状态 Condition of Delivery：热轧 Hot rolled

1. 尺寸公差 Size tolerance: 合格 OK　2. 表面质量 Surface quality：合格 OK　3.低倍检验 Macroexamination: 合格 OK　4.放射性检验 Radioactivity test：合格OK

1. 兹证明所列产品经检验均符合合同和标准要求。
   The materrial listed above has been tested and complies with the terms of the contract & the standard.
2. 如有质量异议，请来电来函说明情况，并告知质量证明书编号。
   If any quality query, please clarify via phone call or fax, indicating the certificate number.
3. 本公司取得资质证书：1.ISO 9001；2.IATF(TS) 16949；3.压力设备指令 PED 4.3，AD2000 W0和ASME材料认证
   Following quality certification is available: 1.ISO 9001；2.IATF(TS) 16949；3.Pressure Equipment Directive 4.3，AD2000 W0 and ASME

编制：张茹　判定员：蒋东林　批准：
Typed by　Surveyor　Quanlity engineer

日期 Date：2022 年 2 月 17 日

质检专用章 (复印无效)
Qua. Insp.Stamp (copy is invalid)

振石集团东方特钢有限公司
ZHENSHI GROUP EASTERN SPECIAL STEEL CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址:浙江省嘉兴市南湖区新丰镇工业功能区（北区）
ADD: (NORTH) INDUSTRIAL FUNCTION ZONE, XINFENG TOWN, NANHU DISTRICT, JIAXING CITY, ZHEJIANG PROVINCE, CHINA
电话TEL: +86-573-88620697　　邮编(P.C): 314500

订货单位 CUSTOMER	江苏金珊瑚科技有限公司	产品名称 PRODUCT	热轧不锈钢带 HOT-ROLLED STAINLESS STEEL COILS	证书号 CERTIFICATE NO.	191204017
收货单位 PURCHASER	江苏金珊瑚科技有限公司	合同号 CONTRACT NO.	ESS(XS)/XS-JSHS20191203115	交货日期 DATE OF DELIVERY	2019年12月3日
牌　号 GRADE	316L	订单号 ORDER NO		签发日期 DATE OF ISSUE	2019年12月4日
标准 SPECIFICATION	ASTM A240M-17	交货状态 SOLUTION TREATED AND PICKLING	NO.1	ISO9001证书号 ISO9001 CERTIFICATE NUMBER	CN10/21015

序号	钢卷/板号 COIL/PLATE NO.	炉号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION 厚度 THICKNESS	宽度 WIDTH	长度 LENGTH	件数 NUMBER	重量 WEIGHT	化学成分（熔炼分析）/% CHEMICAL COMPOSITION (HEAT ANALYSIS) /% C	Si	Mn	P	S	Cr	Ti	Ni	Mo	N
			mm			件	kg										
1	119146880400	1914688	7.75	1525	C	1	20505	0.018	0.44	1.16	0.030	0.005	16.09		10.08	2.02	0.053
2	119160200200B	1916020	6.75	1525	C	1	10885	0.020	0.44	1.13	0.026	0.002	16.10		10.08	2.01	0.046
3	119161840500	1916184	3.75	1525	C	1	20615	0.017	0.50	1.18	0.022	0.004	16.13		10.07	2.03	0.052
4	119161860200A	1916186	5.75	1525	C	1	10115	0.020	0.45	1.19	0.024	0.002	16.11		10.00	2.01	0.043
5	119129470400	1912947	10.75	1530	C	1	26825	0.025	0.45	1.23	0.021	0.004	16.56		10.10	2.06	0.044
合计(TOTAL)						5	88945										

序号	钢卷/板号 COIL/PLATE NO.	拉伸试验TENSILE TEST 屈服强度 (Y.S.) Rp0.2	抗拉强度 (T.S.) Rm	断后伸长率 (EL.) A50	硬度 HARDNESS HRB 1	2	ISO-V冲击试验 IMPACT TEST 方向 DIR.	宽度 W.	温度 TEM.	吸收功（J） ABSORBED ENERGY (J) KV 1	2	3	AVE.	晶间腐蚀 INTERGRANULAR CORROSION TEST
		Mpa		%			L./TR.	mm	℃					
1	119146880400	270	617	65	82	81								
2	119160200200B	293	600	72	82	81								
3	119161840500	274	606	69	81	81								
4	119161860200A	300	619	72	83	82								
5	119129470400	309	612	72	85	83								

公司印章
Company Seal

备注 REMARKS
1. 本产品已通过ISO9001质量认证许可(THE PRODUCTS HAVE PASSED THE ISO9001 QUALITY CERTIFICATION LICENSE.)
2. 谨保证以上所有的内容真实准确(WE HEREBY CERTIFY THE ABOVE STATEMENT TO BE TRUE AND CORRECT IN EVERY DETAIL.)
3. 热处理（HEAT TREATMENT）:1050-1100℃固溶+水冷处理（SOLUTION 1050-1100℃ QUENCHING IN WATER）
4. 材料无放射性污染(The material is free from Radioactive Contamination.)
5. 产品的尺寸公差、外观检查符合ASTM A480M相关要求(Dimension control, visual inspection acc. to ASTM A480M)

质量负责人
QUALITY MANAGER

注释 NOTES
TR.:(Transverse)横向, L.:(Longitudinal)纵向, DIR.:(Direction)方向, W.:(Width)宽度, TEM.:(Temperature)温度, EL.:(Elongation)断后伸长率, Y.S.:(Yield Strength)屈服强度, T.S.:(Tensile Strength)抗拉强度, AVE.:平均值

8

SECTION 5. Fixings 2

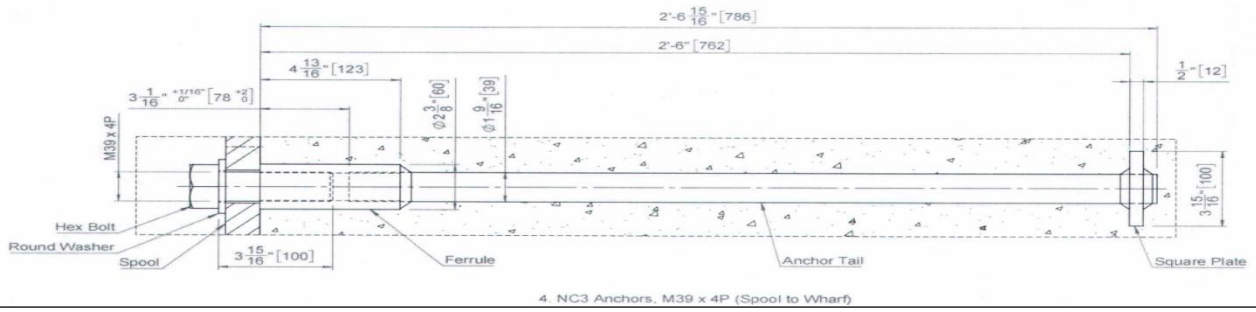
5-B:

Dimensional Reports

TRELLEBORG

Dimensional Inspection Report

Product Description	NC3	Size	M39x4P
Quantity	100Pcs	Material	316



4. NC3 Anchors, M39 x 4P (Spool to Wharf)

Size	M39	L	G	T	C	D	F	S	A
No.	2D	786	762	12	123	39	60	100	78
1	Actual	790	764	11.66	124.1	37.9	59.63	101.2	82.44
2	Actual	789.8	764.2	11.65	124.22	37.95	59.5	101.25	82.35
3	Actual	790.2	764.3	11.7	124.25	38	59.55	101.3	81.9

Size	M39	L	G	T	C	D	F	S	A
No.	2D	786	762	12	123	39	60	100	78
1	Actual	790.5	763.5	11.63	124.3	37.94	59.7	101.4	81.95
2	Actual	791	764.2	11.62	124.2	37.99	59.65	101.32	81.99
3	Actual	789.6	765	11.66	124.33	38.02	59.6	101.26	82.2

Size	M39	L	G	T	C	D	F	S	A
No.	2D	786	762	12	123	39	60	100	78
1	Actual	790.2	764.5	11.6	123.98	38.03	59.63	101.15	82.25
2	Actual	791	763.8	11.64	124.24	37.98	59.54	101.13	82.42
3	Actual	790.5	764	11.67	124.4	37.96	59.5	101.3	81.98

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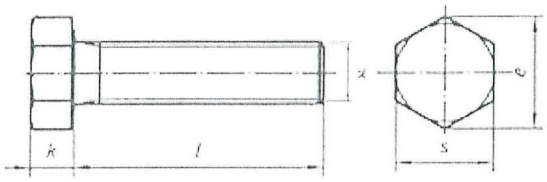
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M39*4P*100mmL
Quantity	100 Pcs	Material	316



Size	M39	M	l
No.	2D	39	100
1	Actual	38.74	99.9
2	Actual	37.7	99.93
3	Actual	37.76	100.04

Size	M39	M	l
No.	2D	39	100
1	Actual	38.82	100
2	Actual	38.78	100.02
3	Actual	38.5	99.95

Size	M39	M	l
No.	2D	39	100
1	Actual	38.55	99.98
2	Actual	37.8	100
3	Actual	37.92	100.15

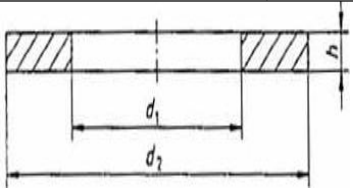
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Round Washer	Size	M39 （OD72*ID42*6mm）
Quantity	220Pcs	Material	316



Size	M39	D1	D2	H
No.	2D	42	72	6
1	Actual	42.3	71.7	5.89
2	Actual	42.1	71.75	5.9
3	Actual	42.14	71.6	5.91

Size	M39	D1	D2	H
No.	2D	42	72	6
1	Actual	42.25	71.65	5.92
2	Actual	42.3	71.72	5.9
3	Actual	42.2	71.3	5.93

Size	M39	D1	D2	H
No.	2D	42	72	6
1	Actual	42.16	71.23	5.88
2	Actual	42.14	71.2	5.89
3	Actual	42.22	71.35	5.92

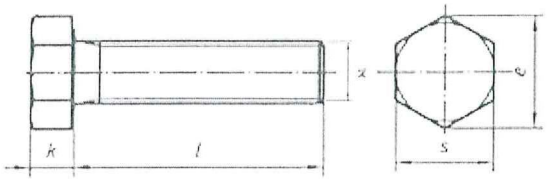
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M30*3.5P*130mmL
Quantity	132Pcs	Material	316



Size	M30	M	l
No.	2D	30	130
1	Actual	29.6	129.5
2	Actual	29.65	129.55
3	Actual	29.52	129.6

Size	M30	M	l
No.	2D	30	130
1	Actual	29.55	129.63
2	Actual	29.58	129.58
3	Actual	29.6	129.62

Size	M30	M	l
No.	2D	30	130
1	Actual	29.62	129.63
2	Actual	29.58	129.52
3	Actual	29.63	129.64

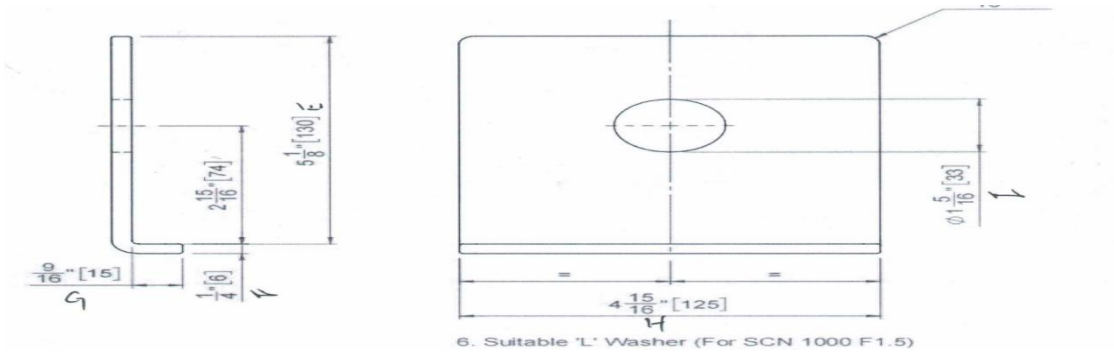
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	L Washer	Size	SCN1000
Quantity	132Pcs	Material	316



6. Suitable 'L' Washer (For SCN 1000 F1.5)

Size	SCN1000	G	H	I	E	F
No.	2D	15	126	33	130	6
1	Actual	15.2	125.4	33.06	135.85	6.35
2	Actual	15.22	125.18	33.10	137.2	6.2
3	Actual	15.15	125.2	33.2	137.15	6.18

Size	SCN1000	G	H	I	E	F
No.	2D	15	126	33	130	6
1	Actual	15.13	125.3	33.15	136.8	6.19
2	Actual	15.2	125.25	33.11	136.95	6.27
3	Actual	15.18	125.4	33.08	137	6.3

Size	SCN1000	G	H	I	E	F
No.	2D	15	126	33	130	6
1	Actual	15.14	125.3	33.10	137.15	6.34
2	Actual	15.22	125.42	33.08	137.2	6.22
3	Actual	15.2	125.28	33.12	136.98	6.35

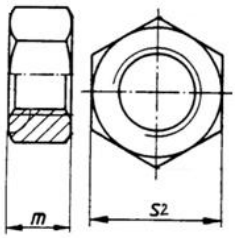
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Nut	Size	M30*3.5PmmL
Quantity	132Pcs	Material	316



Size	M30	M	S2
No.	2D	25.6	46
1	Actual	23.4	45.2
2	Actual	23.48	45.24
3	Actual	23.5	45.15

Size	M30	M	S2
No.	2D	25.6	46
1	Actual	23.49	45.23
2	Actual	23.48	45.25
3	Actual	23.52	45.2

Size	M30	M	S2
No.	2D	25.6	46
1	Actual	23.5	45.23
2	Actual	23.49	45.2
3	Actual	23.51	45.28

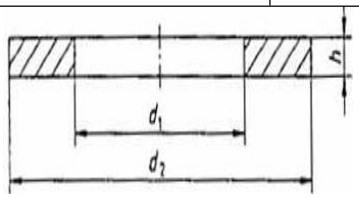
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Round Washer	Size	M30 （OD56*ID33*4mm）
Quantity	264Pcs	Material	316



Size	M30	D1	D2	H
No.	2D	33	56	4
1	Actual	33.03	56.08	3.92
2	Actual	33.02	56.1	3.91
3	Actual	33	56.07	3.94

Size	M30	D1	D2	H
No.	2D	33	56	4
1	Actual	33.04	56.12	3.95
2	Actual	33.1	56.02	3.92
3	Actual	33.02	56	3.9

Size	M30	D1	D2	H
No.	2D	33	56	4
1	Actual	33.03	56.13	3.95
2	Actual	33.12	56.12	3.92
3	Actual	33.05	56.08	3.94

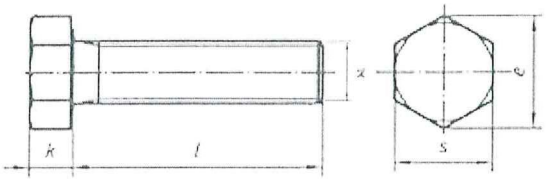
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M30x3.5PX90mml
Quantity	132Pcs	Material	316



Size	M30	M	l
No.	2D	30	90
1	Actual	29.48	89.5
2	Actual	29.5	89.45
3	Actual	29.52	89.52

Size	M30	M	l
No.	2D	30	90
1	Actual	29.55	89.59
2	Actual	29.5	89.5
3	Actual	29.48	89.53

Size	M30	M	l
No.	2D	30	90
1	Actual	29.49	89.6
2	Actual	29.5	89.62
3	Actual	29.53	89.55

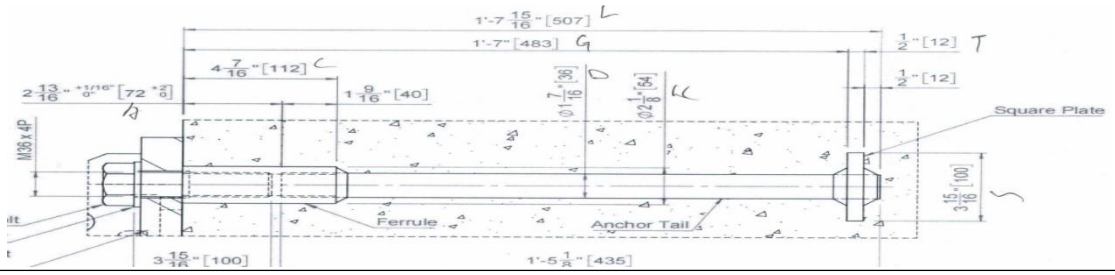
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	NC3	Size	M36x4P
Quantity	160 Pcs	Material	316



Size	M36	L	G	T	C	D	F	S	A
No.	2D	507	483	12	112	36	54	100	72
1	Actual	507.7	486.65	11.4	112.06	35.2	53.98	101.08	73.8
2	Actual	507.3	486.3	11.43	112.15	35.27	53.94	100.7	73.84
3	Actual	507.35	487.4	11.3	112.2	35.24	53.85	100.65	72.9

Size	M36	L	G	T	C	D	F	S	A
No.	2D	507	483	12	112	36	54	100	72
1	Actual	507.25	486.55	11.38	112.4	35.3	53.9	100.8	72.92
2	Actual	507.4	486.7	11.42	112.43	35.25	53.92	100.82	73.82
3	Actual	507.38	487.5	11.5	112.38	35.26	53.98	101.02	73.75

Size	M36	L	G	T	C	D	F	S	A
No.	2D	507	483	12	112	36	54	100	72
1	Actual	507.33	486.45	11.38	112.5	35.3	53.86	100.65	72.9
2	Actual	507.2	487.2	11.42	112.35	35.2	53.94	100.7	73.7
3	Actual	507.65	486.5	11.4	112.42	35.32	53.9	101.03	72.95

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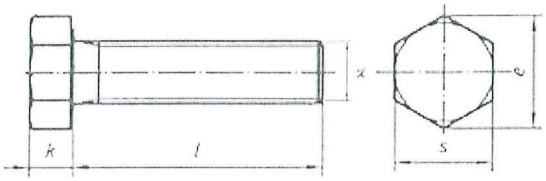
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M36x4PX100mml
Quantity	160Pcs	Material	316



Size	M36	M	l
No.	2D	36	100
1	Actual	35.77	100.5
2	Actual	35.8	100.6
3	Actual	35.72	100.55

Size	M36	M	l
No.	2D	36	100
1	Actual	35.7	100.72
2	Actual	35.78	100.8
3	Actual	35.82	100.73

Size	M36	M	l
No.	2D	36	100
1	Actual	35.8	100.82
2	Actual	35.75	100.6
3	Actual	35.76	100.75

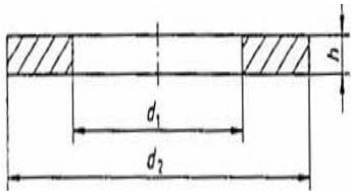
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Round Washer	Size	M36 （OD66*ID39*5mm）
Quantity	336Pcs	Material	316



Size	M30	D1	D2	H
No.	2D	39	66	5
1	Actual	37.24	65.95	4.7
2	Actual	37.3	66	4.73
3	Actual	37.27	65.98	4.75

Size	M30	D1	D2	H
No.	2D	39	66	5
1	Actual	37.2	66.03	4.8
2	Actual	37.32	66.02	4.78
3	Actual	37.26	65.9	4.7

Size	M30	D1	D2	H
No.	2D	39	66	5
1	Actual	37.28	66.03	4.82
2	Actual	37.25	65.97	4.75
3	Actual	37.4	63.01	4.72

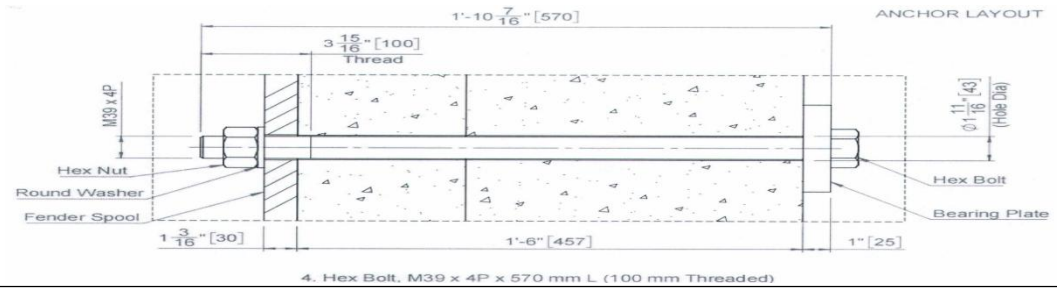
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M39x4PX570mml
Quantity	14Pcs	Material	316



4. Hex Bolt, M39 x 4P x 570 mm L (100 mm Threaded)

Size	M39	M	b	l
No.	2D	39	100	570
1	Actual	38.7	100.98	569
2	Actual	38.73	101	568.8
3	Actual	38.76	101.2	569.2

Size	M39	M	b	l
No.	2D	39	100	570
1	Actual	38.79	101.15	569.4
2	Actual	38.75	101.3	569.2
3	Actual	38.8	100.99	568.95

Size	M39	M	b	l
No.	2D	39	100	570
1	Actual	38.77	101.35	570
2	Actual	38.76	101.22	569.2
3	Actual	38.7	101.18	569.22

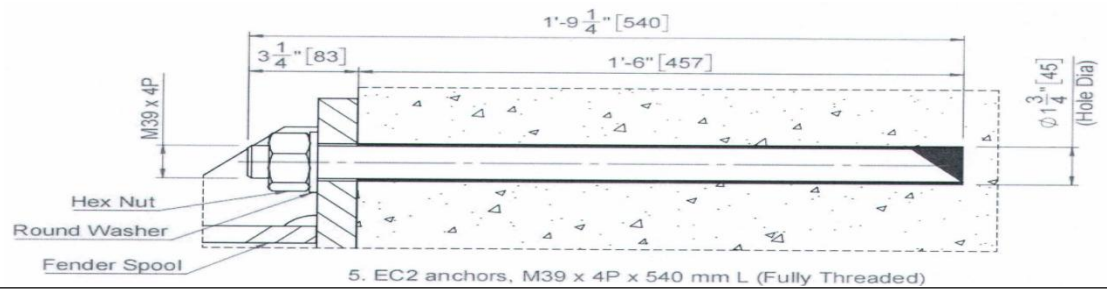
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	EC2	Size	M39x4PX540mml
Quantity	96Pcs	Material	316



5. EC2 anchors, M39 x 4P x 540 mm L (Fully Threaded)

Size	M39	M	l
No.	2D	39	540
1	Actual	38.8	536
2	Actual	38.7	538
3	Actual	38.76	539

Size	M39	M	l
No.	2D	39	540
1	Actual	38.82	536.8
2	Actual	38.79	536
3	Actual	38.85	538

Size	M39	M	l
No.	2D	39	540
1	Actual	38.84	539
2	Actual	38.82	538.5
3	Actual	38.9	539

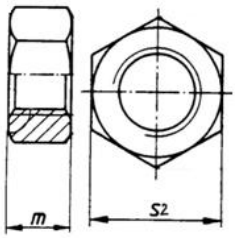
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Nut	Size	M39*4PmmL
Quantity	120Pcs	Material	316



Size	M39	M	S2
No.	2D	32	60
1	Actual	30.12	59.77
2	Actual	30.2	59.8
3	Actual	30.15	59.75

Size	M39	M	S2
No.	2D	32	60
1	Actual	30.13	59.76
2	Actual	30.18	59.82
3	Actual	30.22	59.8

Size	M39	M	S2
No.	2D	32	60
1	Actual	30.15	59.75
2	Actual	30.23	59.77
3	Actual	30.18	59.82

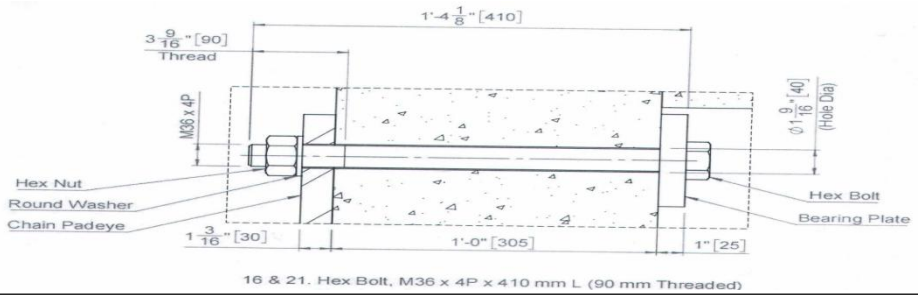
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M39x4PX410mml
Quantity	176Pcs	Material	316



16 & 21. Hex Bolt, M36 x 4P x 410 mm L (90 mm Threaded)

Size	M39	M	b	l
No.	2D	36	90	410
1	Actual	35.75	91.05	411
2	Actual	35.7	91.1	410.3
3	Actual	35.77	91.08	410.5

Size	M39	M	b	l
No.	2D	36	90	410
1	Actual	35.76	91.04	410.75
2	Actual	35.8	91.45	410.8
3	Actual	35.74	91.55	410.82

Size	M39	M	b	l
No.	2D	36	90	410
1	Actual	35.82	91.3	410.72
2	Actual	35.8	91.2	410.8
3	Actual	35.77	91.25	410.65

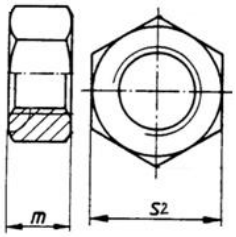
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Nut	Size	M36*4PmmL
Quantity	176Pcs	Material	316



Size	M36	M	S2
No.	2D	31	55
1	Actual	28.18	54.03
2	Actual	28.2	54.2
3	Actual	28.22	54.15

Size	M36	M	S2
No.	2D	31	55
1	Actual	28.23	54.3
2	Actual	28.3	54.25
3	Actual	28.25	54.18

Size	M36	M	S2
No.	2D	31	55
1	Actual	28.24	54.23
2	Actual	28.22	54.25
3	Actual	28.32	54.16

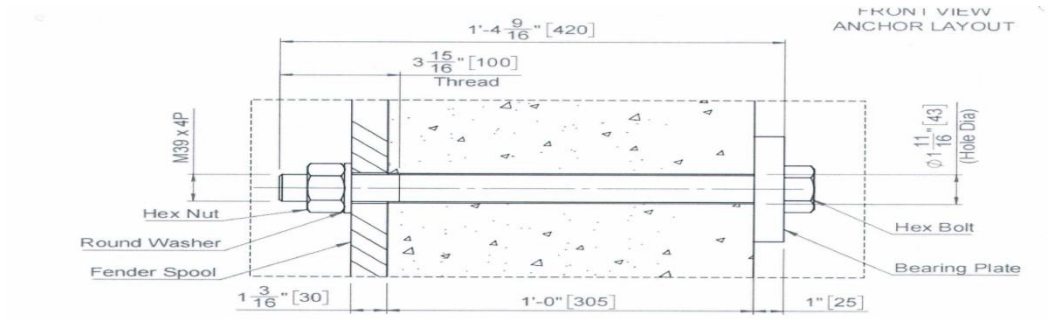
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Hex Bolt	Size	M39x4PX420mml
Quantity	10Pcs	Material	316



4. Hex Bolt, M39 x 4P x 420 mm L (100 mm Threaded)

Size	M39	M	b	l
No.	2D	39	100	420
1	Actual	38.7	101.6	419.6
2	Actual	38.79	101.65	419.8
3	Actual	38.8	101.8	420

Size	M39	M	b	l
No.	2D	39	100	420
1	Actual	38.82	101.7	420.3
2	Actual	38.78	101.76	419.85
3	Actual	38.84	101.86	420.1

Size	M39	M	b	l
No.	2D	39	100	420
1	Actual	38.79	101.1	419.98
2	Actual	38.84	102.16	419.8
3	Actual	38.8	101.85	419.88

Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

SECTION 6. Fixings 3

SECTION 6. Fixings 3

6-A:

Material Certs & Test reports

TRELLEBORG

List of Material Certificates

No.	Position	Description	Mill certificate No.	Heat No.	Mill Company	Grade
1	NC3 Anchor M36*507mm	Ferrule	20220226-067	S220107AA18	TSING TUO GROUP CO.,LTD.	SS316
2	NC3 Anchor M36*507mm	Anchor Tail	QT202201010074	821-E25	SHOUGANG CHANGZHI IRON&STEEL CO.,LTD.	45#
3	NC3 Anchor M36*507mm	Square Plate	7825-06 3589820	A236703	SHAXI TAIGANG STAINLESS STELL SCIENCE&TECHNOLOGY CO. , LTD	Q235B
4	NC3 Anchor M30*477mm	Ferrule	20220226-067	S220107AA19	TSING TUO GROUP CO.,LTD.	SS316
5	NC3 Anchor M30*477mm	Anchor Tail	QT202201010074	821-E24	SHOUGANG CHANGZHI IRON&STEEL CO.,LTD.	45#
6	NC3 Anchor M30*477mm	Square Plate	7825-06 3589820	A236628	SHAXI TAIGANG STAINLESS STELL SCIENCE&TECHNOLOGY CO. , LTD	Q235B
7	NC3 Anchor M39*786mm	Ferrule	20220226-070	S210717AB12	TSING TUO GROUP CO.,LTD.	SS316
8	NC3 Anchor M39*786mm	Anchor Tail	202202100000163	WB0222000092	WEIFANG SPECIAL STEEL CO.,LTD.	45#
9	NC3 Anchor M39*786mm	Square Plate	7825-06 3589820	A236703	SHAXI TAIGANG STAINLESS STELL SCIENCE&TECHNOLOGY CO. , LTD	Q235B

TRELLEBORG

山西太钢不锈钢股份有限公司
SHAXI TAGANG STAINLESS STELL SCIENCE&TECHNOLOGY CO., LTD

产品质量证明书

QUALITY CERTIFICATE

证书编号：7825-06 3589820
Certificate No.
许可证号：XK05-212-00321
License No.

产品名称 PRODUCT	热轧直发卷	订货单位 CUSTOMER	青岛山川钢板有限公司	收货单位 PURCHASER	
订单号 Contract No.	0000236597-0032183			车号 TRAIN WAGOW No.	B8306

序号 NO.	批号 BATCH NO.	箱号 BOX NO.	炉号 HEAT NO.	牌号 GRADE	规格 DESCTIPTION (mm)	重量 WEIGHT	化学成份(熔炼分析) CHEMICAL COMPOSITION（HEAT ANALYSIS）%													
							C	Si	Mn	P	S	Cr	Ni	Cu	Al	Nb	V	Ti	MO	N
1	140053203	H143-03865	A236597	Q235B	4.0*1500	15.2	0.19	0.13	1.30	0.015	0.007	0.030	0.040							
2	140053200	H143-03729	A236526	Q235B	6.0*1500	20.8	0.20	0.13	1.26	0.018	0.006	0.032	0.036							
3	140053002	H143-03365	A236628	Q235B	10.0*1500	20.6	0.19	0.12	1.3	0.017	0.007	0.033	0.041							
4	140053004	H143-03780	A236703	Q235B	10.0*1500	21.6	0.19	0.14	1.25	0.016	0.005	0.035	0.038							

序号 NO	执行标准 STANDARD	交货状态 STATE	抗拉 T.S.	屈服强度 Y.S.（Mpa）				伸长率 EL	冲击功 IMPACT	冷弯 180	晶间腐蚀 INTRG	硬度 HARDNESS			
				屈服 Y.S	屈强比 Y.S/TS	屈服	屈服					HB	HRB	HRC	HV
1	GB912-2008	热轧	472	365				33.6		合格					

备注 NOTE

1. 用户提出质量异议时，请提出供证书号、订单号、批次号、交货单号、炉号、牌号、规格、重量等信息。
Incase of dispute the purchaser shall supply the number of certificate、contract、batch、vbeln、heat and trade、dimension、quantity. etc.
2.

地址（ADD）	中国山西省太原市尖草坪街2号 No. jiancaoping, taiyuan, shanxi, p. r. china							制表人（LISTER）	日期（DATE）	签发单位(章)（STANP）
邮编（ZIP）	030003	电话（TEL）	3013328	传真（FAX）	3017816			马枫	2020.05.20	

山西太钢不锈钢股份有限公司 质量证明书专用章

声明：本产品已按上述要求进行制造和检验，其结果符合要求，特此证明。
WE HEREBY THAT MATERIAL DESCRIBED HEREIV HAS MANUFACTURED AND TESTED WITH SATISFACTORY RESLLTS INACCORDANCE WITH THE REQUIREMENTS OF THE ABOVE MATERIAL SPECIFICATION EN 10204 3.1。

TRELLEBORG

产品质量证明书

QUALITY CERTIFICATE

制　造　厂：首钢长治钢铁有限公司

MANUFACTUER:SHOUGANG CHANGZHI IRON&STEEL CO.,LTD

传真：0355-5085725　邮政编码：046031
销售服务热线：0355-5089999
质量服务热线：0355-5085752
网址：http://www.changgang.com
公司地址：山西省长治市故县东大街9号

JL-36-600

订货单位 Customer	天津市优顺贸易有限公司	合同编号 Contract No.	HT10042021123110093427 6	标　准 Specification	GB/T699-2015	证明书编号 Certificate No.	QT202201010074
收货单位 Purchaser	天津市优顺贸易有限公司	交货状态 Condition of Supply	热轧	牌　号 Steel Grade	45#	车船号 Train/Ship No.	晋DZ3207
产品名称 Product	优质碳素结构钢热轧圆钢-直条	发货日期 Date of Delivery	2022-01-01 06:55	许可证编号 License No.		到　站 Destination	天津优顺圆钢库房

炉批号	规格/mm	长度/m	数量	重量/吨		化学成分/%														气体含量ppm	
			件/支	理论	实际	C	Mn	Si	P	S	Cr	Ni	Cu	V	Ceq					O	N
821-E24	Φ30	6	5	-	10.1440	0.451	0.5936	0.2224	0.017	0.017	0.050	0.012	0.018	0.003	0.5600	-	-	-	-	0	0
						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
821-E25	Φ36	6	12	-	24.3360	0.444	0.6220	0.2394	0.018	0.015	0.057	0.011	0.017	0.003	0.5600	-	-	-	-	0	0
						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
总计 Total			17		34.4800																

炉批号	力学性能									冷弯	反弯	冷顶锻	热顶锻				硬度/HBW	非金属夹杂	低倍	晶粒度
	Rm/MPa	ReL/MPa	ReH/MPa	Rp0.2/MPa	A/%	Agt/%	Z/%	Akv/J												
821-E24	634	393	-	-	23.0		46		-	-				-	-	-	193			-
821-E25	617	386	-	-	25.0		46		-	-				-	-	-	189			-

备注：1、本产品质量证明书加盖产品质量专用章生效，涂改、复印无效。2、顾客如有异议，请保持我公司发货时产品原状，来函注明合同、产品质量证明书编号、批号、牌号、规格、重量、原因等，以便及时处理。3、产品应在规定范围内使用。4、合同/标准中要求检验，而此处没有注明结果的，我公司均保证合格。5、建议顾客搬运、吊装本产品时采用不损害产品质量的平钩、磁吊或其它吊具。

制表单位	质量检验负责人
质量监督站	

日期：2022年01月01日

TRELLEBORG

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	青岛龙泉特钢有限公司	合同号 CONTRACT NO.	DD22100779	件数合计 TOTAL QTY	13	证书号 CERTIFICATE	202202100000163
牌号 GRADE	45	执行标准 STANDARD	GB/T 699-2015	车号 VEHICLE NO.	鲁VV1816	重量合计 TOTAL WEIGHT	36.18	出库单号	CF022200924

炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu								
WB022200092	40	1	3.153	0.449	0.235	0.567	0.018	0.005	0.015	0.006	0.007								

炉号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	硬度HB	热顶锻	一般疏松	中心偏析	锭型偏析	中心疏松					
WB022200092	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0	0	1					
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0	0	1					

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don`t contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2022-02-10	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	

青拓集团有限公司
TSING TUO GROUP CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：福建省福安市湾坞镇经济开发区
ADD.: Economic Development Zone of WanWu, Fu'an Fujian
电话Tel.：0593-6600575
传真Fax ：0593-5077091
邮编PC ：355006

制造厂：福建青拓实业股份有限公司
Factory: Fujian Tsingtuo Nickel Industry Co. Ltd.
订货单位 Order unit：温州市青远不锈钢有限公司
收货单位 Receiving unit：
产品名称 Products:不锈钢棒
执行标准 Execution standard： Q/TTXB001-2021

质保书号 Certificate №： 20220226-067
签发日期 Issue Date： 2022/2/26

炉号	牌号	规格	支数	重量	化学成分 Chemical Composition, %										拉伸试验 Tensile Test			硬度试验	判定
Heat №	Steel Grade	Size mm	Pcs	Weight kg	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Ti	抗拉强度 (Mpa)	屈服强度 Rp0.2% (Mpa)	伸长EL (%)	hardness testing (HBW)	
S211222AA15	316L	32		12541	0.018	0.38	0.98	0.028	0.006	16.58	10.04	2.04	0.07						合格
S211222AA13	316L	33		13541	0.019	0.42	0.92	0.029	0.005	16.31	10.01	2.04	0.13						合格
S220107AA14	316L	35		16321	0.018	0.366	0.93	0.033	0.0074	16.44	10.01	2.03	0.11						合格
S211008AA03	316L	36		12874	0.017	0.353	1.00	0.036	0.0100	16.16	10.02	2.07	0.14						合格
S210908AA03	316L	37		12892	0.011	0.367	1.01	0.030	0.0093	16.21	10.04	2.03	0.11						合格
S220107AA20	316L	38		12632	0.018	0.357	0.95	0.033	0.0135	16.10	10.01	2.04	0.09						合格
S211114AA12	316L	40		13521	0.017	0.355	0.98	0.030	0.0067	16.47	10.06	2.10	0.10						合格
S220107AA14	316L	42		15321	0.018	0.366	0.93	0.033	0.0074	16.44	10.01	2.03	0.11						合格
S220107AA19	316L	45		13211	0.015	0.393	1.00	0.032	0.0086	16.28	10.02	2.03	0.08						合格
S210523AA41	316L	47		12547	0.022	0.426	0.91	0.034	0.0087	16.21	10.01	2.02	0.05						合格
S210717AB14	316L	50		14521	0.011	0.408	0.93	0.032	0.0062	16.19	10.07	2.03	0.10						合格
S220107AA18	316L	52		14521	0.022	0.361	0.92	0.032	0.0154	16.36	10.03	2.05	0.08						合格
S220107AA18	316L	55		14632	0.022	0.361	0.92	0.032	0.0154	16.36	10.03	2.05	0.08						合格
S210902AA15	316L	57		15623	0.02	0.463	0.96	0.034	0.0190	16.39	10.05	2.05	0.33						合格

Ⅰ.熔炼方式 Melting Process ：EAF+AOD Ⅱ.交货状态 Condition of Delivery ：热轧 Hot rolled

1. 尺寸公差 Size tolerance: 合格 OK 2. 表面质量 Surface quality：合格 OK 3.低倍检验 Macroexamination: 合格 OK 4.放射性检验 Radioactivity test：合格OK

1. 兹证明所列产品经检验均符合合同和标准要求。
   The materrial listed above has been tested and complies with the terms of the contract & the standard.
2. 如有质量异议，请来电来函说明情况，并告知质量证明书编号。
   If any quality query, please clarify via phone call or fax, indicating the certificate number.
3. 本公司取得资质证书： 1. ISO 9001；2. IATF(TS) 16949；3. 压力设备指令 PED 4.3，AD2000 W0和ASME材料认证
   Following quality certification is available: 1. ISO 9001；2. IATF(TS) 16949；3. Pressure Equipment Directive 4.3, AD2000 W0 and ASME

编制：张茹 Typed by
判定员：蒋东林 Surveyor
批准： Quanlity engineer
日期 Date：2022 年 2 月 26 日
产品质量检验专用章（复印无效） Quality insp. Stamp (copy is invalid)

扫描全能王 创建

青拓集团有限公司
TSING TUO GROUP CO., LTD.

产品质量证明书
INSPECTION CERTIFICATE

地址：福建省福安市湾坞镇经济开发区
ADD.：Economic Development Zone of WanWu，Fu'an Fujian
电话Tel.：0593-6600575
传真Fax ：0593-5077091
邮编PC ：355006

制造厂：福建青拓实业股份有限公司
Factory：Fujian Tsingtuo Nickel Industry Co. Ltd.

订货单位 Order unit：温州市青远不锈钢有限公司　　收货单位 Receiving unit：

产品名称 Products:不锈钢棒　　执行标准 Execution standard： Q/TTXB001-2021

质保书号 Certificate №： 20220226-070
签发日期 Issue Date： 2022/2/26

炉号	牌号	规格	支数	重量	化学成分 Chemical Composition, %										拉伸试验 Tensile Test			硬度试验	判定
Heat №	Steel Grade	Size mm	Pcs	Weight kg	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Ti	抗拉强度 (Mpa)	屈服强度 Rp0.2% (Mpa)	伸长EL (%)	hardness testing (HBW)	
S210717AB12	316L	60		14562	0.011	0.41	0.93	0.032	0.006	16.18	10.08	2.02	0.10						合格

Ⅰ.熔炼方式 Melting Process ：EAF+AOD　Ⅱ.交货状态 Condition of Delivery ：热轧 Hot rolled

1. 尺寸公差 Size tolerance: 合格 OK　2. 表面质量 Surface quality：合格 OK　3.低倍检验 Macroexamination: 合格 OK　4.放射性检验 Radioactivity test：合格OK

1. 兹证明所列产品经检验均符合合同和标准要求。
   The materrial listed above has been tested and complies with the terms of the contract & the standard.
2. 如有质量异议，请来电来函说明情况，并告知质量证明书编号。
   If any quality query, please clarify via phone call or fax, indicating the certificate number.
3. 本公司取得资质证书： 1.ISO 9001；2.IATF(TS) 16949；3.压力设备指令 PED 4.3，AD2000 W0和ASME材料认证
   Following quality certification is available: 1.ISO 9001；2.IATF(TS) 16949；3.Pressure Equipment Directive 4.3，AD2000 W0 and ASME

编制：张茹　判定员：蒋东林　批准：
Typed by　Surveyor　Quanlity engineer

日期 Date：2022 年 2 月 26 日

产品质量检验专用章（复印无效）
Quality Insp.Stamp (copy is invalid)

扫描全能王 创建

SECTION 6. Fixings 3

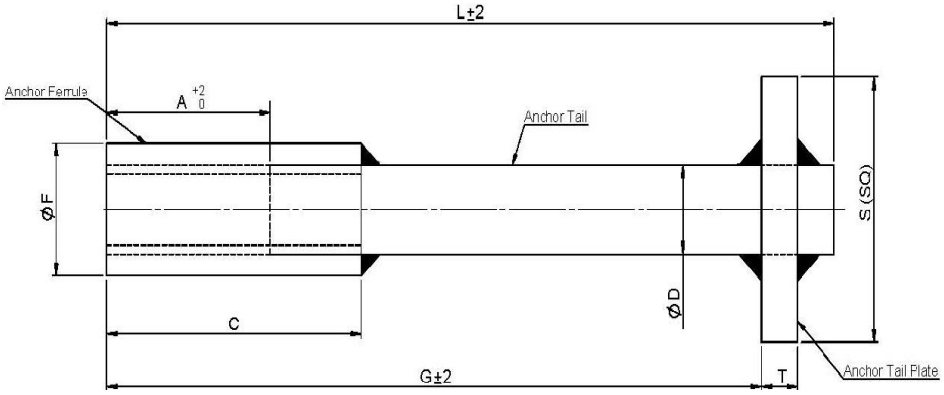
6-B:

Dimensional Reports

TRELLEBORG

紧固件尺寸检验报告
NC3 Anchor Dimensions Inspection Report

项目号 Project Number:	25135-28524	日期 Date:	5/12/2022
材料 Material:	SS316/45#/Q235B	订单数量 Qty:	352Pcs



尺寸 Dim.	标准要求 Specified	实测值 Actual				
		1	2	3	4	5
ΦD	36	36.1	36.1	36.2	36.1	36.1
ΦF	54	54.8	54.9	54.9	54.8	54.9
C	112	112	112	112	112	112
S（sq）	100	100	100	100	100	100
热镀锌厚度 HDG Coating Thickness Check:		≥85um				
参考标准 Refer. St.	要求 Requirement	实测值 Actual				
ISO 1461:2009	Average≥85μm	103	92	95	106	90

Remarks:

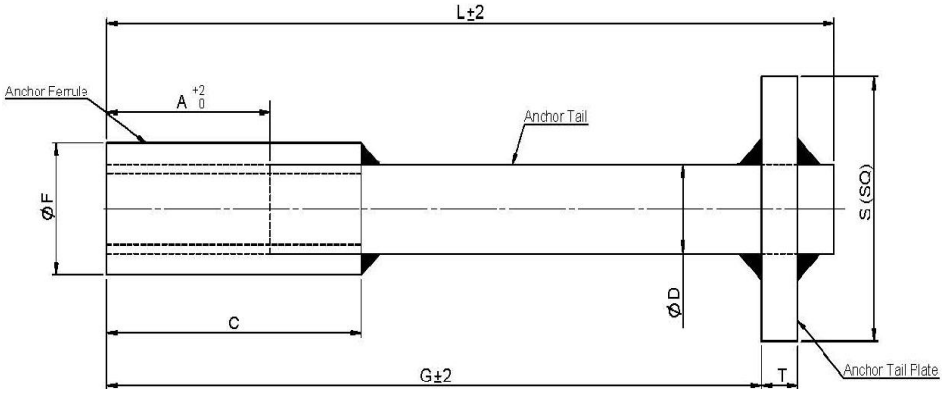
We hereby declare that all items mentioned above have been inspected and tested as per purchase order, related standards and found to be in conformance with requirements.

检验员 Inspector：Xiujun Song	审核 Checked by：

TRELLEBORG

紧固件尺寸检验报告
NC3 Anchor Dimensions Inspection Report

项目号 Project Number:	25135-28524	日期 Date:	5/12/2022
材料 Material:	SS316/45#/Q235B	订单数量 Qty:	78Pcs



尺寸 Dim.	标准要求 Specified	实测值 Actual				
		1	2	3	4	5
ΦD	30	29.9	30.1	30.2	30.1	29.9
ΦF	45	45.1	45.2	45.1	45.1	45.2
C	95	95	95	95	95	95
S（sq）	100	100	100	100	100	100
热镀锌厚度 HDG Coating Thickness Check:		≥85um				
参考标准 Refer. St.	要求 Requirement	实测值 Actual				
ISO 1461:2009	Average≥85μm	102	98	95	100	95

Remarks:

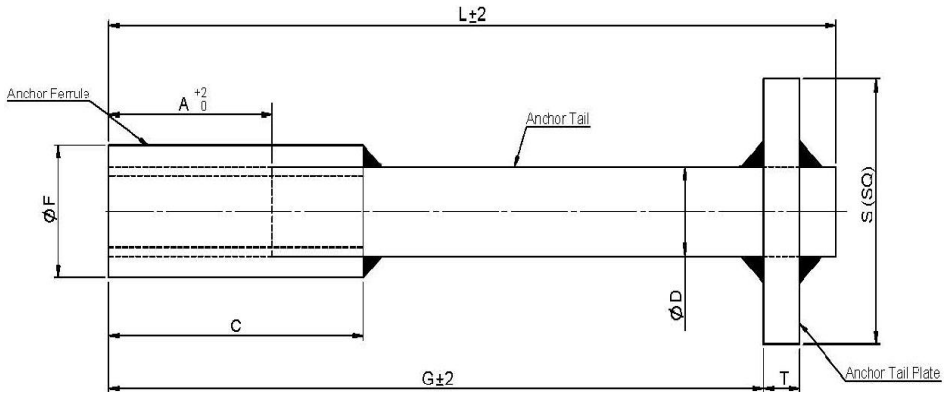
We hereby declare that all items mentioned above have been inspected and tested as per purchase order, related standards and found to be in conformance with requirements.

检验员 Inspector：Xiujun Song	审核 Checked by：

TRELLEBORG

紧固件尺寸检验报告
NC3 Anchor Dimensions Inspection Report

项目号 Project Number:	25135-28524	日期 Date:	5/12/2022
材料 Material:	SS316/45#/Q235B	订单数量 Qty:	100Pcs



尺寸 Dim.	标准要求 Specified	实测值 Actual				
		1	2	3	4	5
ΦD	39	39.8	39.9	39.9	39.8	39.9
ΦF	60	60	60	60.1	60	60
C	123	123	123	123	123	123
S（sq）	100	100	100	100	100	100

热镀锌厚度 HDG Coating Thickness Check:	≥85um

参考标准 Refer. St.	要求 Requirement	实测值 Actual				
ISO 1461:2009	Average≥85μm	105	101	95	89	93

Remarks:

We hereby declare that all items mentioned above have been inspected and tested as per purchase order, related standards and found to be in conformance with requirements.

检验员 Inspector：Xiujun Song	审核 Checked by：







SECTION 6. Fixings 3

6-C:

Calibration Certificates

Calibration Certificate Register

No.	Name	Certificate No.	Type	Serial No.	Expiry Date
1	Steel tape measure	HDDX2021-02 -0002756	50mFY	501	June.03.2022
2	Tensile testing machine	HDDX2021-01 -0007322	400T	TSD-32	June.01.2022
3	Vernier caliper	HDDX2021-01 0007325	0m-300mm	C130415116	June.01.2022
4	Vernier caliper	HDDX2021-01 -0007326	0m-600mm	110839691	June.01.2022
5	Vernier caliper	HDDX2021-01 -0007327	0m-1500mm	99480	June.01.2022
6	Thickness gauge	HDDX2021-01 -0007327	KT220PLUS	/	June.09.2022

SECTION 7. UHMW PE Pads

SECTION 7. UHMW PE Pads

7-A:

Material Certs & Test Reports

TRELLEBORG

检验报告
Inspection Report

产品名称 Product Name	超高分子聚乙烯贴面板 UHMW-PE pad	型号/规格 Size/Thickness	60mm
生产单位 Producer	宁津县新江化工有限公司 Ningjin xinjiang Chemical Co.,ltd	颜色型号 Color/Type	蓝色 Blue
生产日期 Production Date	2022.12.22	抽样样品 Place of Sample	车间 Workshop
检验类别 Inspection Type	抽检 Sampling	抽样数量 Sample Qty	5 PC
抽样日期 Sample Date	2022.01.08		
检验依据 Test Basis	ASTM D6474-12 ASTM D792 ASTM D638 ASTM D2240 ASTM D1894 ASTM D256 ASTM D695 ASTM D1525	检验项目：9 项 Test Items:9 Items	
检验结论 Test Result	样品经检验后，所检验项目符合标准中规定要求。 The test results meet related requirements and are acceptable. 签发日期（Issue Date):2022.02.18		

批准：
Approved By

审核：
Reviewed By

编制：
Worked By

TRELLEBORG

Test Report

测试温度 Relative Temperature： (23±2)℃　　相对湿度 Relative Humidity：(50±10)%
报告日期(Date):2022.02.18

测试项目 Item	检测依据 Test Basis	指标 Reference Range	单位 Unit	测试结果 Result
分子量 Molecular Weight	ASTM D6474-12	2,000,000 - 9,000,000	g/mol	4,100,000
密度 Density	ASTM D792	0.92-0.96	g/cm³	0.934
拉伸强度 Tensile Strength	ASTM D638	≥24	Mpa	27.6
断裂伸长率 Elongation at Break	ASTM D638	≥280	%	310
邵氏硬度 Hardness Shore-D	ASTM D2240	60-65	D	64
动摩擦系数 Dynamic Friction Coefficient	ASTM D1894	≤0.20	-	0.175
切口冲击强度 Notched Impact Strength(Charpy)	ASTM D256	≥100	kJ/m²	120
抗压强度 Compression Strength	ASTM D695	≥30	MPa	39.2
维卡软化温度 Vicat softing point	ASTM D1525	≥80	℃	83

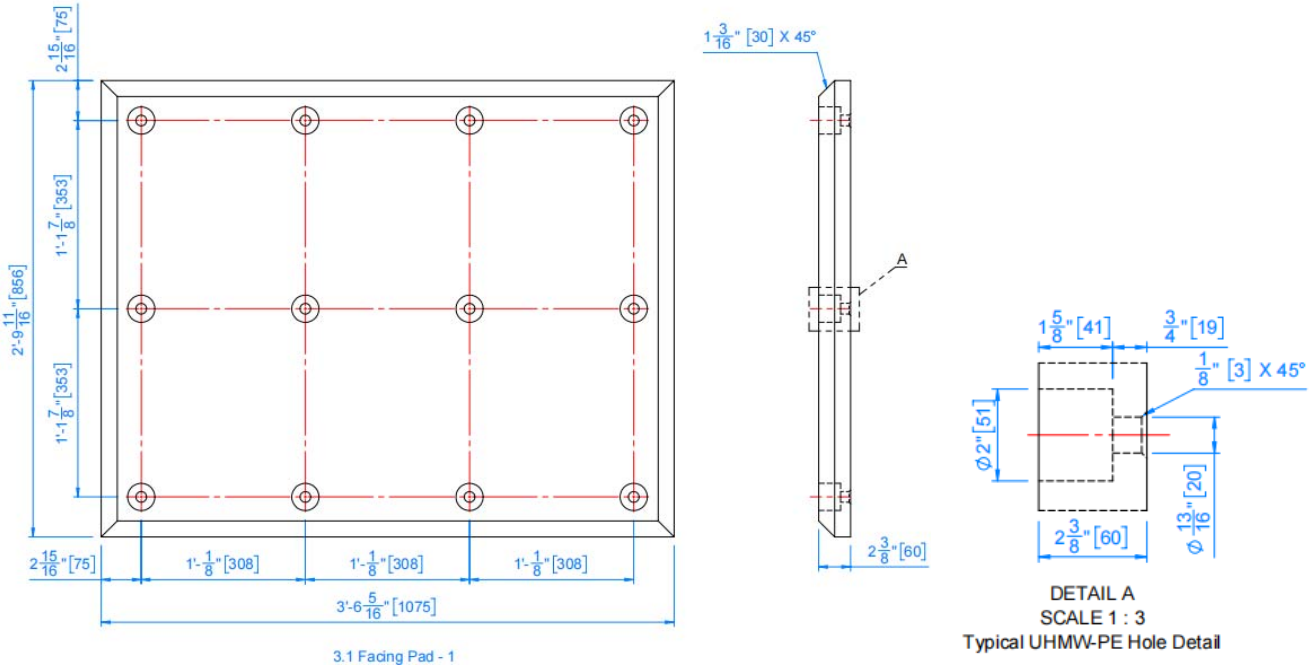
检验合格 (2)

SECTION 7. UHMW PE Pads

7-B:
Dimensional Reports

TRELLEBORG

产品名称 Products	Facing Pad 3.1 25135-1P01	订货数量 Quantity：	104PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



尺寸（mm）： Nominal size		1075	856	308	353	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1075	855.8	308	353	75.5	60.1	51	20	19.1
	2	1075	856	308	353	75.5	60.1	51	20	19.1
	3	1075.2	856	308	353	75.5	60.1	51	20	19.1
	4	1074.8	856	308	353	75.4	60.1	51	20	19.1
	5	1075	856.4	308	353	75.5	60.1	51	20	19.1
	6	1075	856	308	353	75.5	60.1	51	20	19.1
	7	1075.3	856	308	353	75.6	60.1	51	20	19.1
	8	1075	856.2	308	353	75.5	60.1	51	20	19.1
	9	1075	856	308	353	75.5	60.1	51	20	19.1

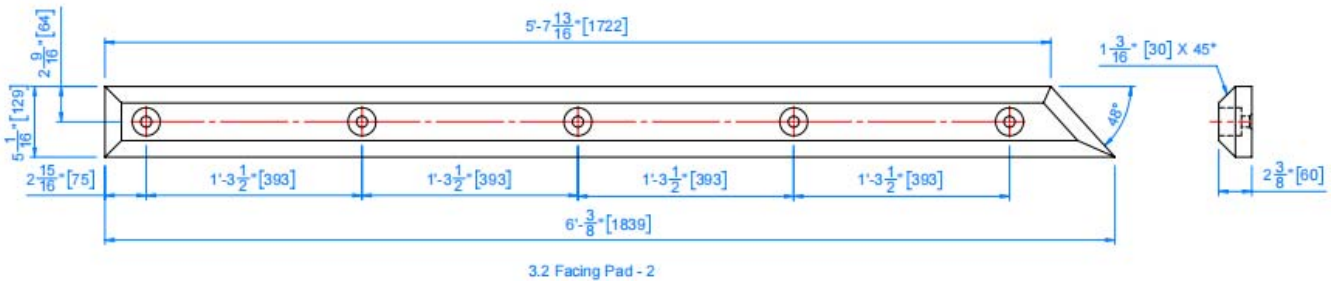
检查结果 Check Conclusion：

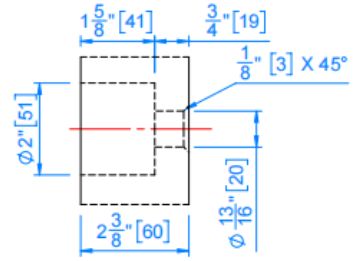
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.2 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%





DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

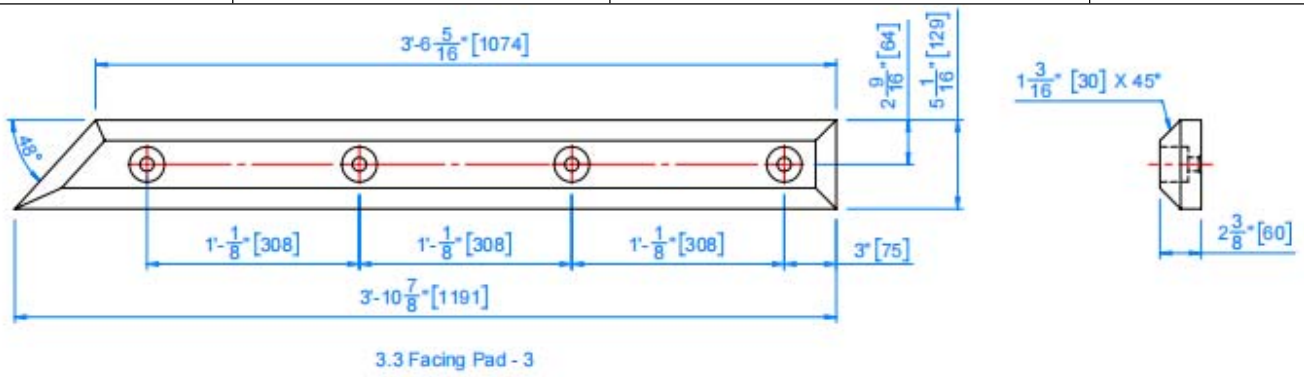
尺寸（mm）： Nominal size		1839	129	393	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1839	129	393	64.5	75	60.1	51	20	19.1
	2	1839.3	129	393	64.5	75	60.1	51	20	19.1
	3	1839	129	393	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

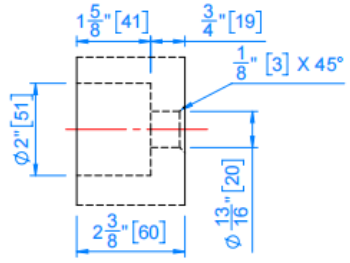
检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.3 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.3 Facing Pad - 3



DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

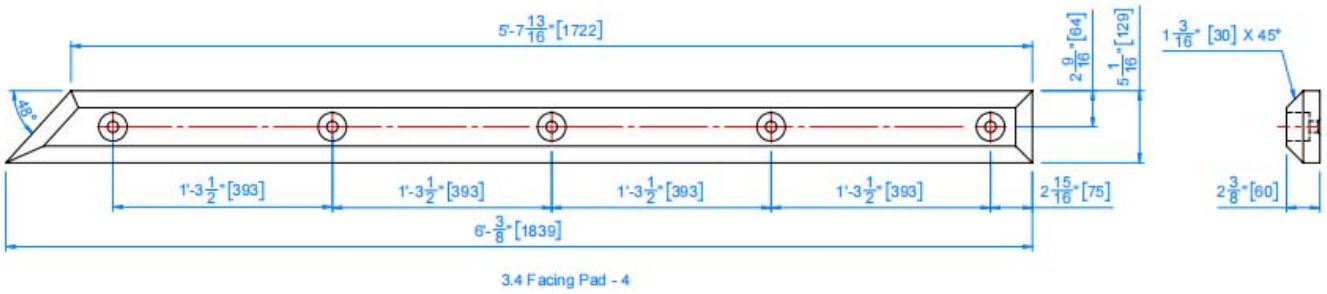
尺寸（mm）： Nominal size		1191	129	308	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1191	129	308	64.5	75	60.1	51	20	19.1
	2	1191.3	129	308	64.5	75	60.1	51	20	19.1
	3	1191	129	308	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

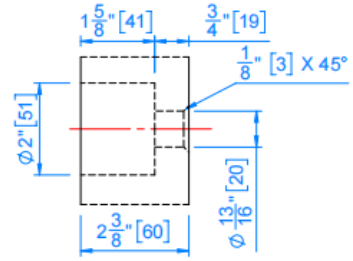
检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.4 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.4 Facing Pad - 4



DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

尺寸（mm）： Nominal size		1839	129	393	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1838.6	129	393	64.5	75	60.1	51	20	19.1
	2	1839	129	393	64.5	75	60.1	51	20	19.1
	3	1839	129	393	64.5	75	60.1	51	20	19.1

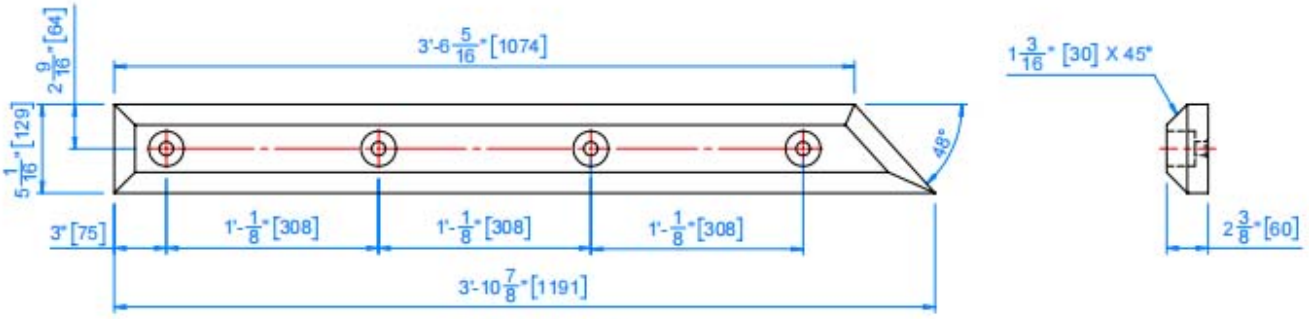
检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

检验合格 (2)

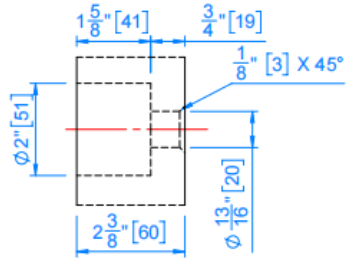
检验员 Inspector：02　　日期 Date:2022.02.18

TRELLEBORG

产品名称 Products	Facing Pad 3.5 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.5 Facing Pad - 5



DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

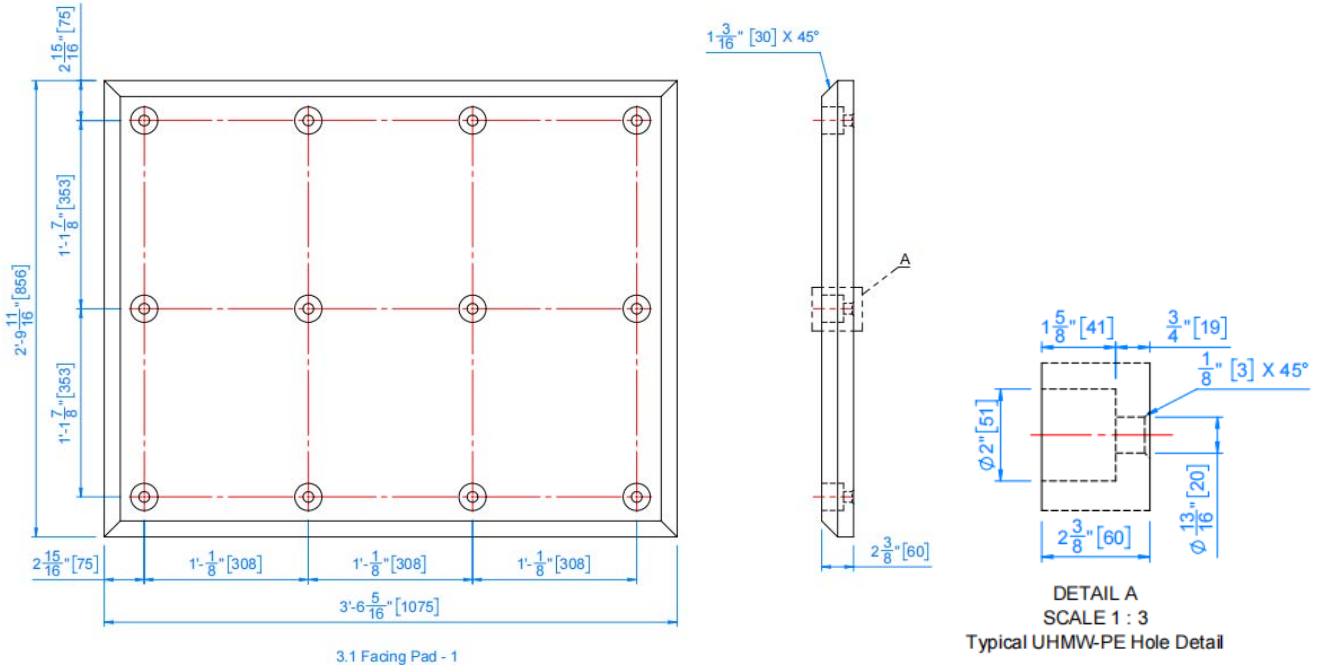
尺寸（mm）： Nominal size		1191	129	308	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1191.4	129	308	64.5	75	60.1	51	20	19.1
	2	1191	129	308	64.5	75	60.1	51	20	19.1
	3	1191	129	308	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

检验员 Inspector：02 检验合格 (2) 日期 Date:2022.02.18

TRELLEBORG

产品名称 Products	Facing Pad 3.1 25135-1P01	订货数量 Quantity：	104PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.1 Facing Pad - 1

尺寸（mm）： Nominal size		1075	856	308	353	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1075	855.8	308	353	75.5	60.1	51	20	19.1
	2	1075	856	308	353	75.5	60.1	51	20	19.1
	3	1075.2	856	308	353	75.5	60.1	51	20	19.1
	4	1074.8	856	308	353	75.4	60.1	51	20	19.1
	5	1075	856.4	308	353	75.5	60.1	51	20	19.1
	6	1075	856	308	353	75.5	60.1	51	20	19.1
	7	1075.3	856	308	353	75.6	60.1	51	20	19.1
	8	1075	856.2	308	353	75.5	60.1	51	20	19.1
	9	1075	856	308	353	75.5	60.1	51	20	19.1

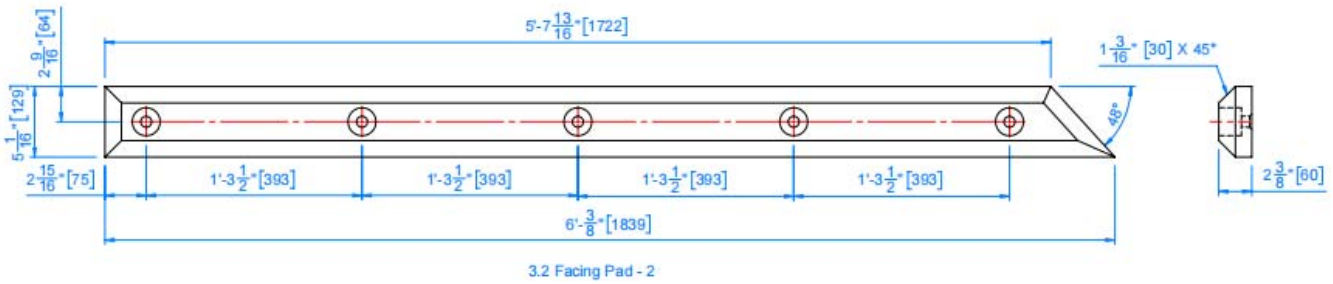
检查结果 Check Conclusion：

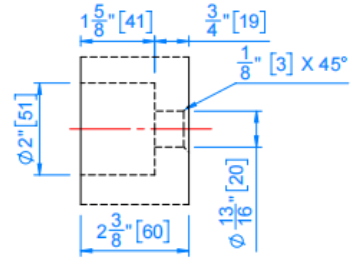
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.2 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%





DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

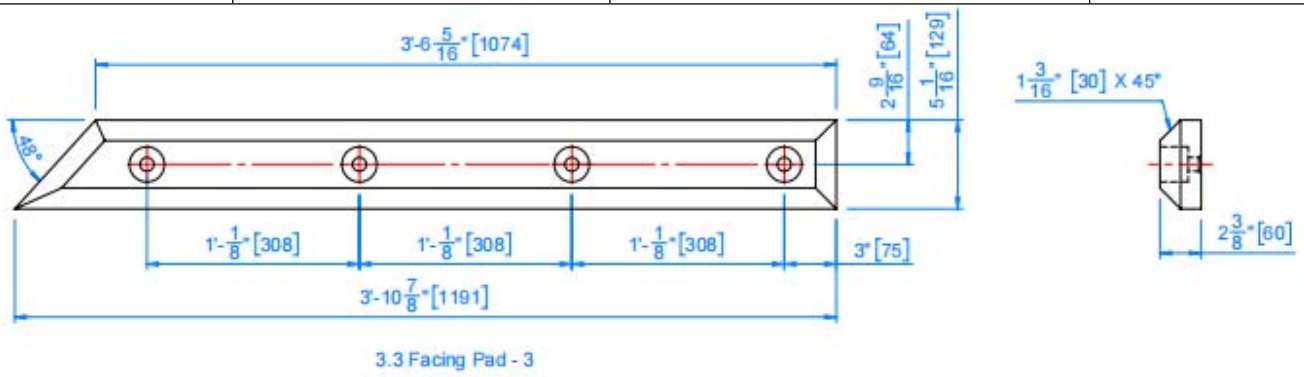
尺寸（mm）： Nominal size		1839	129	393	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1839	129	393	64.5	75	60.1	51	20	19.1
	2	1839.3	129	393	64.5	75	60.1	51	20	19.1
	3	1839	129	393	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

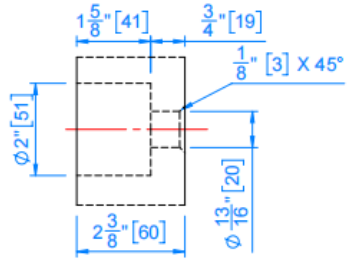
检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.3 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.3 Facing Pad - 3



DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

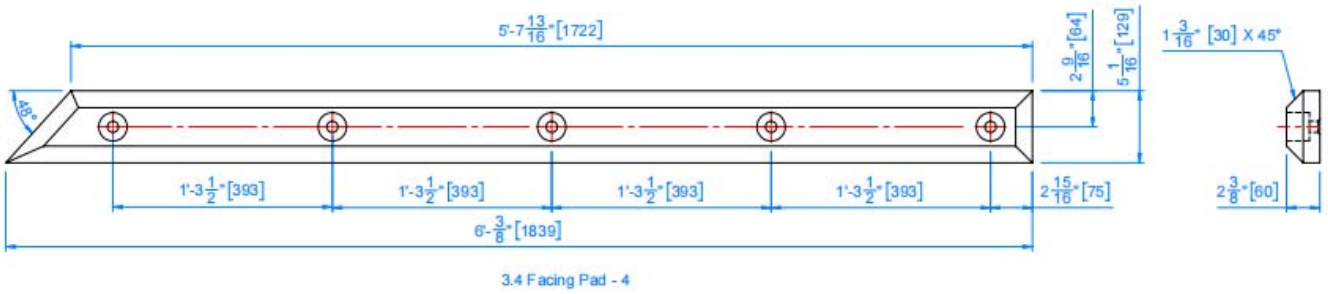
尺寸（mm）： Nominal size		1191	129	308	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1191	129	308	64.5	75	60.1	51	20	19.1
	2	1191.3	129	308	64.5	75	60.1	51	20	19.1
	3	1191	129	308	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

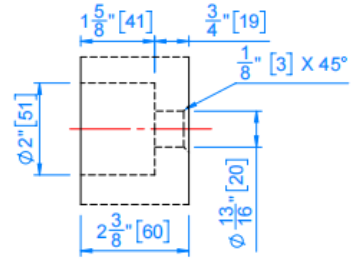
检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.4 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.4 Facing Pad - 4



DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

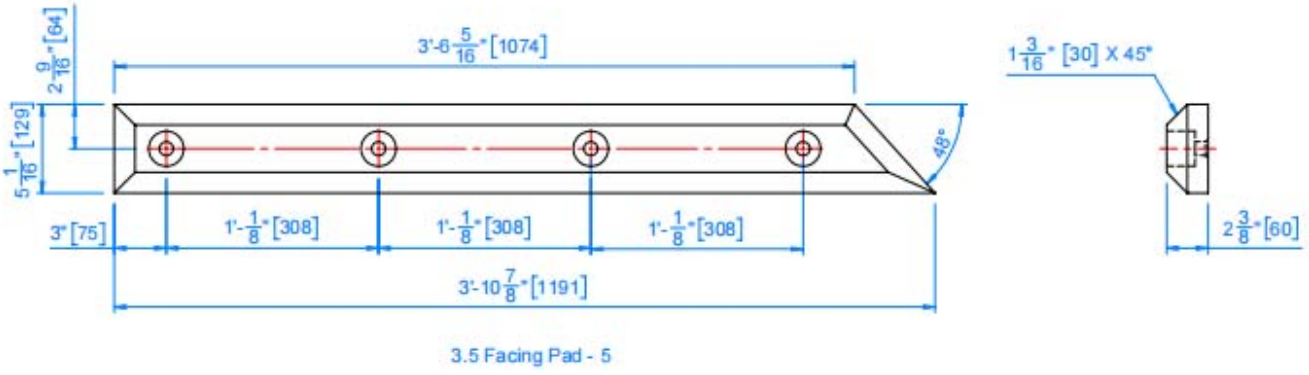
尺寸（mm）： Nominal size		1839	129	393	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1838.6	129	393	64.5	75	60.1	51	20	19.1
	2	1839	129	393	64.5	75	60.1	51	20	19.1
	3	1839	129	393	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

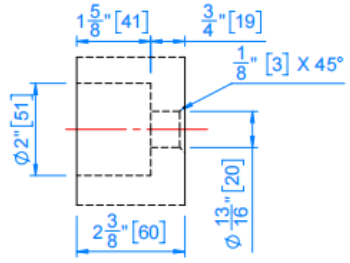
检验合格 (2)

检验员 Inspector：02　　日期 Date:2022.02.18

产品名称 Products	Facing Pad 3.5 25135-1P01	订货数量 Quantity：	26PCS
材质 Material	UHMW-PE	检验比例 Inspection Rates：	10%



3.5 Facing Pad - 5



DETAIL A
SCALE 1 : 3
Typical UHMW-PE Hole Detail

尺寸（mm）： Nominal size		1191	129	308	64	75	60	Φ51	Φ20	19
公差（mm）： Tolerance		±2	±2	±1	±1	±1	±1	±1	±1	±1
测量值（mm）： Actual Size	1	1191.4	129	308	64.5	75	60.1	51	20	19.1
	2	1191	129	308	64.5	75	60.1	51	20	19.1
	3	1191	129	308	64.5	75	60.1	51	20	19.1

检查结果 Check Conclusion：
We here to certify the relevant dimensions against this project have been checked as per related drawing and standards.
The results are acceptable.

检验员 Inspector：02 检验合格 (2) 日期 Date:2022.02.18

SECTION 7. UHMW PE Pads

7-C:

Calibration Certificates

SDIM

山东省计量科学研究院

Shandong Institute of Metrology

校准证书

Calibration Certificate

证书编号：F14-20212461
Certificate No.

委托单位名称：宁津县新江化工有限公司
Name of Customer

地　　址：宁津县大曹镇孙其滨工业区
Address

计量器具名称：简支梁冲击试验机
Name of Instrument

制 造 者：承德市考思科学检测有限公司
Manufacturer

型号/规格：XJJD-50
Type/Specification

编号：**031511**
No.

校准依据：JJG145-2007 摆锤式冲击试验机检定规程
Reference Documents for the Calibration

发证单位（专用章）：
Issued by (stamp)

校　　准：
Calibrated by

核　　验：
Checked by

批　　准：
Approved by

职　　务：所长
Functions

校准日期：2021 年 09 月 28 日
Date of Calibration　Year　Month　Day

计量检定机构授权证书号（Authorization Certificate No.）：（国）法计（2017）01024 号
地址（Address）：济南市千佛山东路 28 号　　邮编（Post Code）：250014 传真（Fax）：（0531）82660117
28th Qianfoshan East Road ,Jinan,China　　查询电话（Inquiry Tel.）：(0531)81695741
网址（Web）：www.sdim.cn　　电子邮件（Email）：jcywb@sdim.cn

山东省计量科学研究院校准证书

Calibration Certificate of SDIM

证书编号：F14-20212461

Certificate No.

校准所使用的计量标准装置
Main standards of measurement used in the calibration

名　称 Name	测量范围 Measuring range	不确定度/准确度 Uncertainty / Accuracy	证书号 Certificate No.	证书有效期至 Valid until
摆锤式冲击试验机检定装置	(0～750)J	摆锤初始势能测量不确定度 U_{rel}=0.2% k=2(直接检定法)；冲击值测量不确定度 U_{rel}=2.4% k=2(间接检定法)	[1988]鲁量标证字第022号	2023-02-12

本次校准所使用的计量标准装置均溯源至国家计量基准
Standards of measurement used in the calibration are traced to National Measurement Standard.

校准的环境条件及地点：
Environmental conditions and location for the calibration

温　　度：24.0 ℃　　湿　　度：50 %RH
Temperature　　Humidity

其　　它：/　　地　　点：宁津县新江化工有限公司
Others　　Location

敬告：
1、被校准仪器修理后，应立即进行校准。
2、在使用过程中，如对被校准仪器的技术指标产生怀疑，请重新校准。
3、根据校准文件或顾客要求，通常情况下复校时间间隔为__壹__年。

＊ 未经本院书面批准，不得部分复印此证书。
＊ 本证书的校准结果仅对所校准的计量器具有效。

SDIM/MB07B

山东省计量科学研究院校准证书

Calibration Certificate of SDIM

证书编号：F14-20212461

Certificate No.

校 准 结 果

Calibration Results

校准项目	校准结果
回零	0.0J
仰角 150°	150. 1°
打击中心距 395mm	395mm
初始能量 50J	50.1J
力矩 26.79Nm	26.81Nm

测量结果的不确定度： U_{rel}= 0.8%（k=2）

The uncertainty of measurement results

＊ 未经本院书面批准，不得部分复印此证书。
＊ 本证书的校准结果仅对所校准的计量器具有效。

SDIM/MB07B

SDIM

山东省计量科学研究院

Shandong Institute of Metrology

检定证书

Verification Certificate

证书编号： F01-20213464
Certificate No.

送 检 单 位：宁津县新江化工有限公司
Applicant

计 量 器 具 名 称：电子万能试验机
Name of Instrument

型 号/ 规 格：WDW-1010
Type/Specification

出 厂 编 号：091516
Serial No.

制 造 单 位：承德市考思科学检测有限公司
Manufacturer

检 定 依 据：JJG475-2008 电子式万能试验机 检定规程
Verification Regulation

检 定 结 论：1 级
Conclusion

批准人： 赵玉成
Approved by

（检定专用章）
(Stamp)

核验员： 林琪超
Checked by

检定员： 李海斗
Verified by

检定日期： 2021 年 09 月 28 日
Date of Verification Year Month Day

有效期至： 2022 年 09 月 27 日
Valid until Year Month Day

计量检定机构授权证书号（Authorization Certificate No.）：（国）法计（2017）01024 号
地址（Address）：济南市千佛山东路 28 号
传真（Fax）：（0531）82660117 网址(Web)：www.sdim.cn
电话（Tel.）：(0531)81695741
邮编（Post Code）：250014
电子邮件(Email)：jcywb@sdim.cn

山东省计量科学研究院检定证书

Verification Certificate of SDIM

证书编号：F01-20213464
Certificate No.

检定所使用的计量标准装置
Standards of measurement used in the verification

名　称 Name	测量范围 Measuring range	不确定度/准确度 Uncertainty / Accuracy	证书号 Certificate No.	证书有效期至 Valid until
0.3 级测力仪标准装置	2N～10MN	0.3 级	[1986]国量标鲁证字第 017 号	2022-10-28

本次检定所使用的计量标准装置均溯源至国家计量基准
Standards of measurement used in the verification are traced to National Measurement Standard.

检定的环境条件及地点：
Environmental conditions and location for the verification

温　度：24.0℃ Temperature　　湿　度：50 %RH Humidity

其　它：/
Others

地　点：宁津县新江化工有限公司
Location

*未经本院书面批准，不得部分复印此证书。
*本证书的检定结果仅对所检定的计量器具有效。

SDIM/MB01B

山东省计量科学研究院检定证书
Verification Certificate of SDIM

证书编号：F01-20213464
Certificate No.

检定所使用的计量标准装置
Standards of measurement used in the verification

名　称 Name	测量范围 Measuring range	不确定度/准确度 Uncertainty / Accuracy	证书号 Certificate No.	证书有效期至 Valid until
0.3 级测力仪标准装置	2N～10MN	0.3 级	[1986]国量标鲁证字第 017 号	2022-10-28

本次检定所使用的计量标准装置均溯源至国家计量基准
Standards of measurement used in the verification are traced to National Measurement Standard.

检定的环境条件及地点：
Environmental conditions and location for the verification

温　　度：24.0℃　　湿　　度：50 %RH
Temperature　　Humidity

其　　它：/
Others

地　　点：宁津县新江化工有限公司
Location

*未经本院书面批准，不得部分复印此证书。
*本证书的检定结果仅对所检定的计量器具有效。

SDIM/MB01B

山东省计量科学研究院检定证书

Verification Certificate of SDIM

证书编号：F01-20213464

Certificate No.

检 定 结 果

Verification Results

力值：

最大试验力（kN）	试验力（kN）	示值相对误差（%）	示值重复性相对误差（%）
10	1	-0.1	0.2
	2	-0.5	0.2
	3	-0.6	0.2
	4	-0.6	0.1
	5	-0.5	0.1
	6	-0.5	0.1
	8	-0.6	0.1
	10	-0.6	0.1

外观检查： 合格 零点漂移： 0. 0% 同轴度： 0.0%

以下空白

*未经本院书面批准，不得部分复印此证书。
*本证书的检定结果仅对所检定的计量器具有效。

SDIM/MB01B

山东省计量科学研究院

Shandong Institute of Metrology

校准证书

Calibration Certificate

证书编号： F14-20212462
Certificate No.

委托单位名称：宁津县新江化工有限公司
Name of Customer

地　　址：宁津县大曹镇孙其滨工业区
Address

计量器具名称：摩擦系数仪
Name of Instrument

制 造 者：济南兰光机电技术有限公司
Manufacturer

型号/规格：MXD-02
Type/Specification

编号：**000-0172001933-D09JD**
No.

校准依据：　技术说明书
Reference Documents for the Calibration

发证单位（专用章）：
Issued by (stamp)

校　　准：李道升
Calibrated by

核　　验：
Checked by

批　　准：赵玉成
Approved by

职　　务：所长
Functions

校准日期：2021 年 09 月 28 日
Date of Calibration　Year Month Day

地址（Address）：济南市千佛山东路 28 号　邮编（Post Code）：250014 传真（Fax）：（0531）82660117
28th Qianfoshan East Road ,Jinan,China　查询电话（Inquiry Tel.）：(0531)81695741
网址（Web）：www.sdim.cn　电子邮件（Email）：jcywb@sdim.cn

山东省计量科学研究院校准证书

Calibration Certificate of SDIM

证书编号：F14-20212462

Certificate No.

校准所使用的主要标准器（或标准装置）
Main standards（standard device）of measurement used in the calibration

名　称 Name	测量范围 Measuring range	不确定度/准确度 Uncertainty / Accuracy	证书号 Certificate No.	证书有效期至 Valid until
专用砝码	（0.2~97）N	0.01 级	F16-20200196	2022-10-28

本次校准所使用的主要标准器（或标准装置）均溯源至国家计量基准
Main standards（standard device）of measurement used in the calibration are traced to National Measurement Standard.

校准的环境条件及地点：
Environmental conditions and location for the calibration

温　　度：24.0 ℃　　湿　　度：50 %RH
Temperature　　Humidity

其　　它：/　　地　　点：宁津县新江化工有限公司
Others　　Location

敬告：
1、被校准仪器修理后，应立即进行校准。
2、在使用过程中，如对被校准仪器的技术指标产生怀疑，请重新校准。
3、根据校准文件或顾客要求，通常情况下复校时间间隔为__壹__年。

＊ 未经本院书面批准，不得部分复印此证书。
＊ 本证书的校准结果仅对所校准的计量器具有效。

山东省计量科学研究院校准证书

Calibration Certificate of SDIM

证书编号：F14-20212462

Certificate No.

校 准 结 果

Calibration Results

力值（N）	
标准值	显示值
0.5	0.500
1	1.000
2	2.000
3	3.000
4	4.001
5	5.001
6	6.002

测量结果的不确定度： U_{rel}= 0.2%　　（k=2）

The uncertainty of measurement results

＊ 未经本院书面批准，不得部分复印此证书。

＊ 本证书的校准结果仅对所校准的计量器具有效。

SDIM/MB04B

SECTION 8. Chains 1

SECTION 8. Chainss1

8-A:

Material Certs & Test Reports

TRELLEBORG

Proof load Test Report Date:2022.2.20

1. ITEM ARTICLE: Chain Assemblies Ø26mm c/w5 shackles /13shackles Qty:26sets/26sets

NOMINAL SIZE OF CHAIN LINKS		Ø26mm X Inside length104mm X Inside widthX39mm	
CHAIN LINKS TOLERANCE		±2.5%	
PROOF LOAD	244KN	BREAKING LOAD	488KN
NOMINAL SIZE OF SHACKLE		G2130 WLL8.5Ton	
WLL	8.5Ton	BREAKING LOAD	508.9KN
NOMINAL SIZE OF SHACKLE		G2130 WLL6.5Ton	
WLL	6.5Ton	BREAKING LOAD	388.9KN
NOMINAL SIZE OF CHAIN TENSIONER		M27	
PROOF LOAD	229KN	BREAKING LOAD	458KN
TEST METHOD	1 set of chain assemblies randomly for proof load. Test load:458KN		
RESULT	Elongation <2.5%	CONCLUSION	Pass

2. ITEM ARTICLE: Chain Assemblies Ø28mm c/w 9shackles Qty:26sets

NOMINAL SIZE OF CHAIN LINKS		Ø28mm X Inside length112mm X Inside widthX42mm	
CHAIN LINKS TOLERANCE		±2.5%	
PROOF LOAD	283KN	BREAKING LOAD	566KN
NOMINAL SIZE OF SHACKLE		G2130 WLL9.5 Ton	
WLL	9.5Ton	BREAKING LOAD	558.6KN
NOMINAL SIZE OF SHACKLE		G2130 WLL8.5Ton	
WLL	8.5Ton	BREAKING LOAD	508.9KN
NOMINAL SIZE OF TENSIONER		M30	
PROOF LOAD	282.5KN	BREAKING LOAD	565KN
TEST METHOD	1 set of chain assemblies randomly for proof load. Test load:567.5KN		
RESULT	Elongation <2.5%	CONCLUSION	Pass

Inspector: 李玲 Checked by: 鞠传峰

List of Material Certificates

No.	Position	Description	Mill certificate No.	Heat No.	Mill Company	Grade
1	Weight chain	BM3-26mm	B20211013188	1304133	Shandong Shouguang Juneng Special Steel Co.,Ltd	CM690
2	Bow shackle for weight chain	G2130 1” body 42mm	B20200604010	0202453Y	Shandong Shouguang Juneng Special Steel Co.,Ltd	45#
3	Bow shackle for weight chain	G2130 1” pin 28mm	201904280000159	WB021901408	Shandong Weiwang Special Steel Co.,Ltd	40Cr
4	Bow shackle for weight chain	G2130 7/8” body 38mm	202004240000130	WB022002725	Shandong Weiwang Special Steel Co.,Ltd	45#
5	Bow shackle for weight chain	G2130 7/8” Pin 25mm	202003040000124	WB021903703	Shandong Weiwang Special Steel Co.,Ltd	40Cr
6	Weight chain	BM3-28mm	B20211123190	1210561	Shandong Shouguang Juneng Special Steel Co.,Ltd	CM690
7	Bow shackle for weight chain	G2130 1-1/8” body 50mm	202011030000196	WB012004226	Shandong Shouguang Juneng Special Steel Co.,Ltd	45#
8	Bow shackle for weight chain	G2130 1-1/8” pin 32mm	202008280000162	WB011904668	Shandong Weiwang Special Steel Co.,Ltd	40Cr
9	Chain tensioner	M27 bolt	20210426000247	WB012013268	Shandong Weiwang Special Steel Co.,Ltd	40Cr
10	Chain tensioner	M27 Plate	W02022011000076	WE727316	HEBEI WENFENG IRON AND STEEL COMPANY	Q355B
11	Chain tensioner	M30 bolt	20210426000247	WB012013268	Shandong Weiwang Special Steel Co.,Ltd	40Cr
12	Chain tensioner	M30 Plate	W02022011000076	WE727323	HEBEI WENFENG IRON AND STEEL COMPANY	Q355B

产品质量证明书

Quality Certificate

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

记录编号（Form No）：TSJ-05-27

产品名称Description	船用锚链圆钢	生产许可证编号Certificate No	----	证书顺序号Certificate No..	B20211013188
用户Consignee	青岛万成锚链有限公司	执行标准Standard	GB/T18669-2012	合同号Contract No	----

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
CM690	1304133	Φ26	6.68	11	26.145	热轧(Hot Rolled)	---	---

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.30	0.25	1.77	0.014	0.002	0.04	0.02	----	0.02	----	0.003	0.013	----	---	0.036	0.034	0.001	----	----	----	----	---	----	----	----	---

低倍组织/级 * Macroscopically Organization/Grade							非金属夹杂物/级 * Nonmetallic Inclusion/Grade								
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A		B		C		D		DS
							粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	
---	----	----	---	----	---	----	---	----	---	----	----	---	----	----	---
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热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance		
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度T/℃	冷弯180° Coolbend	表面质量 Surface	探伤 testing
870	40	水	620	784	69	24.0	162	0℃	---	合格ok	---
600	60	水	----	----	----	---	158	0℃			
---	---	---	----	----	----	---	155	0℃			

产品信息 Product Information	----
备注 Note	1.兹证明材料按船级社（英国、日本、美国、挪威、德国、法国、韩国、中国）认可的过程生产并按船规要求试验合格。 (We hereby certify that the material has been made by an approved process and satisfactonly tested in accordance with Classrules of LR,NK,ABS,DNV,GL,BV,KR,CCS) 2..带“ * ”检测项目的试验方法通过国家实验室（CNAS）认可。 (with “* ”detection project is the National Laboratory （CNAS）Accreditation project.) 3.本质量证明书以原件为主，复印无效。 (No duplicate will be accepted.)

售后服务 (Service after sale)
电话(Tel):0536-5186888
传真(Fax):0536-5186666
地址:山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge)：刘勇

判定员 (Chief of Check Point)：杨丹丹

日期 (Date) 2021/10/15

产品质量证明书

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

Quality Certificate

记录编号（Form No）：TSJ-05-27

产品名称Description	优质碳素结构钢	生产许可证编号Certificate No	——	证书顺序号Certificate No..	B20200604010
用户Consignee	青岛青银金属有限公司	执行标准Standard	GB/T699-2015	合同号Contract No	——

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
45	0202453Y	Φ42	6.66	7	33.31	热轧(Hot Rolled)	——	——

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.44	0.25	0.58	0.016	0.005	0.04	0.01	----	0.01	----	----	----	----	----	0.014	0.012	----	----	----	----	----	----	----	----	----	----

低倍组织/级 • Macroscopically Organization/Grade							非金属夹杂物/级 • Nonmetallic Inclusion/Grade									脱碳/mm*	晶粒度/等级 *	组织/等级*
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A 粗 Thick	A 细 Thin	B 粗 Thick	B 细 Thin	C 粗 Thick	C 细 Thin	D 粗 Thick	D 细 Thin	DS	Decarb-nization	Tafergrade	Structure
0.5	1.5	0	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
0.5	1.5	0	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance					
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度 T/℃	布氏硬度HB* HB Rigidity	洛氏硬度HRC* HRC Rigidity	热顶锻 Hot Forge	端淬性HRC Hardenability	表面质量 Surface	探伤 testing
850	50	空气(air)	412	670	48	24.5	——	——	187	——	合格(ok)	——	合格(ok)	超声:B级合格;涡流:8级合格
—	—	—	420	680	49	24	——	——	186	——	合格(ok)			
—	—	—	----	----	----	----	——	——	186	——	—			

产品信息 Product Information

备注 Note

1..带“ • ”检测项目为国家实验室（CNAS）认可项目。
(with “ • ” detection project is the National Laboratory （CNAS） Accreditation project.)
2.本质量证明书以原件为主，复印无效。
(No duplicate will be accepted.)

售后服务(Service)
销售热线(Sales hot line)：+86-0536-5186688
技术热线(Technical hot line)：+86-0536-5186588
地址：山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge)：

判定员 (Chief of Check Point)： 王丽凤

日期 (Date) 2020/6/4

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	青岛龙泉特钢有限公司	合同号 CONTRACT NO.	DD19401008	件数合计 TOTAL QTY	16	证书号 CERTIFICATE	201904280000159
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁GR6668	重量合计 TOTAL WEIGHT	34.54	出库单号	CF019409059

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu	Mo
B10119040832	WB021901407	38	7	17.729	0.405	0.218	0.602	0.022	0.007	0.860	0.014	0.010	0.0011
B10119040833	WB021901408	28	10	22.766	0.410	0.220	0.600	0.020	0.007	0.870	0.015	0.011	0.0011

批号	屈服强度(MPa)	抗拉强度(MPa)	断后伸长率(%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析
B10119040832	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
B10119040833	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期15天（Ø>=10mm 20天）后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don`t contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2019-04-28	制表人 TABULATOR	黄秀丽	质量负责人 QUALITY MANAGER	刘建印	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE

质量证明书专用章 (1)

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材		订货单位 CUSTOMER	潍坊市成泰钢铁贸易有限公司		合同号 CONTRACT NO.	DD19400952	件数合计 TOTAL QTY	12	证书号 CERTIFICATE	202004240000130
牌号 GRADE	45		执行标准 STANDARD	GB/T 699-2015		车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	31.8	出库单号	CF020408735

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%)															
					C	Si	Mn	P	S	Cr	Ni	Cu								
B10120040269	WB022002725	38	1	2.593	0.435	0.226	0.567	0.014	0.010	0.017	0.007	0.007								
B10120040176	WB022002748	55	4	9.526	0.438	0.232	0.564	0.017	0.012	0.016	0.007	0.006								

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	硬度HB	热顶锻	一般疏松	中心偏析	锭型偏析	中心疏松					
B10120040269	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1					
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1					
B10120040176	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1					
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1					

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天，春季、秋季 15天，冬天20天；Ø>=10mm 夏季 20天，春季、秋季 25天，冬天 40天后投入使用。本产品不含有任何辐射元素。 It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的钢材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2020-04-24	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPAKTMENT OF QUALITY ASSURANCE

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	山东天保工贸有限公司	合同号 CONTRACT NO.	DD19400949	件数合计 TOTAL QTY	9	证书号 CERTIFICATE	202003040000124
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	21.2	出库单号	CF020300887

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu	Mo
B10120020390	WB022001297	32	8	18.911	0.398	0.244	0.590	0.020	0.008	0.857	0.010	0.008	0.0015
B10120020394	WB021903703	25	1	2.289	0.393	0.216	0.596	0.019	0.008	0.863	0.012	0.013	0.0016

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率 (%)	冲击功 Aku2 (J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析
B10120020390	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
B10120020394	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中文数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2020-03-04	制表人 TABULATOR	蔡世英	质量负责人 QUALITY MANAGER	刘建印	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	潍坊特钢集团有限公司 质量证明书专用章 (2)

产品质量证明书

Quality Certificate

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

记录编号（Form No）：TSJ-05-27

产品名称Description	船用锚链圆钢	生产许可证编号Certificate No	-----	证书顺序号Certificate No..	B20211123190
用户Consignee	青岛万成锚链有限公司	执行标准Standard	GB/T18669-2012	合同号Contract No	-----

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
CM690	1210561	Φ28	6.75	9	24.64	热轧(Hot Rolled)	-----	-----

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.30	0.24	1.73	0.015	0.002	0.04	0.02	----	0.02	----	0.003	0.013	----	----	0.035	0.033	0.001	----	----	----	----	----	----	----	----	----

低倍组织/级 * Macroscopically Organization/Grade

一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注
----	----	----	----	----	----	----
----	----	----	----	----	----	----
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非金属夹杂物/级 * Nonmetallic Inclusion/Grade

A		B		C		D		DS
粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	
----	----	----	----	----	----	----	----	----
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热处理Heat Treatment / 力学性能 * Mechanical Performance / 工艺性能Technical Performance

温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度 T/℃	冷弯180° Coolbend	表面质量 Surface	探伤 testing
870	40	水	626	781	69	22.5	159	0℃	-----	合格ok	-----
600	60	水	----	----	----	----	160	0℃			
---	---	---	----	----	----	----	153	0℃			

产品信息 Product Information	----
备注 Note	1.兹证明材料按船级社（英国、日本、美国、挪威、德国、法国、韩国、中国）认可的过程生产并按船规要求试验合格。 (We hereby certify that the material has been made by an approved process and satisfactonly tested in accordance with Classrules of LR,NK,ABS,DNV,GL,BV,KR,CCS) 2..带“ * ”检测项目的试验方法通过国家实验室（CNAS）认可。 (with “* ”detection project is the National Laboratory （CNAS）Accreditation project.) 3.本质量证明书以原件为主，复印无效。 (No duplicate will be accepted.)

售后服务 (Service after sale)
电话(Tel):0536-5186888
传真(Fax):0536-5186666
地址:山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge):

判定员 (Chief of Check Point): 杨丹丹

日期 (Date) 2021/11/25

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	潍坊市成泰钢铁贸易有限公司	合同号 CONTRACT NO.	DD20701108	件数合计 TOTAL QTY	10	证书号 CERTIFICATE	202011030000186
牌号 GRADE	45	执行标准 STANDARD	GB/T 699-2015	车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	22.24	出库单号	CF020800960

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%)														
					C	Si	Mn	P	S	Cr	Ni	Cu							
B10120110025	WB012004226	50	10	22.24	0.468	0.225	0.576	0.019	0.008	0.037	0.008	0.012							

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率 (%)	冲击功 Aku2(J)	硬度HB	热顶锻	一般疏松	中心偏析	锭型偏析	中心疏松					
B10120110016	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/CK	0.5	0.5	0.5	1					
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/CK	0.5	0.5	0.5	1					

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Θ<10mm 夏季 10天，春季、秋季 15天，冬天 20天；Θ>=10mm 夏季 20天，春季、秋季 25天，冬天40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2020-11-03	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材		订货单位 CUSTOMER	潍坊市成泰钢铁贸易有限公司		合同号 CONTRACT NO.	DD19400952		件数合计 TOTAL QTY	14		证书号 CERTIPICATE	202008280000462
牌号 GRADE	40Cr		执行标准 STANDARD	GB/T 3077-2015		车号 VEHICLE NO.	鲁GF6762		重量合计 TOTAL WEIGHT	34.74		出库单号	CF019808853

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%)														
					C	SI	Mn	P	S	Cr	Ni	Cu	Mo						
B10119080712	WB011904712	25	3	6.84	0.392	0.226	0.590	0.014	0.009	0.863	0.018	0.024	0.0038						
B10119080715	WB011904668	32	8	19.876	0.386	0.228	0.589	0.015	0.010	0.864	0.014	0.011	0.0016						
B10119080781	WB011904715	28	3	8.024	0.391	0.232	0.620	0.017	0.017	0.870	0.015	0.019	0.0028						

批号	屈服强度(MPa)	抗拉强度(MPa)	断后伸长率(%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析						
B10119080745	合格/OK	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5						
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5						
B10119080783	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5						
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5						
B10119080781	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5						
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5						

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期15天（Ø>=10mm 20天）后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don`t contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、批号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7079796	

签发日期 ISSUED DATE	2020-08-28	制表人 TABULATOR	蔡世英	质量负责人 QUALITY MANAGER	刘建印	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	质量证明书专用章 (1)

SECTION 8. Chains 1

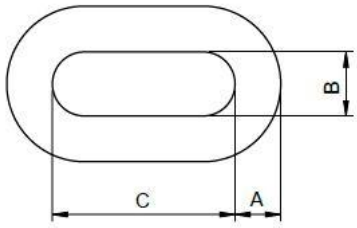
8-B:

Dimensional & Coating Thickness Reports

TRELLEBORG

Dimensional Inspection Report

Product Description	Weight chain	Size	Ø26x104mmx39mmx5links
Quantity	26Pcs	Material	CM690



Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.2	105.2
2	Actual	26	39	104
3	Actual	26	39.4	105

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.5	104.6
2	Actual	26	39.2	105.8
3	Actual	26	39	106

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.4	104.8
2	Actual	26	39.2	105.2
3	Actual	26	39.5	105

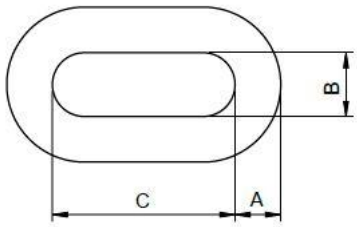
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Weight chain	Size	Ø26x104mmx39mmx13 links
Quantity	26Pcs	Material	CM690



Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.3	105.4
2	Actual	26	39.2	104.8
3	Actual	26	39.3	105.2

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.2	105.6
2	Actual	26	39.2	104.8
3	Actual	26	39	105

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.5	105
2	Actual	26	39.2	104.6
3	Actual	26	39.3	105.3

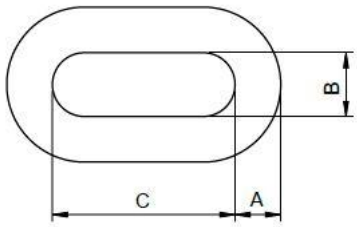
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Weight chain	Size	Ø28x112mmx45mmx9 links
Quantity	26Pcs	Material	CM690



Size	28	A	B	C
No.	2D	28	42	112
1	Actual	28	42.5	112.5
2	Actual	28	42.2	113
3	Actual	28	42	112.8

Size	28	A	B	C
No.	2D	28	42	112
1	Actual	28	42.4	113
2	Actual	28	42.3	113.2
3	Actual	28	42.2	112

Size	28	A	B	C
No.	2D	28	42	112
1	Actual	28	42	112.2
2	Actual	28	42.5	113
3	Actual	28	42.3	113.5

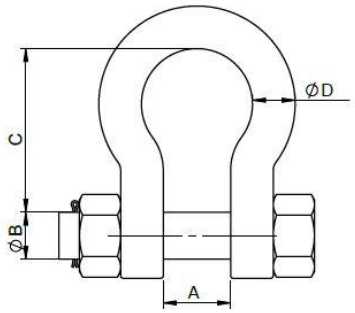
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 7/8"
Quantity	52Pcs	Material	45# 40Cr



Size	7/8"	A	B	C	D
No.	2D	36.57	25.4	84.07	22.35
1	Actual	36.15	25.2	80.5	22.8
2	Actual	36.12	25.15	81.22	22.85
3	Actual	36.56	25.3	82.3	22.72

Size	7/8"	A	B	C	D
No.	2D	36.57	25.4	84.07	22.35
1	Actual	36.35	25.3	80.25	22.65
2	Actual	36.4	25.25	81.36	22.6
3	Actual	36.52	25.4	83.2	22.83

Size	7/8"	A	B	C	D
No.	2D	36.57	25.4	84.07	22.35
1	Actual	36.42	25.33	82.25	22.64
2	Actual	36.5	25.3	81.33	22.73
3	Actual	36.48	25.38	81.26	22.66

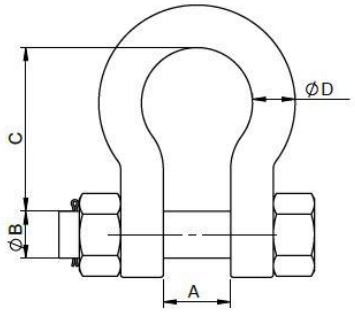
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector： 李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 1"
Quantity	78Pcs	Material	45# 40Cr



Size	1"	A	B	C	D
No.	2D	42.93	28.70	95.25	25.4
1	Actual	43.32	27.9	94.30	25.14
2	Actual	43.4	27.92	94.4	25.25
3	Actual	43.38	27.88	94.54	25.2

Size	1"	A	B	C	D
No.	2D	42.93	28.70	95.25	25.4
1	Actual	42.92	27.93	94.5	25.23
2	Actual	43.15	27.9	95.1	25.12
3	Actual	43.2	27.94	94.25	25.15

Size	1"	A	B	C	D
No.	2D	42.93	28.70	95.25	25.4
1	Actual	43.2	27.92	94.52	25.1
2	Actual	43.18	27.9	94.3	25.14
3	Actual	43.3	27.93	95.14	25.13

Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

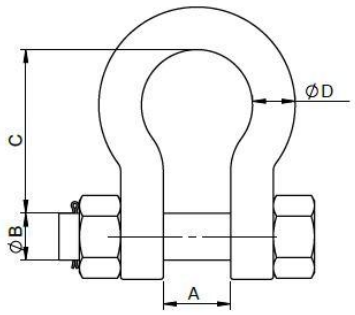
Inspector： 李玲

Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 1-1/8"
Quantity	26Pcs	Material	45# 40Cr



Size	1-1/8"	A	B	C	D
No.	2D	45.97	31.75	107.95	28.70
1	Actual	45.72	32.2	108.2	28.65
2	Actual	47.2	32.3	108.15	28.44
3	Actual	45.68	32.25	107.98	28.5

Size	1-1/8"	A	B	C	D
No.	2D	45.97	31.75	107.95	28.70
1	Actual	46.25	31.85	107.84	28.45
2	Actual	46.5	32.15	107.92	28.6
3	Actual	45.82	32.2	108.15	28.32

Size	1-1/8"	A	B	C	D
No.	2D	45.97	31.75	107.95	28.70
1	Actual	47.25	32.18	108.2	28.45
2	Actual	46.85	32.15	107.7	28.6
3	Actual	47.15	32.22	107.75	28.42

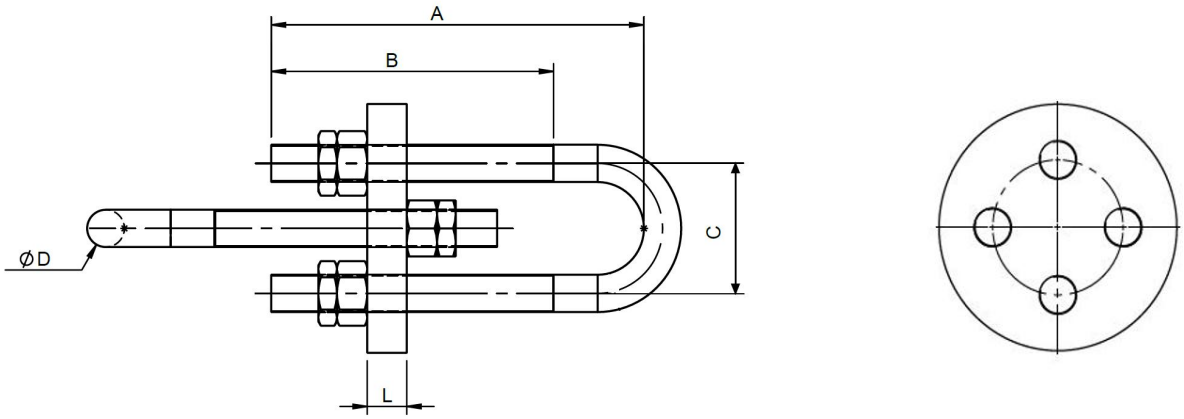
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector： 李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Chain tensioner	Size	M27*220
Quantity	26 Pcs	Material	8.8/Q355B



Size		A	B	C	D	L
No.	2D	220	135	95	27	30
1	Actual	222	136	95.2	27.1	30.2
2	Actual	221	135	95.3	27.2	30.1
3	Actual	220	137	95.1	27.1	30.3

Size		A	B	C	D	L
No.	2D	220	135	95	27	30
1	Actual	221	135	95.1	27.2	30.1
2	Actual	223	135	95.2	27.2	30.2
3	Actual	221	136	95.1	27.3	30.1

Size		A	B	C	D	L
No.	2D	220	135	95	27	30
1	Actual	221	135	95.1	27.2	30.1
2	Actual	221	136	95.2	27.1	30.2
3	Actual	221	137	95.3	27.3	30.1

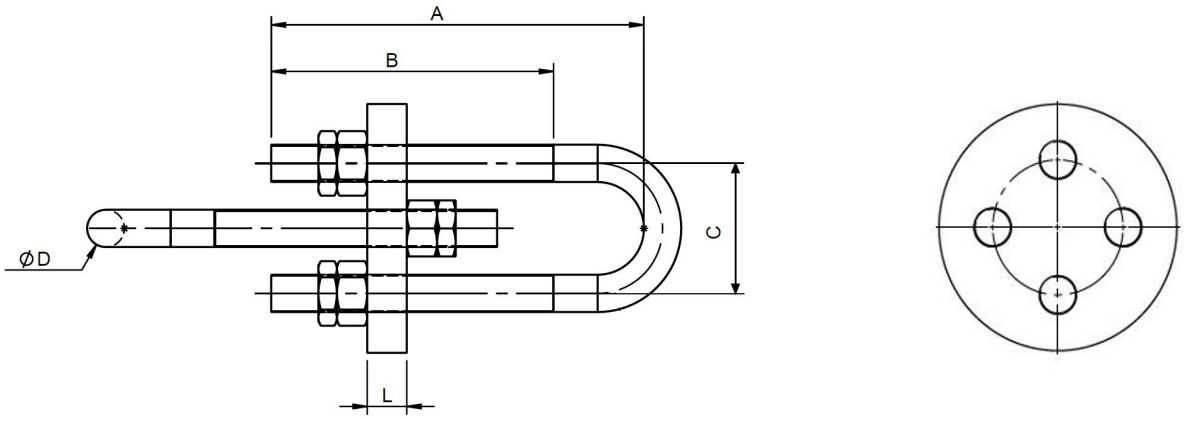
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Chain tensioner	Size	M27*270
Quantity	26 Pcs	Material	8.8/Q355B



Size		A	B	C	D	L
No.	2D	270	185	95	27	30
1	Actual	271	186	95.2	27.3	30.2
2	Actual	270	185	95.1	27.2	30.1
3	Actual	272	186	95.3	27.1	30.3

Size		A	B	C	D	L
No.	2D	270	185	95	27	30
1	Actual	270	185	95.1	27.2	30.3
2	Actual	271	186	95.2	27.1	30.2
3	Actual	273	185	95.3	27.2	30.1

Size		A	B	C	D	L
No.	2D	270	185	95	27	30
1	Actual	272	185	95.3	27.2	30.1
2	Actual	271	185	95.2	27.3	30.2
3	Actual	271	186	95.1	27.1	30.1

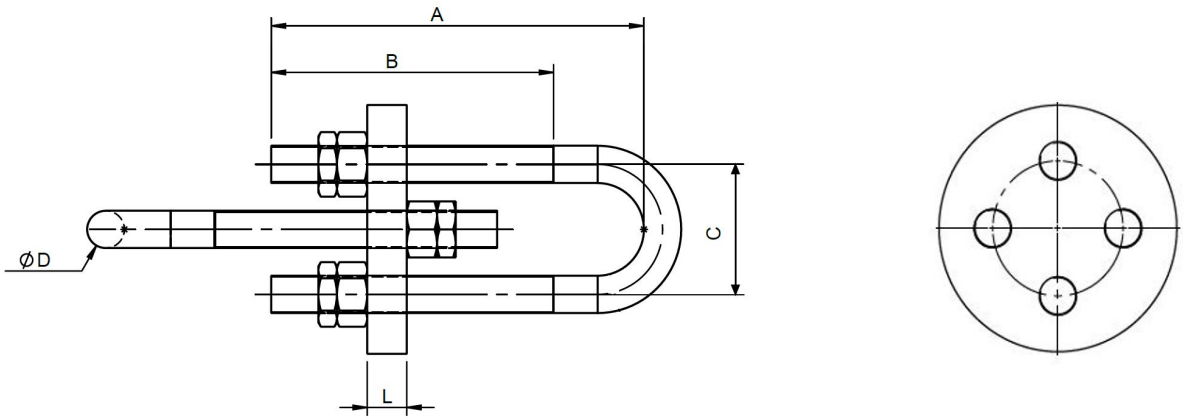
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Chain tensioner	Size	M30*330
Quantity	26 Pcs	Material	8.8/Q355B



Size		A	B	C	D	L
No.	2D	330	235	106	30	35
1	Actual	331	236	106	30.3	35.2
2	Actual	330	235	107	30.2	35.1
3	Actual	332	237	105	30.1	35.3

Size		A	B	C	D	L
No.	2D	330	235	106	30	35
1	Actual	332	235	107	30.1	35.1
2	Actual	331	236	106	30.2	35.2
3	Actual	333	236	106	30.3	35.1

Size		A	B	C	D	L
No.	2D	330	235	106	30	35
1	Actual	333	236	107	30.2	35.2
2	Actual	332	237	105	30.1	35.1
3	Actual	332	235	106	30.1	35.1

Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

HDG Thickness Inspection Report

ITEM	REQUSET	TEST RESULT						CONCLUSION
Surface	Clean,smooth,no zinc burl,no feculence and no missing coat	Clean,smooth,no zinc burl,no feculence and no missing coat						Pass
HDG Thickness	Average Zinc Coating Thickness Min.100μm (610g/m²)	Article	Test Point				Average (μm)	Conclusion
		Weight chainØ26x1046mm x39mm x5Links/13Links	100	105	104	106	113	105.6	Pass
			112	103	100	110	110	107	
			105	110	106	103	106	106	
		Bow shackle 7/8”(2130)	99	115	112	112	108	109.2	Pass
			106	104	103	102	114	105.8	
			100	113	114	108	110	109	
		Bow shackle 1”(2130)	113	101	110	114	103	108.2	Pass
			104	108	112	105	100	105.8	
			102	109	106	112	101	106	
		Bow shackle 1-1/8”(2130)	112	106	113	108	106	109	Pass
			107	104	109	112	105	107.4	
			106	108	113	114	113	110.8	
		Weight chain Ø28x126mm x42mmx9Links	101	114	108	103	100	105.2	Pass
			100	110	103	108	108	105.8	
			108	106	100	110	102	105.2	
		M27 Chain tensioner	115	118	117	107	109	113.2	Pass
			118	109	114	118	113	114.4	
			114	106	118	114	108	112	
		M30 Chain tensioner	109	121	106	109	115	112	Pass
			107	109	116	115	108	111	
			105	115	106	109	115	110	

Inspector: 李玲 Checked by:鞠传峰

SECTION 8. Chains 1

8-C:

Calibration certificates

青岛市计量技术研究院

校 准 证 书

证书编号：CJ920008598-001

客 户 名 称 ： 青岛万成锚链有限公司

客 户 地 址 ： 即墨市TCL大道7号

器 具 名 称 ： 游标卡尺

型 号 / 规 格 ： （0-1500）mm

出 厂 编 号 ： 02000223

制 造 单 位 ： 无锡锡工

接 收 日 期 ： 2020年04月07日

校 准 日 期 ： 2020年04月07日

发 布 日 期 ： 2020年04月07日

批准人：张泽武

核验员：张泽武

校准员：王兴华

（校准专用章）：

计量检定机构授权证书号： （鲁）法计（2018）37002号 电话：0532-68069221/68069222

地址：青岛市崂山区科苑纬四路77号 邮政编码：266101

传真： 0532-68069202 网址：www.qdjly.cn EMAIL：qimt16766@163.com

青岛市计量技术研究院

检 定 证 书

证书编号：CJ820007032-001

送 检 单 位 ： 青岛万成锚链有限公司

计量器具名称： 纤维卷尺

型 号 / 规 格 ： 50m

出 厂 编 号 ： /

制 造 单 位 ： 蓝特工量具

检 定 依 据 ： JJG 5-2001《纤维卷尺、测绳检定规程》

检 定 结 论 ： 1级

批准人：张泽武

核验员：隋桂芝

（检定专用章）：

检定员：李宝春

检定日期 2020 年 04 月 08 日

有效期至 2021 年 04 月 07 日

计量检定机构授权证书号： （鲁）法计（2018）37002号 电话：0532-68069221/68069222

地址：青岛市崂山区科苑纬四路77号 邮政编码：266101

传真： 0532-68069202 网址：www.qdjly.cn EMAIL：qimt16766@163.com

青岛市计量技术研究院

检 定 证 书

证书编号：CJ920008594-001

送 检 单 位： 青岛万成锚链有限公司

计量器具名称： 游标卡尺

型 号 / 规 格： (0-300)mm

出 厂 编 号： 3223

制 造 单 位： 哈量

检 定 依 据： JJG 30-2012《通用卡尺检定规程》

检 定 结 论： 合格

批准人：张泽武

（检定专用章）：

核验员：张泽武

检定员：王兴华

检定日期 2020 年 04 月 07 日

有效期至 2021 年 04 月 06 日

计量检定机构授权证书号： （鲁）法计（2018）37002号 电话：0532-68069221/68069222

地址：青岛市崂山区科苑纬四路77号 邮政编码：266101

传真： 0532-68069202 网址：www.qdjly.cn EMAIL：qimt16766@163.com

2018-jd-c

SECTION 9. Chains 2

SECTION 9. Chains 2

9-A:

Material Certs & Test Reports

TRELLEBORG

Proof load Test Report Date:2022.5.5

1. ITEM ARTICLE: Chain Assemblies Ø26mm c/w21 shackles /29shackles Qty:44sets/44sets

NOMINAL SIZE OF CHAIN LINKS		Ø26mm X Inside length104mm X Inside widthX39mm	
CHAIN LINKS TOLERANCE		±2.5%	
PROOF LOAD	244KN	BREAKING LOAD	488KN
NOMINAL SIZE OF SHACKLE		G2130 WLL8.5Ton	
WLL	8.5Ton	BREAKING LOAD	508.6KN
NOMINAL SIZE OF SHACKLE		G2130 WLL6.5Ton	
WLL	6.5Ton	BREAKING LOAD	388.9KN
NOMINAL SIZE OF CHAIN TENSIONER		M27	
WLL	229K N	BREAKING LOAD	458KN
TEST METHOD	1 set of chain assemblies randomly for proof load. Test load:388.9KN		
RESULT	Elongation <2.5%	CONCLUSION	Pass

2. ITEM ARTICLE: Chain Assemblies Ø34mm c/w 17shackles Qty:44sets

NOMINAL SIZE OF CHAIN LINKS		Ø34mm X Inside length136mm X Inside widthX51mm	
CHAIN LINKS TOLERANCE		±2.5%	
PROOF LOAD	417.3KN	BREAKING LOAD	834.6KN
NOMINAL SIZE OF SHACKLE		G2130 WLL13.5 Ton	
WLL	13.5Ton	BREAKING LOAD	807.95KN
NOMINAL SIZE OF SHACKLE		G2130 WLL12Ton	
WLL	12Ton	BREAKING LOAD	718.1KN
NOMINAL SIDE OF CHAIN TENSIONER		M36	
WLL	407KN	BREAKING LOAD	814KN
TEST METHOD	1 set of chain assemblies randomly for proof load. Test load:835.5KN		
RESULT	Elongation <2.5%	CONCLUSION	Pass

Inspector: 李玲 Checked by: 鞠传峰

List of Material Certificates

No.	Position	Description	Mill certificate No.	Heat No.	Mill Company	Grade
1	Weight chain	BM3-26mm	B20211013188	1304133	Shandong Shouguang Juneng Special Steel Co.,Ltd	CM690
2	Bow shackle for weight chain	G2130 1” body 42mm	B20200604010	0202453Y	Shandong Shouguang Juneng Special Steel Co.,Ltd	45#
3	Bow shackle for weight chain	G2130 1” pin 28mm	201904280000159	WB021901408	Shandong Weiwang Special Steel Co.,Ltd	40Cr
4	Bow shackle for weight chain	G2130 7/8” body 38mm	202004240000130	WB022002725	Shandong Weiwang Special Steel Co.,Ltd	45#
5	Bow shackle for weight chain	G2130 7/8” Pin 25mm	202003040000124	WB021903703	Shandong Weiwang Special Steel Co.,Ltd	40Cr
6	Weight chain	BM3-34mm	B20211015163	1355738	Shandong Shouguang Juneng Special Steel Co.,Ltd	CM690
7	Bow shackle for weight chain	G2130 1-3/8” body 60mm	202011030000186	WB012004471	Shandong Weiwang Special Steel Co.,Ltd	45#
8	Bow shackle for weight chain	G2130 1-3/8” Pin 38mm	202003040000122	WB022001297	Shandong Weiwang Special Steel Co.,Ltd	40Cr
9	Bow shackle for weight chain	G2130 1-1/4” body 55mm	B20190405029	9101485	Shandong Shouguang Juneng Special Steel Co.,Ltd	45#
10	Bow shackle for weight chain	G2130 1-1/4”pin 35mm	202003040000124	WB022001297	Shandong Weiwang Special Steel Co.,Ltd	40Cr
11	Chain tensioner	M27 bolt	202104260000247	WB012103168	Shandong Weiwang Special Steel Co.,Ltd	40Cr
12	Chain tensioner	M27 plate	W202022011000076	WE727316	HEBEI WENFENG IRON AND STEEL COMPANY LTD	Q355B
13	Chain tensioner	M34 bolt	202104140000167	WB012103179	Shandong Weiwang Special Steel Co.,Ltd	40Cr
14	Chain tensioner	M34 plate	W02022093500596	WE727247	HEBEI WENFENG IRON AND STEEL COMPANY LTD	Q355B

产品质量证明书

Quality Certificate

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

记录编号（Form No）：TSJ-05-27

产品名称Description	船用锚链圆钢	生产许可证编号Certificate No	----	证书顺序号Certificate No..	B20211013188
用户Consignee	青岛万成锚链有限公司	执行标准Standard	GB/T18669-2012	合同号Contract No	----

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
CM690	1304133	Φ26	6.68	11	26.145	热轧(Hot Rolled)	---	---

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.30	0.25	1.77	0.014	0.002	0.04	0.02	----	0.02	----	0.003	0.013	----	----	0.036	0.034	0.001	----	----	----	----	----	----	----	----	---

低倍组织/级 * Macroscopically Organization/Grade							非金属夹杂物/级 * Nonmetallic Inclusion/Grade								
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A		B		C		D		DS
							粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	
---	----	----	---	----	---	----	---	----	---	----	----	---	----	----	----
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热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance		
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度T/℃	冷弯180° Coolbend	表面质量 Surface	探伤 testing
870	40	水	620	784	69	24.0	162	0℃	---	合格ok	---
600	60	水	----	----	----	---	158	0℃			
---	---	---	----	----	----	---	155	0℃			

产品信息 Product Information	----
备注 Note	1.兹证明材料按船级社（英国、日本、美国、挪威、德国、法国、韩国、中国）认可的过程生产并按船规要求试验合格。 (We hereby certify that the material has been made by an approved process and satisfactonly tested in accordance with Classrules of LR,NK,ABS,DNV,GL,BV,KR,CCS) 2..带“ * ”检测项目的试验方法通过国家实验室（CNAS）认可。 (with “* ”detection project is the National Laboratory （CNAS）Accreditation project.) 3.本质量证明书以原件为主，复印无效。 (No duplicate will be accepted.)

售后服务 (Service after sale)
电话(Tel):0536-5186888
传真(Fax):0536-5186666
地址:山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge)：刘勇

判定员 (Chief of Check Point)：杨丹丹

日期 (Date) 2021/10/15

产品质量证明书

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

Quality Certificate

记录编号（Form No）：TSJ-05-27

产品名称Description	优质碳素结构钢	生产许可证编号Certificate No	——	证书顺序号Certificate No..	B20200604010
用户Consignee	青岛青银金属有限公司	执行标准Standard	GB/T699-2015	合同号Contract No	——

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
45	0202453Y	Φ42	6.66	7	33.31	热轧(Hot Rolled)	——	——

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.44	0.25	0.58	0.016	0.005	0.04	0.01	----	0.01	----	----	----	----	----	0.014	0.012	----	----	----	----	----	----	----	----	----	----

低倍组织/级 • Macroscopically Organization/Grade							非金属夹杂物/级 • Nonmetallic Inclusion/Grade									脱碳/mm*	晶粒度/等级 *	组织/等级*
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A 粗 Thick	A 细 Thin	B 粗 Thick	B 细 Thin	C 粗 Thick	C 细 Thin	D 粗 Thick	D 细 Thin	DS	Decarb-nization	Tafergrade	Structure
0.5	1.5	0	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
0.5	1.5	0	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance					
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度 T/℃	布氏硬度HB* HB Rigidity	洛氏硬度HRC* HRC Rigidity	热顶锻 Hot Forge	端淬性HRC Hardenability	表面质量 Surface	探伤 testing
850	50	空气(air)	412	670	48	24.5	——	——	187	——	合格(ok)	——	合格(ok)	超声:B级合格;涡流:8级合格
—	—	—	420	680	49	24	——	——	186	——	合格(ok)			
—	—	—	----	----	----	----	——	——	186	——	—			

产品信息 Product Information

备注 Note

1..带“ • ”检测项目为国家实验室（CNAS）认可项目。
(with “ • ” detection project is the National Laboratory （CNAS） Accreditation project.)
2.本质量证明书以原件为主，复印无效。
(No duplicate will be accepted.)

售后服务(Service)
销售热线（Sales hot line）:+86-0536-5186688
技术热线(Technical hot line):+86-0536-5186588
地址:山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge):

判定员 (Chief of Check Point): 王丽凤

日期 (Date) 2020/6/4

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	青岛龙泉特钢有限公司	合同号 CONTRACT NO.	DD19401008	件数合计 TOTAL QTY	16	证书号 CERTIFICATE	201904280000159
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁GR6668	重量合计 TOTAL WEIGHT	34.54	出库单号	CF019409059

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu	Mo
B10119040832	WB021901407	38	7	17.729	0.405	0.218	0.602	0.022	0.007	0.860	0.014	0.010	0.0011
B10119040833	WB021901408	28	10	22.766	0.410	0.220	0.600	0.020	0.007	0.870	0.015	0.011	0.0011

批号	屈服强度(MPa)	抗拉强度(MPa)	断后伸长率(%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析
B10119040832	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
B10119040833	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期15天（Ø>=10mm 20天）后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don`t contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2019-04-28	制表人 TABULATOR	黄秀丽	质量负责人 QUALITY MANAGER	刘建印	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE

质量证明书专用章（1）

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材		订货单位 CUSTOMER	潍坊市成泰钢铁贸易有限公司		合同号 CONTRACT NO.	DD19400952	件数合计 TOTAL QTY	12	证书号 CERTIFICATE	202004240000130
牌号 GRADE	45		执行标准 STANDARD	GB/T 699-2015		车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	31.8	出库单号	CF020408735

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu
B10120040269	WB022002725	38	1	2.593	0.435	0.226	0.567	0.014	0.010	0.017	0.007	0.007
B10120040176	WB022002748	55	4	9.526	0.438	0.232	0.564	0.017	0.012	0.016	0.007	0.006

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	硬度HB	热顶锻	一般疏松	中心偏析	锭型偏析	中心疏松
B10120040269	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1
B10120040176	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/OK	0.5	0.5	0.5	1

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Φ<10mm 夏季 10天，春季、秋季 15天，冬天20天；Φ>=10mm 夏季 20天，春季、秋季 25天，冬天 40天后投入使用，本产品不含有任何辐射元素。 It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的钢材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2020-04-24	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	山东天保工贸有限公司	合同号 CONTRACT NO.	DD19400949	件数合计 TOTAL QTY	9	证书号 CERTIFICATE	202003040000124
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	21.2	出库单号	CF020300887

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu	Mo
B10120020390	WB022001297	32	8	18.911	0.398	0.244	0.590	0.020	0.008	0.857	0.010	0.008	0.0015
B10120020394	WB021903703	25	1	2.289	0.393	0.216	0.596	0.019	0.008	0.863	0.012	0.013	0.0016

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析
B10120020390	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
B10120020394	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、建议按备注时效期天数投入使用; 2、对钢材质量有异议时,应在发货之日起二月内提出,并保留能够充分证明为同批号的母材,来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等; 3、本证明书加盖质检章有效,复印无效; 4、钢材按实际重量交货; 5、棒材标识中支数一栏仅供参考; 6、售后服务电话: 0536-7679796	

签发日期 ISSUED DATE	2020-03-04	制表人 TABULATOR	蔡世英	质量负责人 QUALITY MANAGER	刘建印	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	质量证明书专用章 (2)

产品质量证明书

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

Quality Certificate

记录编号（Form No）：TSJ-05-27

产品名称Description	船用锚链圆钢	生产许可证编号Certificate No	----	证书顺序号Certificate No..	B20211015163
用户Consignee	青岛万成锚链有限公司	执行标准Standard	GB/T18669-2012	合同号Contract No	----

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
CM690	1355738	Φ34	6.85	11	33.90	热轧(Hot Rolled)	----	----

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.30	0.25	1.72	0.014	0.002	0.04	0.02	----	0.02	----	0.003	0.013	----	----	0.033	0.031	0.001	----	----	----	----	----	----	----	----	----

低倍组织/级 * Macroscopically Organization/Grade							非金属夹杂物/级 * Nonmetallic Inclusion/Grade								
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A		B		C		D		DS
							粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	粗Thick	细Thin	
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
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热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance		
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度T/℃	冷弯180° Coolbend	表面质量 Surface	探伤 testing
870	40	水	642	769	69	23.2	163	0℃	----	合格ok	----
600	60	水	----	----	----	----	160	0℃			
----	----	----	----	----	----	----	158	0℃			

产品信息 Product Information	----
备注 Note	1.兹证明材料按船级社（英国、日本、美国、挪威、德国、法国、韩国、中国）认可的过程生产并按船规要求试验合格。 (We hereby certify that the material has been made by an approved process and satisfactonly tested in accordance with Classrules of LR,NK,ABS,DNV,GL,BV,KR,CCS) 2..带“ * ”检测项目的试验方法通过国家实验室（CNAS）认可。 (with “* ”detection project is the National Laboratory （CNAS）Accreditation project.) 3.本质量证明书以原件为主，复印无效。 (No duplicate will be accepted.)

售后服务 (Service after sale)
电话(Tel):0536-5186888
传真(Fax):0536-5186666
地址:山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge)：刘勇

判定员 (Chief of Check Point)：杨丹丹

日期 (Date) 2021/10/16

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	潍坊市成泰钢铁贸易有限公司	合同号 CONTRACT NO.	DD20701108	件数合计 TOTAL QTY	10	证书号 CERTIFICATE	202011030000186
牌号 GRADE	45	执行标准 STANDARD	GB/T 699-2015	车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	22.24	出库单号	CF020800960

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%)															
					C	Si	Mn	P	S	Cr	Ni	Cu								
B10120110016	WB012004471	60	10	22.24	0.468	0.225	0.576	0.019	0.008	0.037	0.008	0.012								

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	硬度HB	热顶锻	一般疏松	中心偏析	锭型偏析	中心疏松						
B10120110016	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/CK	0.5	0.5	0.5	1						
	合格/OK	合格/OK	合格/OK	合格/OK	≥39	≤229	合格/CK	0.5	0.5	0.5	1						

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天，春季、秋季 15天，冬天 20天；Ø>=10mm 夏季 20天，春季、秋季 25天，冬天40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2020-11-03	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	山东天保工贸有限公司	合同号 CONTRACT NO.	DD19400949	件数合计 TOTAL QTY	9	证书号 CERTIFICATE	202003040000122
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁VL6319	重量合计 TOTAL WEIGHT	28.7	出库单号	CF020300887

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu	Mo
B10120020390	WB022001297	38	8	18.911	0.398	0.244	0.590	0.020	0.008	0.857	0.010	0.008	0.0015
B10120020394	WB021903703	20	1	2.289	0.393	0.216	0.596	0.019	0.008	0.863	0.012	0.013	0.0016

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率 (%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析
B10120020390	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
B10120020394	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、建议按备注时效期天数投入使用; 2、对钢材质量有异议时,应在发货之日起二月内提出,并保留能够充分证明为同批号的母材,来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等; 3、本证明书加盖质检章有效,复印无效; 4、钢材按实际重量交货; 5、棒材标识中支数一栏仅供参考; 6、售后服务电话: 0536-7679796	

签发日期 ISSUED DATE	2020-03-04	制表人 TABULATOR	蔡世英	质量负责人 QUALITY MANAGER	刘建	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

产品质量证明书

Quality Certificate

记录编号（Form No）：TSJ-05-27

产品名称Description	优质碳素结构钢	生产许可证编号Certificate No	----	证书顺序号Certificate No..	B20190405029
用户Consignee	青岛青银金属有限公司	执行标准Standard	GB/T699-2015	合同号Contract No	----

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
45	9101485	Φ55	6.5	11	37.66	热轧(Hot Rolled)	----	----

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.45	0.23	0.60	0.009	0.003	0.04	0.01	---	0.01	----	----	----	----	---	0.016	0.015	----	----	----	----	----	----	----	----	----	----

低倍组织/级 * Macroscopically Organization/Grade							非金属夹杂物/级 * Nonmetallic Inclusion/Grade									脱碳/mm*	晶粒度/等级 *	组织/等级*
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A		B		C		D		DS	Decarb-nization	Wafergrade	Structure
							粗 Thick	细 Thin	粗 Thick	细 Thin	粗 Thick	细 Thin	粗 Thick	细 Thin				
0.5	1.5	0	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
0.5	1.5	0	0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance					
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度T/℃	布氏硬度HB* HB Rigidity	洛氏硬度HRC* HRC Rigidity	热顶锻 Hot Forge	端淬性HRC Hardenability	表面质量 Surface	探伤 testing
850	50	空气(air)	414	644	43	25.0	----	----	186	----	合格(ok)	----	合格(OK)	----
---	---	---	410	640	44	25.0	----	----	186	----	合格(ok)			
---	---	---	----	---	----	---	----	----	186	----	---			

产品信息 Product Information

备注 Note

1..带“*”检测项目为国家实验室（CNAS）认可项目。
(with “*” detection project is the National Laboratory （CNAS）Accreditation project.)
2.本质量证明书以原件为主，复印无效。
(No duplicate will be accepted.)

售后服务(Service)
销售热线（Sales hot line）:+86-0536-5186688
技术热线(Technical hot line):+86-0536-5186588
地址:山东寿光特钢路9号
(Add:NO.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge)：

判定员 (Chief of Check Point)： 王丽凤

日期 (Date) 2019/4/5

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材		订货单位 CUSTOMER	山东天保工贸有限公司		合同号 CONTRACT NO.	DD19400949		件数合计 TOTAL QTY	9		证书号 CERTIFICATE	202003040000124
牌号 GRADE	40Cr		执行标准 STANDARD	GB/T 3077-2015		车号 VEHICLE NO.	鲁VL6319		重量合计 TOTAL WEIGHT	21.2		出库单号	CF020300887

批号	炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%)														
					C	Si	Mn	P	S	Cr	Ni	Cu	Mo						
B10120020390	WB022001297	35	8	18.911	0.398	0.244	0.590	0.020	0.008	0.857	0.010	0.008	0.0015						
B10120020394	WB021903703	20	1	2.289	0.393	0.216	0.596	0.019	0.008	0.863	0.012	0.013	0.0016						

批号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析					
B10120020390	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
B10120020394	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。It is guaranteed that the products don't contain radiochemical imparities.
注释 NOTES	1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、钢号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796	

签发日期 ISSUED DATE	2020-03-04	制表人 TABULATOR	蔡世英	质量负责人 QUALITY MANAGER	刘建印	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	潍坊特钢集团有限公司 质量证明书专用章 (2)

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	青岛龙泉特钢有限公司	合同号 CONTRACT NO.	DD21400007	件数合计 TOTAL QTY	13	证书号 CERTIFICATE	202104140000167
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁VS5117	重量合计 TOTAL WEIGHT	35.38	出库单号	CF021405849

炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%) C	Si	Mn	P	S	Cr	Ni	Cu	Mo
WB012103179	36	3	8.136	0.380	0.220	0.590	0.021	0.008	0.870	0.016	0.017	0.0110
WB022102974	32	6	16.686	0.408	0.232	0.592	0.015	0.005	0.854	0.015	0.012	0.0001
WB022102933	36	4	10.558	0.423	0.249	0.587	0.018	0.006	0.873	0.014	0.011	0.0052

炉号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析
WB012103179	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
WB022102974	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
WB022102933	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。 It is guaranteed that the products don`t contain radiochemical imparities.
注释 NOTES		1、 建议按备注时效期天数投入使用； 2、对钢材质量有异议时，应在发货之日起二月内提出，并保留能够充分证明为同批号的母材，来函请标明证书号、炉号、牌号、规格、重量、合同号、原因等； 3、本证明书加盖质检章有效，复印无效； 4、钢材按实际重量交货； 5、棒材标识中支数一栏仅供参考； 6、售后服务电话：0536-7679796

签发日期 ISSUED DATE	2021-04-14	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	质量证明书专用章 (2)

潍坊特钢集团有限公司

产品质量证明书

产品名称 PRODUCT NAME	棒材	订货单位 CUSTOMER	青岛龙泉特钢有限公司	合同号 CONTRACT NO.	DD21400007	件数合计 TOTAL QTY	13	证书号 CERTIFICATE	202104260000247
牌号 GRADE	40Cr	执行标准 STANDARD	GB/T 3077-2015	车号 VEHICLE NO.	鲁GW1903	重量合计 TOTAL WEIGHT	36.48	出库单号	CF021411418

炉号	规格 SIZE mm	件数 PIECES	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION (%)														
				C	Si	Mn	P	S	Cr	Ni	Cu	Mo						
WB012103168	30	6	16.236	0.400	0.210	0.600	0.022	0.007	0.870	0.014	0.014	0.0065						
WB012102334	35	4	12.353	0.416	0.223	0.602	0.013	0.005	0.885	0.025	0.019	0.0101						
WB022102629	30	3	7.891	0.385	0.200	0.590	0.018	0.005	0.860	0.015	0.019	0.0159						

炉号	屈服强度 (MPa)	抗拉强度 (MPa)	断后伸长率 (%)	断面收缩率(%)	冲击功 Aku2(J)	热顶锻	一般疏松	锭型偏析	中心疏松	一般点状偏析	边缘点状偏析	•				
WB012103168	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
WB012102334	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
WB022102629	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					
	合格/OK	合格/OK	合格/OK	合格/OK	≥47	合格/OK	0.5	0.5	1	0.5	0.5					

外观及尺寸合格 Acceptable Visual and Size	备注 REMARKS	按生产日期 Ø<10mm 夏季 10天,春季、秋季 15天,冬天 20天; Ø>=10mm 夏季 20天,春季、秋季 25天,冬天 40天后投入使用。本产品不含有任何辐射元素。 It is guaranteed that the products don't contain radiochemical imparities.
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签发日期 ISSUED DATE	2021-04-26	制表人 TABULATOR	王心森	质量负责人 QUALITY MANAGER	刘建垒	质量部门盖章 STAMP OF DEPARTMENT OF QUALITY ASSURANCE	

质 量 证 明 书

QUALITY CERTIFICATE

合同编号：
CONTRACT NO. _____

技术条件：
TECHNICAL CONDITION GB/T3274-2007

收货单位：
PURCHASER 洛阳齐益商贸有限公司

河北文丰钢铁有限公司
HEBEI WENFENG IRON AND STEEL COMPANY LTD.

产品名称：
COMMODITY: 碳素结构钢和低合金结构热轧厚钢板和钢带 Hot-rolldd plates and strips of carbon structural steels and high strength low alloy structural steels

日 期：
DATE 2022.01.15

车 号：
TRAIN NO. 2743

证明书号
CERTIFICATE NO. W02022093500596

供货状态：控轧
CONDITION OF SUPPLY C.R

钢种 GRADE	熔炼号 HEAT NO.	规格 SIZE (mm)	批号 BATCH NO.	产品数量 QUANTITY		化学成份% CHMICAL COMPOSITION					屈服点 Rel N/mm2	抗拉强度 RN /mm2	伸长率 A %	冷弯 BENDING 180°	冲击试验 IMPACT VALUE			合格项目 RESULT
				张数 PCS	重量 WEIGHT (t)	C	Si	Mn	P	S					A	B	C	
Q355B	WE727247	40*2200	2WE727067	3		0.17	0.19	1.12	0.014	0.012	385	533	23.9	合格	103	98	101	5
Q355B	WE727268	55*2200	2WE727099	1		0.16	0.17	1.15	0.010	0.012	372	518	23.2	合格	92	91	93	5
Q355B	WE727279	65*2200	2WE727113	1		0.18	0.16	1.10	0.014	0.010	369	512	23.3	合格	86	89	88	5
合计（SUB-TOTAL）：				5														
备注（REMARKS）																		

说明：贵方若查询产品质量情况，请将产品牌号、熔炼号、批号、证明号编号、发货日期、车号、合同号等写入函内，本质证书在且仅在中国大陆范围内有效。
NOTE:IF THER IS ANY QUESTION WITH QUALTY,PLEASE OFFER THE GRADE,HEAT NO.,BATCH NO.,CERTIFICATE NO.,DATE,VEHICLE NO.,CONTRACT NO.ETC. THIS QUALITY CERTIFICATE IS APPLIED AND ONLY APPLIED IN CHINESE MAINLAND AERA.

发货员：
CONSIGNOR:

制表： 温晓华
TABULATOR:

河北文丰钢铁有限公司 钢材质检专用章 (1)

质 量 证 明 书

QUALITY CERTIFICATE

合同编号：
CONTRACT NO. _____

技术条件：
TECHNICAL CONDITION GB/T3274-2007

收货单位：
PURCHASER 洛阳齐益商贸有限公司

河北文丰钢铁有限公司
HEBEI WENFENG IRON AND STEEL COMPANY LTD.

产品名称：碳素结构钢和低合金结构热轧厚钢板和钢带
COMMODITY : Hot-rolldd plates and strips of carbon structural steels and high strength low alloy structural steels

日 期：
DATE 2022.1.21

车 号：
TRAIN NO. 7831

证明书号
CERTIFICATE NO. W02022011000076

供货状态：控轧
CONDITION OF SUPPLY C.R

钢种 GRADE	熔炼号 HEAT NO.	规格 SIZE (mm)	批号 BATCH NO.	产品数量 QUANTITY		化学成份% CHMICAL COMPOSITION					屈服点 ReL N/mm2	抗拉强度 RN /mm2	伸长率 A %	冷弯 BENDING 180°	冲击试验 IMPACT VALUE			合格项目 RESULT
				张数 PCS	重量 WEIGHT (t)	C	Si	Mn	P	S					A	B	C	
Q355B	WE727316	30*2200	22W011052	15		0.17	0.18	1.13	0.014	0.012	389	523	23.5	合格	102	105	103	5
Q355B	WE727323	35*2200	22W011067	13		0.16	0.17	1.15	0.010	0.012	391	519	23.5	合格	99	96	97	5
合计（SUB-TOTAL）：				28														
备注（REMARKS）																		

说明：贵方若查询产品质量情况，请将产品牌号、熔炼号、批号、证明号编号、发货日期、车号、合同号等写入函内，本质证书在且仅在中国大陆范围内有效。
NOTE:IF THER IS ANY QUESTION WITH QUALTY,PLEASE OFFER THE GRADE,HEAT NO.,BATCH NO.,CERTIFICATE NO.,DATE,VEHICLE NO.,CONTRACT NO.ETC. THIS QUALITY CERTIFICATE IS APPLIED AND ONLY APPLIED IN CHINESE MAINLAND AERA.

发货员：
CONSIGNOR:

制表： 温晓华
TABULATOR:

河北文丰钢铁有限公司 钢材质检专用章 (1)

SECTION 9. Chains 2

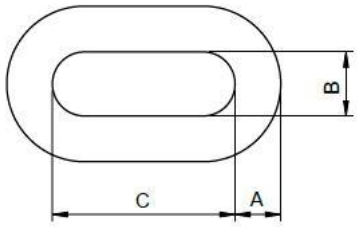
9-B:

Dimensional & Coating Thickness Reports

TRELLEBORG

Dimensional Inspection Report

Product Description	Weight chain	Size	Ø26x104mmx39mmx21 links
Quantity	44Pcs	Material	CM690



Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39	105.3
2	Actual	26	39.2	104.2
3	Actual	26	39.3	104.5

5

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.5	104.8
2	Actual	26	39.4	105.5
3	Actual	26	39.2	105.8

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39	106
2	Actual	26	39.2	105.4
3	Actual	26	39.4	104.6

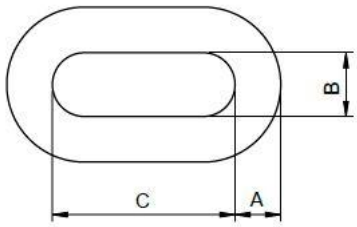
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Weight chain	Size	Ø26x104mmx39mmx29 links
Quantity	44Pcs	Material	CM690



Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.5	105.2
2	Actual	26	39.3	104.6
3	Actual	26	39	106

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39.4	105.8
2	Actual	26	39.2	104.6
3	Actual	26	39.5	105.2

Size	26	A	B	C
No.	2D	26	39	104
1	Actual	26	39	105.8
2	Actual	26	39.4	106
3	Actual	26	39.3	105.5

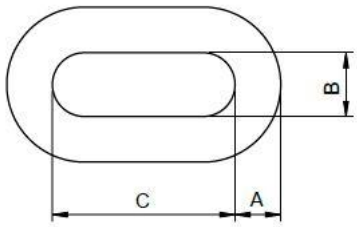
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Weight chain	Size	Ø34x136mmx51mmx17 links
Quantity	44Pcs	Material	CM690



Size	34	A	B	C
No.	2D	34	51	136
1	Actual	34	51.4	136.5
2	Actual	34	52	137
3	Actual	34	51.8	136.4

Size	34	A	B	C
No.	2D	34	51	136
1	Actual	34	51.5	137.2
2	Actual	34	51.4	137
3	Actual	34	51	136.8

Size	34	A	B	C
No.	2D	34	51	136
1	Actual	34	52	136.5
2	Actual	34	51.3	137.8
3	Actual	34	51.6	137

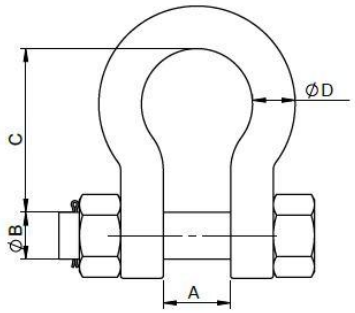
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 7/8"
Quantity	88Pcs	Material	45# 40Cr



Size	7/8"	A	B	C	D
No.	2D	36.57	25.4	84.07	22.35
1	Actual	36.12	25.15	80.55	22.65
2	Actual	36.14	25.23	81.28	22.75
3	Actual	36.5	25.25	82.3	22.7

Size	7/8"	A	B	C	D
No.	2D	36.57	25.4	84.07	22.35
1	Actual	36.34	25.32	80.38	22.64
2	Actual	36.42	25.2	81.3	22.65
3	Actual	36.36	25.42	83.22	22.8

Size	7/8"	A	B	C	D
No.	2D	36.57	25.4	84.07	22.35
1	Actual	36.44	25.3	82.28	22.6
2	Actual	36.48	25.35	81.35	22.74
3	Actual	36.52	25.34	81.28	22.65

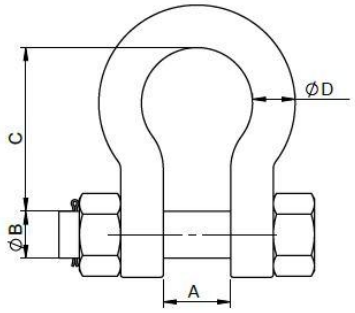
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector： 李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 1"
Quantity	88Pcs	Material	45# 40Cr



Size	1"	A	B	C	D
No.	2D	42.93	28.70	95.25	25.4
1	Actual	43.34	27.93	94.32	25.18
2	Actual	43.42	27.9	94.42	25.2
3	Actual	43.3	27.86	94.5	25.25

Size	1"	A	B	C	D
No.	2D	42.93	28.70	95.25	25.4
1	Actual	42.93	27.95	94.52	25.2
2	Actual	43.18	27.92	95.18	25.18
3	Actual	43.22	27.9	94.35	25.26

Size	1"	A	B	C	D
No.	2D	42.93	28.70	95.25	25.4
1	Actual	43.24	27.93	94.55	25.12
2	Actual	43.16	27.94	94.35	25.16
3	Actual	43.32	27.96	95.25	25.2

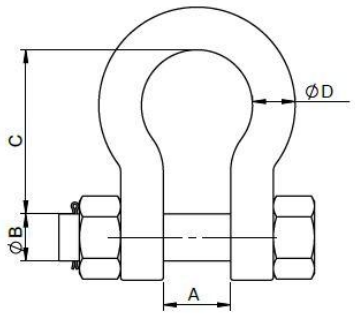
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector： 李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 1-3/8"
Quantity	44Pcs	Material	45# 40Cr



Size	1-3/8"	A	B	C	D
No.	2D	57.15	38.1	133.35	35.05
1	Actual	57.1	37.65	133.12	36.02
2	Actual	56.8	37.7	133.2	34.98
3	Actual	56.75	37.72	133.05	34.9

Size	1-3/8"	A	B	C	D
No.	2D	57.15	38.1	133.35	35.05
1	Actual	56.25	37.62	133.22	35.03
2	Actual	56.3	37.85	133.18	34.95
3	Actual	56.42	37.58	133.2	34.92

Size	1-3/8"	A	B	C	D
No.	2D	57.15	38.1	133.35	35.05
1	Actual	56.45	37.78	133.15	34.9
2	Actual	55.3	37.65	133.2	34.88
3	Actual	55.44	37.82	133.18	35.02

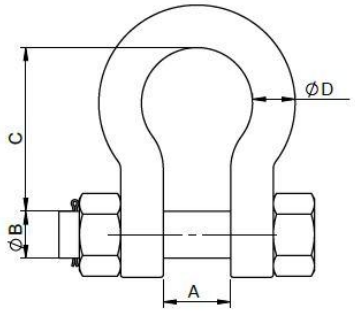
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector： 李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product description	Bow shackle	Size	G2130 1-1/4"
Quantity	44Pcs	Material	45# 40Cr



Size	1-1/4"	A	B	C	D
No.	2D	51.56	35.05	119.12	31.75
1	Actual	51.82	34.82	119.08	33.58
2	Actual	51.8	34.92	119.2	32.45
3	Actual	51.75	34.86	119.25	33.4

Size	1-1/4"	A	B	C	D
No.	2D	51.56	35.05	119.12	31.75
1	Actual	51.78	34.8	119.3	33.52
2	Actual	51.8	34.92	119.25	32.86
3	Actual	51.79	34.85	119.3	32.95

Size	1-1/4"	A	B	C	D
No.	2D	51.56	35.05	119.12	31.75
1	Actual	51.76	34.84	119.24	32.9
2	Actual	51.84	34.82	119.32	33.4
3	Actual	51.78	34.9	119.16	33.52

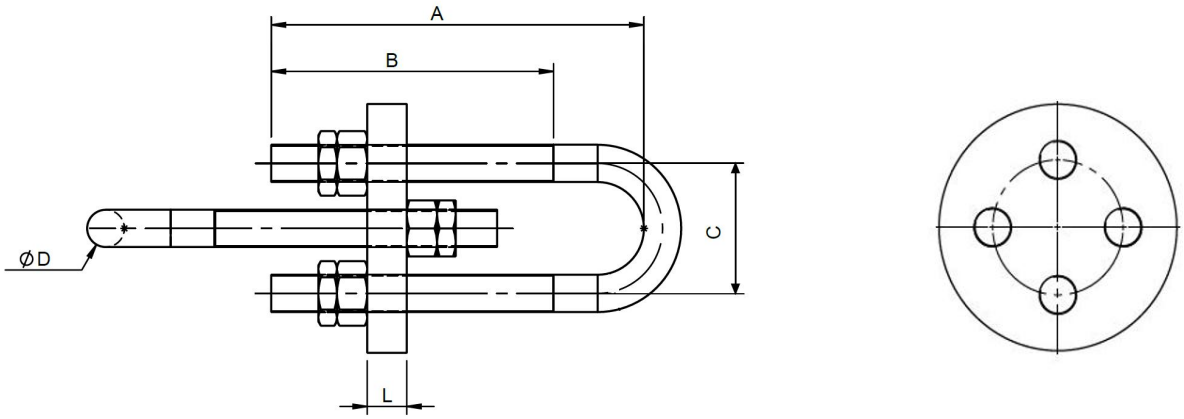
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector： 李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Chain tensioner	Size	M27*230
Quantity	44 Pcs	Material	8.8/Q355B



Size		A	B	C	D	L
No.	2D	230	145	95	27	30
1	Actual	232	145	95.2	27.1	30.2
2	Actual	231	147	95.3	27.2	30.1
3	Actual	230	146	95.1	27.1	30.3

Size		A	B	C	D	L
No.	2D	230	145	95	27	30
1	Actual	231	146	95.1	27.1	30.1
2	Actual	232	145	95.2	27.1	30.2
3	Actual	233	146	95.2	27.2	30.1

Size		A	B	C	D	L
No.	2D	230	145	95	27	30
1	Actual	232	147	95.1	27.2	30.1
2	Actual	233	146	95.2	27.1	30.1
3	Actual	231	145	95.2	27.2	30.2

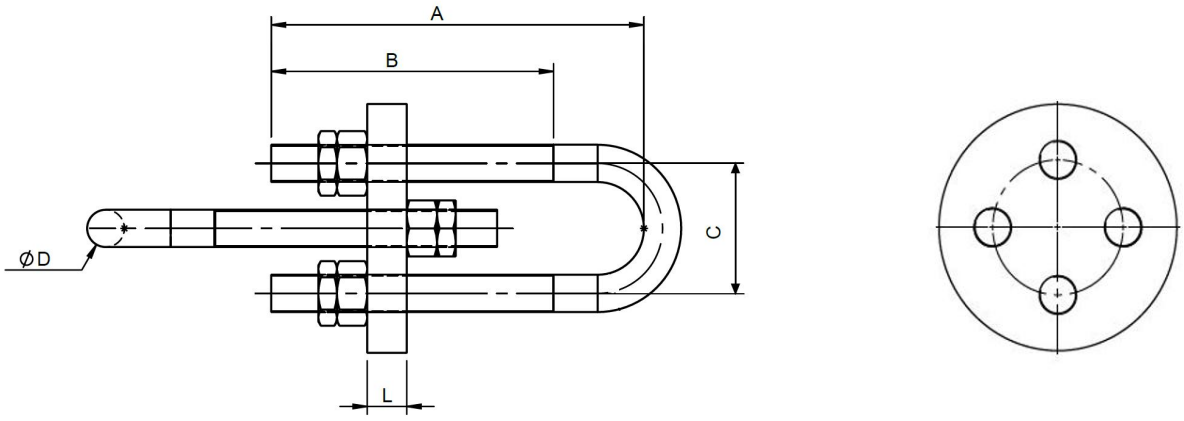
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Chain tensioner	Size	M27*250
Quantity	44 Pcs	Material	8.8/Q355B



Size		A	B	C	D	L
No.	2D	250	165	95	27	30
1	Actual	251	166	95.2	27.3	30.2
2	Actual	253	165	95.1	27.2	30.1
3	Actual	252	167	95.3	27.1	30.3

Size		A	B	C	D	L
No.	2D	250	165	95	27	30
1	Actual	252	165	95.1	27.2	30.1
2	Actual	251	166	95.2	27.1	30.2
3	Actual	253	165	95.2	27.2	30.1

Size		A	B	C	D	L
No.	2D	250	165	95	27	30
1	Actual	251	167	95.1	27.1	30.1
2	Actual	253	166	95.2	27.3	30.2
3	Actual	252	165	95.2	27.2	30.2

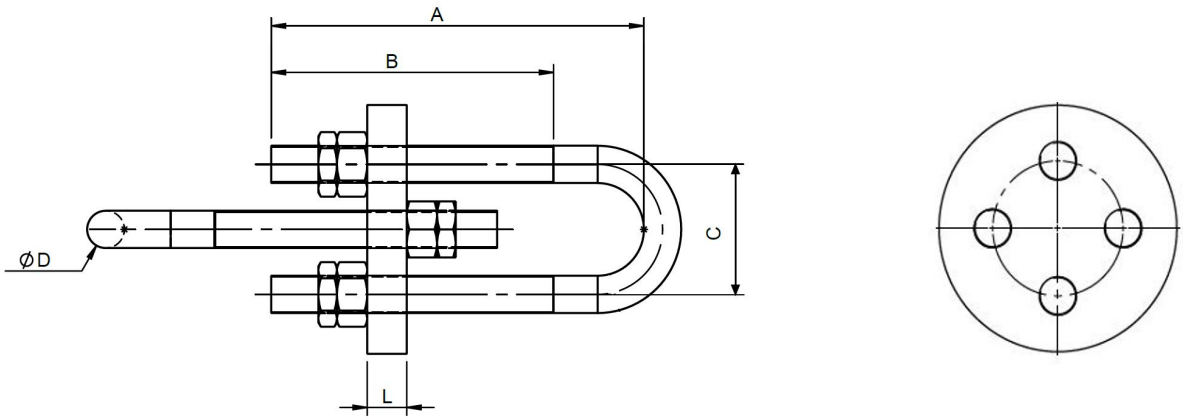
Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

Dimensional Inspection Report

Product Description	Chain tensioner	Size	M36*375
Quantity	44 Pcs	Material	8.8/Q355B



Size		A	B	C	D	L
No.	2D	375	260	126	36	40
1	Actual	376	262	126	36.3	40.2
2	Actual	377	263	127	36.2	40.1
3	Actual	375	261	125	36.1	40.3

Size		A	B	C	D	L
No.	2D	375	260	126	36	40
1	Actual	375	261	127	36.2	40.1
2	Actual	376	262	126	36.1	40.2
3	Actual	377	262	128	36.2	40.2

Size		A	B	C	D	L
No.	2D	375	260	126	36	40
1	Actual	376	261	126	36.2	40.1
2	Actual	375	262	128	36.1	40.2
3	Actual	377	263	127	36.2	40.2

Conclusion:
We here to certify all the relevant dimension against this project have been checked as per related drawing and standards. The results are acceptable.

Inspector：李玲　　Checked by:鞠传峰

TRELLEBORG

HDG Thickness Inspection Report

ITEM	REQUSET	TEST RESULT						CONCLUSION
Surface	Clean,smooth,no zinc burl,no feculence and no missing coat	Clean,smooth,no zinc burl,no feculence and no missing coat						Pass
HDG Thickness	Average Zinc Coating Thickness Min.100μm (610g/m²)	Article	Test Point				Average (μm)	Conclusion
		Weight chain Ø26x1046mmx39mmx21 Links/29Links	110	105	99	118	120	110.4	Pass
			112	100	113	105	101	106.2	
			106	110	113	100	106	107	
		Bow shackle 7/8”(2130)	100	115	100	120	118	110.6	Pass
			109	112	98	113	100	106.4	
			104	110	112	100	105	106.2	
		Bow shackle 1”(2130)	100	120	104	110	113	109.4	Pass
			112	101	100	105	114	106.4	
			110	108	112	102	100	106.4	
		Weight chain Ø34x136mmx51mmx17 Links	99	124	114	100	110	109.4	Pass
			102	106	112	103	100	104.6	
			113	100	115	118	101	109.4	

Inspector: 李玲

Checked by:鞠传峰

HDG Thickness Inspection Report

ITEM	REQUSET	TEST RESULT						CONCLUSION
Surface	Clean,smooth,no zinc burl,no feculence and no missing coat	Clean,smooth,no zinc burl,no feculence and no missing coat						Pass
HDG Thickness	Average Zinc Coating Thickness Min.100μm (610g/m²)	Article	Test Point				Average (μm)	Conclusion
		Bow shackle 1-3/8”(2130)	112	100	103	110	102	105.4	Pass
			110	106	114	104	116	110	
			99	115	103	104	113	106.8	
		Bow shackle 1-1/4”(2130)	113	100	116	118	110	111.4	Pass
			110	102	118	106	109	109	
			105	100	121	102	103	106.2	
		Chain tensioner M27	109	110	105	115	120	111.8	Pass
			112	108	116	109	121	113.2	
			108	116	114	108	109	111	
		Chain tensioner M34	109	108	109	117	110	110.6	Pass
			115	105	116	109	108	110.6	
			109	109	119	115	109	112.2	

Inspector: 李玲 Checked by:鞠传峰

SECTION 10. Bollards 1

SECTION 10. Bolards 1

10-A:

Material Certificates & Test reports

Bollard/Cleat Material Inspection Report

Project Number: 25135-28391

Report Number: 1 OF 1

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Inspector: Zhang Fuqian

Trelleborg Rep: Gisael Gomez

Date: 2022/2/20

Factory Report #: 25135-28391

Bollard/Cleat Type	QTY	Heat/Batch #	Grade	Weight (kg)	Chemical Composition (%)									Yield Strength (MPa)	Tensile Strength (MPa)	Elongation (%)	Reduction of Area (%)
					C	Si	Mn	P	S	Cr	Ni	Mo	Cu				
MSB-50	7	220116-1	ASTM A27 GR.65-35	1400	0.278	0.376	0.635	0.017	0.008					320	532	26.18	36.87

NOTES:

1) All casting are specified as Class 2 per ASTM A27/A27M or A536.

2) Supplementary requirement S53 of ASTM A27/A27M shall be satisfied for all castings of grade A27.

3) Chemical and mechanical properties shall conform to those listed below for Grade of steel required.

	Chemical Composition (%)					**Mechanical Properties**			
	Carbon, max C	Manganese, max Mn	Silicon, max Si	Sulfur, max S	Phosphorus, max P	Yield Strength, min, ksi (Mpa)	Tensile Strength, min, ksi (Mpa)	Elongation in 2 in., min (%)	Reduction of Area, min, (%)
A27 Grade N-1	0.25	0.75	0.8	0.06	0.05	--	--	--	--
A27 Grade N-2	0.35	0.6	0.8	0.06	0.05	--	--	--	--
A27 Grade U-60-30	0.25	0.75	0.8	0.06	0.05	30 (205)	60 (415)	22	30
A27 Grade 60-30	0.3	0.6	0.8	0.06	0.05	30 (205)	60 (415)	24	35
A27 Grade 65-35	0.3	0.7	0.8	0.06	0.05	35 (240)	65 (450)	24	35
A27 Grade 70-36	0.35	0.7	0.8	0.06	0.05	36 (250)	70 (485)	22	30
A27 Grade 70-40	0.25	1.2	0.8	0.06	0.05	40 (275)	70 (485)	22	30
316	0.08	2	1	0.045	0.03	205	515	30	40
A148 Grade 80-50	0.35	0.8	0.6	0.06	0.05	50 (345)	80 (550)	22	35
A536 Grade 60-40-18	-	-	-	-	-	40 (275)	60 (415)	18	-
A536 Grade 65-45-12	-	-	-	-	-	45 (310)	65 (448)	12	-
A536 Grade 80-55-06	-	-	-	-	-	55 (379)	80 (552)	6	-

(Copper (Cu), Nickel (Ni), Molybdenum (Mo), Chromium (Cr) only analyzed if required by spec per ASTM A27A27M)

Test certificate for 25135-28391

General Data:
Ordered by: Trelleborg Marine Systems North America, Inc
Order No.: PO#25135-28391
Manufacturer: Dalian Fortune Machinery Co., Ltd.
Item: Castings (Casting only)

Test requirement:
Material designation: ASTM A27 GR.65-35
Manufacturing process and heat treatment: cast, normalized and tempered.

Test results:
Chemical composition:

	Heat no.:	C	Si	Mn	P	S
Specification		≤0.30	≤0.80	≤0.70	≤0.050	≤0.060
Actual value	220116-1	0.278	0.376	0.635	0.017	0.008

Mechanical properties:

	Heat no.:	Yield strength MPa	Tensile strength MPa	Elongation %	Drawing No.:
Specification		≥240	≥450	≥24	
Actual value	220116-1	320	532	26.18	25135-3M01

The requirements were complied with.

Test results: Satisfaction

Place/Date: Dalian,2022-02-20

Signature of inspector: Li Bo

SECTION 10. Bollards 1

10-B: Dimensional &

Coating Thickness

Reports

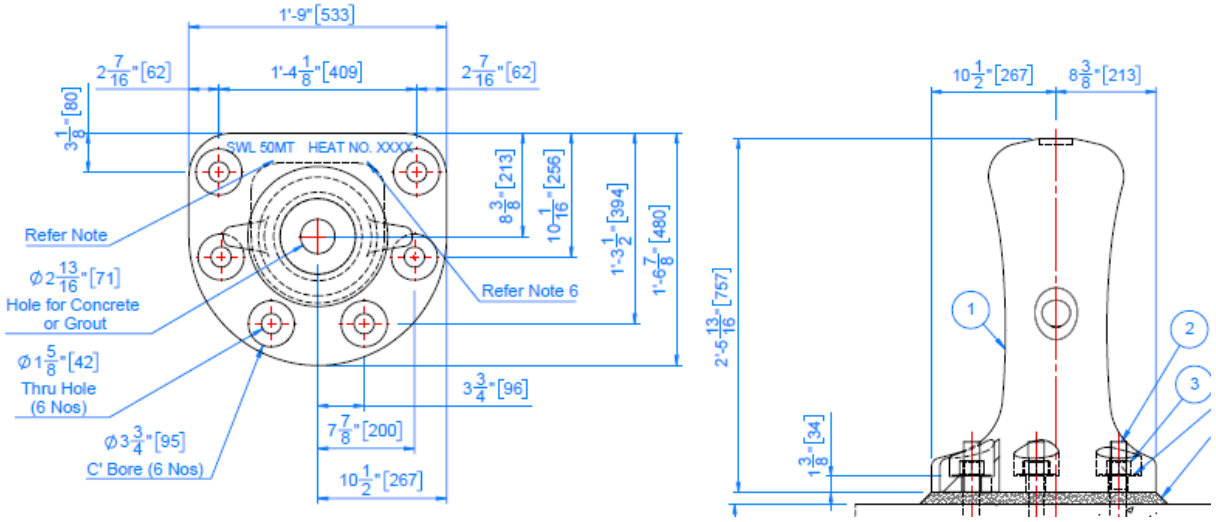
PO#25135-28391

Item: Bollard MSB-50

Dimensional checking records

TRELLEBORG

MARINE SYSTEMS



Dimension	533	62	409	267	200	96	480	394	256	80	757	34	Φ42	Φ95
Actual Value 01	532	63	408	267	199	95	481	395	256	81	755	35	42	96
Actual Value 02	534	63	410	266	201	96	481	395	257	80	757	34	42	95
Actual Value 03	535	63	410	267	199	97	479	393	255	79	755	33	42	96
Actual Value 04	534	61	409	267	199	95	479	394	255	80	758	34	42	95
Actual Value 05	533	61	408	268	201	97	480	393	255	81	759	35	43	95
Actual Value 06	534	61	410	268	200	97	479	395	257	79	756	34	43	95
Actual Value 07	533	61	409	266	199	96	481	393	257	80	758	34	43	95

Inspected by: Li Bo

Date:2022-02-20

SECTION 10. Bollards 1

10-C

Blasting & Coating Inspection Report

Bollard Blast Inspection Report

Project Number:	25135-28391	Blast Report No.:	1 OF 1
Project Name:	CONNECTICUT PORT AUTHORITY - STATE PIER	Blast Specification:	SSPC SP-10
Factory Rep:	Zhang Fuqian		
Trelleborg Rep:	Gisael Gomez	Gage Type/Model:	Elcometer 224

Bollard SN:	Date (mm/dd/yy)	Inspection Time _ : _	No. of Readings Required (Note 1)					Thickness (mils)				Pass / Fail
								Specified	Min.	Max.	Average	
MSB-50/01	07-05-2022	10:15	78	70	62	64	70	50	62	78	69	P
MSB-50/02	07-05-2022	10:15	66	77	67	70	68	50	66	77	70	P
MSB-50/03	07-05-2022	10:30	85	62	79	64	83	50	62	85	75	P
MSB-50/04	07-05-2022	10:30	79	71	80	64	74	50	64	80	74	P
MSB-50/05	07-05-2022	11:00	65	73	83	61	77	50	61	83	72	P
MSB-50/06	07-05-2022	11:00	80	67	61	69	63	50	61	80	68	P
MSB-50/07	07-05-2022	11:00	83	77	74	78	83	50	74	83	79	P

NOTES:

1. (5) five separate measurements shall be taken if no requirement is specified for each project.

Bollard Coating Millage Inspection Report

Project Number: 25135-28391
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez

Coating Type: Carbozinc 859&Carboguard 890&Carbothane 134HG
Minimum Thickness: 300µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-3M01

TRELLEBORG

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 1/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	78	103	91	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	246	281	264	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	326	386	356	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 2/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	80	95	88	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	254	281	268	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	320	369	345	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 3/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	79	102	91	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	253	281	267	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	322	390	356	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 4/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	86	101	94	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	250	284	267	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	334	410	372	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 5/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	81	103	92	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	251	285	268	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	319	387	353	Carbothane 134HG	

NOTES:

*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

DALIAN FORTUNE MACHINERY CO., LTD. 大连福驭机械设备有限公司 报检专用章

Bollard Coating Millage Inspection Report

Project Number: 25135-28391
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez

Coating Type: Carbozinc 859&Carboguard 890&Carbothane 134HG
Minimum Thickness: 300µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-3M01

TRELLEBORG

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 6/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	76	95	86	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	243	295	269	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	326	371	349	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-50 7/7	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	84	101	93	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	241	283	262	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	318	387	353	Carbothane 134HG	

NOTES:
*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

DALIAN FORTUNE MACHINERY CO.,LTD. 大连福驭机械设备有限公司 报检专用章

SECTION 10. Bollards 1

10-D:

Certificate of Conformance for Line Pull Rating

Certificate of Conformance for Line Pull Rating

Date: 2022-02-20
Project: 25135-28391
Items: MSB-50 Cast Steel Bollard

According to the line pull rating test:
The proof load for MSB-50 Cast Steel Bollard is 50 metric tonnes,
Bollards do not break.
Test results: Satisfaction

Dalian Fortune Machinery Co., Ltd.



SECTION 10. Bollards 1

10-E:

Bollard photos




MSB-50

MSB-50





SECTION 11. Bolards 2

SECTION 11. Bollards 2

11-A:

Material Certificates & Test Reports

Bollard/Cleat Material Inspection Report

Project Number: 25135-28392

Report Number: 1 OF 1

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Inspector: Zhang Fuqian

Trelleborg Rep: Gisael Gomez

Date: 2022/2/20

Factory Report #: 25135-28392

Bollard/Cleat Type	QTY	Heat/Batch #	Grade	Weight (kg)	Chemical Composition (%)									Yield Strength (MPa)	Tensile Strength (MPa)	Elongation (%)	Reduction of Area (%)
					C	Si	Mn	P	S	Cr	Ni	Mo	Cu				
MSB-75	13	220118-1	ASTM A27 GR.65-35	4290	0.27	0.35	0.61	0.016	0.01					293	518	28.26	42.34
MSB-75	5	220115-1	ASTM A27 GR.65-35	1650	0.274	0.362	0.62	0.018	0.007					306	525	27.3	39.4

NOTES:

1) All casting are specified as Class 2 per ASTM A27/A27M or A536.

2) Supplementary requirement S53 of ASTM A27/A27M shall be satisfied for all castings of grade A27.

3) Chemical and mechanical properties shall conform to those listed below for Grade of steel required.

	Chemical Composition (%)					**Mechanical Properties**			
	Carbon, max C	Manganese, max Mn	Silicon, max Si	Sulfur, max S	Phosphorus, max P	Yield Strength, min, ksi (Mpa)	Tensile Strength, min, ksi (Mpa)	Elongation in 2 in., min (%)	Reduction of Area, min, (%)
A27 Grade N-1	0.25	0.75	0.8	0.06	0.05	--	--	--	--
A27 Grade N-2	0.35	0.6	0.8	0.06	0.05	--	--	--	--
A27 Grade U-60-30	0.25	0.75	0.8	0.06	0.05	30 (205)	60 (415)	22	30
A27 Grade 60-30	0.3	0.6	0.8	0.06	0.05	30 (205)	60 (415)	24	35
A27 Grade 65-35	0.3	0.7	0.8	0.06	0.05	35 (240)	65 (450)	24	35
A27 Grade 70-36	0.35	0.7	0.8	0.06	0.05	36 (250)	70 (485)	22	30
A27 Grade 70-40	0.25	1.2	0.8	0.06	0.05	40 (275)	70 (485)	22	30
316	0.08	2	1	0.045	0.03	205	515	30	40
A148 Grade 80-50	0.35	0.8	0.6	0.06	0.05	50 (345)	80 (550)	22	35
A536 Grade 60-40-18	-	-	-	-	-	40 (275)	60 (415)	18	-
A536 Grade 65-45-12	-	-	-	-	-	45 (310)	65 (448)	12	-
A536 Grade 80-55-06	-	-	-	-	-	55 (379)	80 (552)	6	-

(Copper (Cu), Nickel (Ni), Molybdenum (Mo), Chromium (Cr) only analyzed if required by spec per ASTM A27A27M)

Test certificate for 25135-28392

General Data:
Ordered by: Trelleborg Marine Systems North America, Inc
Order No.: PO#25135-28392
Manufacturer: Dalian Fortune Machinery Co., Ltd.
Item: Castings (Casting only)

Test requirement:
Material designation: ASTM A27 GR.65-35
Manufacturing process and heat treatment: cast, normalized and tempered.

Test results:
Chemical composition:

	Heat no.:	C	Si	Mn	P	S
Specification		≤0.30	≤0.80	≤0.70	≤0.050	≤0.060
Actual value	220118-1	0.27	0.35	0.61	0.016	0.01
Actual value	220115-1	0.274	0.362	0.62	0.018	0.007

Mechanical properties:

	Heat no.:	Yield strength MPa	Tensile strength MPa	Elongation %	Drawing No.:
Specification		≥240	≥450	≥24	
Actual value	220118-1	293	518	28.26	25135-7M01/25135-8M01
Actual value	220115-1	306	525	27.3	25135-7M01/25135-8M01

The requirements were complied with.

Test results: Satisfaction

Place/Date: Dalian,2022-02-20

Signature of inspector: Li Bo

SECTION 11. Bollards 2

11-B

Dimensional and

Coating Thickness Reports

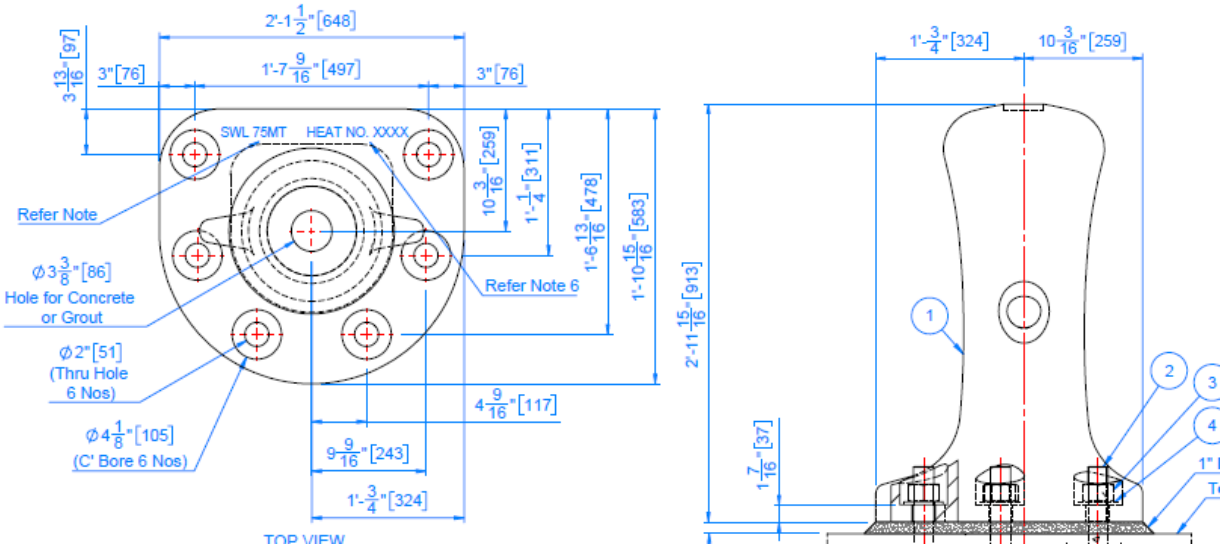
PO#25135-28392

Item: Bollard MSB-75

Dimensional checking records

TRELLEBORG

MARINE SYSTEMS



Dimension	648	76	497	324	243	117	583	478	311	97	913	37	Φ51	Φ105
Actual Value 01	646	77	498	324	243	117	584	479	310	97	911	37	51	106
Actual Value 02	648	75	498	325	242	116	583	478	310	97	912	37	52	105
Actual Value 03	649	75	498	323	244	117	584	479	312	98	913	37	51	106
Actual Value 04	649	77	498	324	243	117	584	477	311	98	913	36	52	106
Actual Value 05	648	75	496	324	244	117	582	479	311	98	913	37	52	105
Actual Value 06	650	77	497	325	243	116	583	477	311	96	912	37	51	106
Actual Value 07	650	77	497	325	242	116	582	477	310	97	912	38	51	106
Actual Value 08	647	77	497	325	243	118	583	477	312	98	912	37	52	105
Actual Value 09	646	75	498	325	242	116	582	478	311	98	912	38	52	106
Actual Value 10	647	76	496	324	242	118	584	478	310	97	914	36	51	105
Actual Value 11	650	77	498	324	242	118	583	479	312	97	912	36	51	105
Actual Value 12	648	77	496	323	242	117	584	478	310	96	912	36	52	106
Actual Value 13	647	77	496	324	242	116	583	477	310	97	912	37	51	106
Actual Value 14	647	76	498	325	242	116	582	478	312	98	912	37	52	105
Actual Value 15	646	77	498	324	243	116	584	479	310	97	914	38	52	106
Actual Value 16	650	75	497	325	242	118	582	478	312	98	911	37	51	106
Actual Value 17	650	75	497	324	242	116	583	479	310	98	914	38	52	105
Actual Value 18	649	75	497	323	242	118	584	479	310	97	914	37	51	105

Inspected by: Li Bo

Date:2022-02-20

SECTION 11. Bollards 2

11-C:

Blasting & Coating Inspection Report

Bollard Blast Inspection Report

TRELLEBORG

Project Number:	25135-28392	Blast Report No.:	1 OF 2
Project Name:	CONNECTICUT PORT AUTHORITY - STATE PIER	Blast Specification:	SSPC SP-10
Factory Rep:	Zhang Fuqian		
Trelleborg Rep:	Gisael Gomez	Gage Type/Model:	Elcometer 224

Bollard SN:	Date (mm/dd/yy)	Inspection Time _ : _	No. of Readings Required (Note 1)					Thickness (mils)				Pass / Fail
								Specified	Min.	Max.	Average	
MSB-75/01	07/05/2022	8:00	67	69	84	68	77	50	67	84	73	P
MSB-75/02	07/05/2022	8:00	72	84	67	61	63	50	61	84	69	P
MSB-75/03	07/05/2022	8:15	81	75	78	62	69	50	62	81	73	P
MSB-75/04	07/05/2022	8:15	62	61	85	74	82	50	61	85	73	P
MSB-75/05	07/05/2022	8:30	60	80	75	65	81	50	60	81	72	P
MSB-75/06	07/05/2022	8:30	61	61	65	74	73	50	61	74	67	P
MSB-75/07	07/05/2022	8:45	63	77	85	69	73	50	63	85	73	P
MSB-75/08	07/05/2022	8:45	79	70	81	69	68	50	68	81	73	P
MSB-75/09	07/05/2022	9:00	69	72	63	64	81	50	63	81	70	P
MSB-75/10	07/05/2022	9:00	69	79	73	82	61	50	61	82	73	P
MSB-75/11	07/05/2022	9:15	60	65	65	78	60	50	60	78	66	P
MSB-75/12	07/05/2022	9:15	82	63	82	64	70	50	63	82	72	P

NOTES:

1. (5) five separate measurements shall be taken if no requirement is specified for each project.

Bollard Blast Inspection Report



Project Number:	25135-28392	Blast Report No.:	2 OF 2
Project Name:	CONNECTICUT PORT AUTHORITY - STATE PIER	Blast Specification:	SSPC SP-10
Factory Rep:	Zhang Fuqian		
Trelleborg Rep:	Gisael Gomez	Gage Type/Model:	Elcometer 224

Bollard SN:	Date (mm/dd/yy)	Inspection Time _ : _	No. of Readings Required (Note 1)					Thickness (mils)				Pass / Fail
								Specified	Min.	Max.	Average	
MSB-75/13	07/05/2022	9:30	66	84	64	61	77	50	61	84	70	P
MSB-75/14	07/05/2022	9:30	73	67	77	70	72	50	67	77	72	P
MSB-75/15	07/05/2022	9:45	70	66	63	70	60	50	60	70	66	P
MSB-75/16	07/05/2022	9:45	68	75	71	66	83	50	66	83	73	P
MSB-75/17	07/05/2022	10:00	70	67	85	74	68	50	67	85	73	P
MSB-75/18	07/05/2022	10:00	65	82	84	61	71	50	61	84	73	P

NOTES:

1. (5) five separate measurements shall be taken if no requirement is specified for each project.

Bollard Coating Millage Inspection Report

Project Number: 25135-28392
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez

Coating Type: Carbozinc 859&Carboguard 890&Carbothane 134HG
Minimum Thickness: 300µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-7M01/8M01

TRELLEBORG

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 1/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	80	91	86	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	246	292	269	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	327	400	364	Carbothane 134HG	
MSB-75 2/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	81	92	87	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	241	288	265	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	329	378	354	Carbothane 134HG	
MSB-75 3/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	81	100	91	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	241	282	262	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	338	387	363	Carbothane 134HG	
MSB-75 4/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	84	98	91	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	242	287	265	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	337	389	363	Carbothane 134HG	
MSB-75 5/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	76	94	85	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	250	293	272	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	332	388	360	Carbothane 134HG	

NOTES:

*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

DALIAN FORTUNE MACHINERY CO., LTD. 大连福驭机械设备有限公司 报检专用章

Bollard Coating Millage Inspection Report

Project Number: 25135-28392
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez

Coating Type: Carbozinc 859&Carboguard 890&Carbothane 134HG
Minimum Thickness: 300µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-7M01/8M01

TRELLEBORG

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 6/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	78	97	88	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	243	284	264	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	320	379	350	Carbothane 134HG	
MSB-75 7/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	78	99	89	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	249	285	267	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	319	394	357	Carbothane 134HG	
MSB-75 8/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	77	95	86	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	240	276	258	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	331	382	357	Carbothane 134HG	
MSB-75 9/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	77	101	89	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	248	281	265	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	328	394	361	Carbothane 134HG	
MSB-75 10/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	80	89	85	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	242	293	268	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	335	391	363	Carbothane 134HG	

NOTES:

*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

DALIAN FORTUNE MACHINERY CO. LTD. 大连福驭机械设备有限公司 报检专用章

Bollard Coating Millage Inspection Report

Project Number: 25135-28392
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez

Coating Type: Carbozinc 859&Carboguard 890&Carbothane 134HG
Minimum Thickness: 300µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-7M01/8M01

TRELLEBORG

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 11/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	79	93	86	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	248	281	265	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	335	366	351	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 12/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	76	101	89	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	242	280	261	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	338	399	369	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 13/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	77	89	83	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	255	287	271	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	340	372	356	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 14/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	81	88	85	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	251	277	264	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	335	361	348	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 15/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	76	88	82	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	235	279	257	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	319	364	342	Carbothane 134HG	

NOTES:

*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

DALIAN FORTUNE MACHINERY CO. LTD. 大连福驭机械设备有限公司 报检专用章

Bollard Coating Millage Inspection Report

Project Number: 25135-28392
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez

Coating Type: Carbozinc 859&Carboguard 890&Carbothane 134HG
Minimum Thickness: 300µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-7M01/8M01

TRELLEBORG

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 16/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	80	88	84	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	251	292	272	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	329	399	364	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 17/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	76	93	85	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	250	294	272	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	330	394	362	Carbothane 134HG	

Bollard SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1]					Pass / Fail
							Specified	Min.	Max.	Average	Other (notes)	
MSB-75 18/18	Primer Coat[2]	28℃/25℃ / 16.4℃ / 49%	07-05-2022	24	07-06-2022	BLD010497	75	84	88	86	Carbozinc 859	P
	Int. Coat 1[2]	26℃/24℃ /15.1℃ / 51%	07-06-2022	24	07-07-2022	BLD010973	150	255	283	269	Carboguard 890	
	Int. Coat 2 If RQD[2]											
	Top Coat	28℃/24℃ /15.8℃ / 47%	07-08-2022	24	07-09-2022	BLD008055	75	332	364	348	Carbothane 134HG	

NOTES:

*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

DALIAN FORTUNE MACHINERY CO., LTD. 大连福驭机械设备有限公司 报检专用章

SECTION 11. Bolllards 2

11-D:

Certificate of Conformance for Line Pull Rating

Certificate of Conformance for Line Pull Rating

Date: 2022-02-20
Project: 25135-28392
Items: MSB-75 Cast Steel Bollard

According to the line pull rating test:
The proof load for MSB-75 Cast Steel Bollard is 75 metric tonnes,
Bollards do not break.
Test results: Satisfaction

Dalian Fortune Machinery Co., Ltd.



SECTION 11. Bollards 2

11-E:

Bollards photos






MSB-75


MSB-75




12
10



SECTION 12. Fixings 3

SECTION 12. Fixings 3

12-A:

Material Certs & Test Reports

Hardware Steel Mill Certificate

Project Number: 25135-28391

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: Zhang Jumin

Trelleborg Rep: Gisael Gomez

Date: 2022/3/26

TRELLEBORG

Item	Heat/Batch #	Grade/Type	Size (note1)	Chemical Composition (%) (note 2)									Yield Strength (MPa) (note 2)	Tensile Strength (MPa) (note 2)	Elongation (%) (note 2)	Hardness (note 2 & 3)
				C	Si	Mn	P	S	Cu	Cr	Ni	Mo				
1	0B06217	F1554 Gr. 105	Φ1-3/8"	0.37	0.22	0.68	0.009	0.005	0.21				862	1026	15.9	
2	1B01531	A563 DH	Φ1-3/8"	0.37	0.21	0.6	0.014	0.005								267
3	12008258	F436	1/8"	0.14	0.05	0.34	0.017	0.011								39HRC
4	215D0838	Q355B	3/4"	0.16	0.36	1.06	0.022	0.016					443	554	21.5	
5																
6																
7																
8																

NOTES:

1. Diameter of round bar.
2. Chemical composition and mechanical property requirements limits listed in table below for specified grade.
3. If using Rockwell Hardness test, list which scale used (i.e. A, B, C, etc.).

	SIZE	Chemical Properties (%)									Mechanical Properties (Coarse Thread)			
		C	Mn	Si	P	S	Cu	Mo	Cr	Ni	Yield Strength, ksi (Mpa)	Tensile Strength, ksi (Mpa)	Elongation, min (%)	Hardness (Brinell/Rockwell)
AISI GR 4140 HR	ALL	0.38-0.43	0.75-1.0	0.15-0.35	0.04 Max	0.04 Max	N/A	0.15-0.25	0.8-1.1	N/A	621	855	15	-
A449 Type 1	1/4" - 1"	0.28 - 0.55	0.60 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	92 (635)	120 (825)	-	255-321 / 25-34C
	1 1/8" - 1 1/2"	0.28 - 0.55	0.60 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	81 (560)	105 (725)	-	223-285 / 19-30C
	1 3/4" - 3"	0.28 - 0.55	0.60 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	58 (400)	90 (620)	-	183-235 / --
A307 Gr. B	ALL	0.29 Max	0.90 Max	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	-	60-100 (415-690)	18	121-212 / 69-95B
F1554 Gr. 36	0-3/4"	0.26 Max	0.60 - 0.90	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	36 (248)	58-80 (400-552)	23	-
	3/4" - 1 1/2"	0.27 Max	0.60 - 0.90	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	36 (248)	58-80 (400-552)	23	-
	1 1/2" - 4"	0.28 Max	0.60 - 0.90	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	36 (248)	58-80 (400-552)	23	-
F1554 Gr. 55	ALL	N/A	N/A	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	55 (380)	75-95 (517-655)	21	-
F1554 Gr. 105	ALL	N/A	N/A	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	105 (724)	125-150 (862-1034)	15	-
304 SS	ALL	0.08 Max	2 Max	1 Max	0.045 Max	0.03 Max	N/A	N/A	18.0-20.0	8.0-10.5	30(207)	75(517)	20	B75
316 SS	ALL	0.08 Max	2 Max	1 Max	0.045 Max	0.03 Max	N/A	2.0-3.0	16.0-18.0	10.0-14.0	30(207)	75(517)	20	B75
GR 4.6	ALL	0.55 Max	N/A	N/A	0.05 Max	0.06 Max	N/A	N/A	N/A	N/A	240	400	22	114-209
GR 4	ALL	0.50 Max	N/A	N/A	0.06 Max	0.15 Max	N/A	N/A	N/A	N/A	-	-	-	188-302
GR 8	ALL	0.58 Max	0.25 Min	N/A	0.06 Max	0.15 Max	N/A	N/A	N/A	N/A	-	-	-	233-353
GR 8.8	ALL	0.25-0.55	N/A	N/A	0.035 Max	0.035 Max	N/A	N/A	N/A	N/A	640	800	12	242-318
Q235B	ALL	0.12-0.20	0.30-0.70	0.30 Max	0.045 Max	0.045 Max	N/A	N/A	N/A	N/A	235	375	26	-
Q355B	ALL	0.20 Max	1.00-1.60	0.55 Max	0.04 Max	0.04 Max	N/A	N/A	N/A	N/A	355	470-630	21	-
A563 DH	ALL	0.18-0.58	0.57 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	-	-	-	248-352
F436	ALL	N/A	N/A	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	-	-	-	26-45 HRC
A325 Type 1	1/2" - 1"	0.30-0.52	0.60 Min	0.15-0.30	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	635	830	-	253-319
	1 1/8" - 1 1/2"	0.30-0.52	0.60 Min	0.15-0.30	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	560	725	-	223-286
A572 GR.50	ALL	0.23 Max	1.35 Max	0.4 Max	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	345	450	18	-
A36	ALL	0.26 Max	N/A	0.4 Max	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	250	400-550	23	-

SECTION 12. Fixings 3

12-B
Dimensional & Coating Thickness Report

Hardware Thread and Dimension Certificate

Project Number: 25135-28391

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: Zhang Jumin

Trelleborg Rep: Gisael Gomez

Date: 2022/2/28

TRELLEBORG

			HH Bolt and Threaded Rod				Heavy Hex Bolt Only (SEE DRAWING BELOW)			Threaded Rod Only	
Item	BOM Callout	Quantity	Material Grade	Size of Bolt or T-Rod (Ds)	Length of Bolt or T-Rod (L)	Thread Pitch[1]	Head Width (S)	Head Height (K)	Thread Length (B)	Fully Threaded or Threaded Each End?	Length of Threads at Each End
1	25135-3M01-2	42	F1554 Gr. 105	1-3/8"	1108MM	6				Each End	105MM/76MM
2	25135-3M01-2	42	F1554 Gr. 105	1-3/8"	1109MM	6				Each End	103MM/76MM
3	25135-3M01-2	42	F1554 Gr. 105	1-3/8"	1109MM	6				Each End	103MM/75MM
4	25135-3M01-2	42	F1554 Gr. 105	1-3/8"	1108MM	6				Each End	104MM/75MM
5	25135-3M01-2	42	F1554 Gr. 105	1-3/8"	1107MM	6				Each End	104MM/76MM
6											

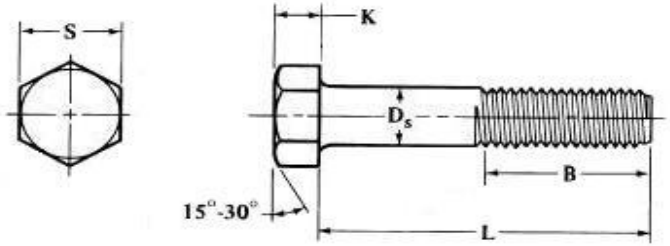
NOTES:

Note 1: Required Thread Details

English Size	Threads/inch
1/4"	20
3/8"	16
1/2"	13
5/8"	11
3/4"	10
7/8"	9
1"	8
1 1/8"	7
1 1/4"	7
1 3/8"	6
1 1/2"	6
1 5/8"	5 1/2
1 3/4"	5
1 7/8"	5
2"	4 1/2
2 1/4"	4 1/2
2 1/2"	4
2 3/4"	4
3"	4

Metric Size	Thread Pitch
M10	1.5
M12	1.75
M14	2
M16	2
M20	2.5
M22	2.5
M24	3
M27	3
M30	3.5
M36	4
M42	4.5
M48	5
M52	5
M56	5.5
M64	6
M72	6
M80	6
M90	6

Typical Heavy Hex Bolt



SECTION 12. Fixings 3

12-C:

Galvanizing Certificate of Compliance

Galvanizing Certificate of Compliance

Date: 2022-03-29
Project: 25135-28391
Items: Galvanized 1-3/8”x1108mm Anchor Hardware Sets

Galvanizing of all hardware was done in accordance with ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware. All hardware was coated according to the requirements of class C or D hardware specified in section 3 of ASTM A153. Galvanizing was performed at the place of manufacture in Dalian, China.

Trelleborg

Gisael Gomez
Name

Dalian Longquan Hardware Co.

Zhang Jumin

SECTION 12. Fixings 3

12-D:

Fixings photos











SECTION 13. Fixings 4

SECTION 13. Fixings 4

13-A:

Material Certs & Test Reports

Hardware Steel Mill Certificate

Project Number: 25135-28392

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: Zhang Jumin

Trelleborg Rep: Gisael Gomez

Date: 2022/3/26

TRELLEBORG

Item	Heat/Batch #	Grade/Type	Size (note1)	Chemical Composition (%) (note 2)									Yield Strength (MPa) (note 2)	Tensile Strength (MPa) (note 2)	Elongation (%) (note 2)	Hardness (note 2 & 3)
				C	Si	Mn	P	S	Cu	Cr	Ni	Mo				
1	1B02275	F1554 Gr. 105	Φ1-3/4"	0.4	0.2	0.69	0.015	0.014	0.22				935	1028	15.5	
2	1C03024	A563 DH	Φ1-3/4"	0.38	0.21	0.63	0.017	0.004								274
3	21AD5134	F436	1/4"	0.16	0.08	0.36	0.011	0.006								38HRC
4	205D6664	Q355B	1"	0.15	0.16	1.45	0.017	0.007					412	515	28	
5	215D0838	Q355B	3/4"	0.16	0.36	1.06	0.022	0.016					443	554	21.5	
6																
7																
8																

NOTES:

1. Diameter of round bar.
2. Chemical composition and mechanical property requirements limits listed in table below for specified grade.
3. If using Rockwell Hardness test, list which scale used (i.e. A, B, C, etc.).

	SIZE	Chemical Properties (%)									Mechanical Properties (Coarse Thread)			
		C	Mn	Si	P	S	Cu	Mo	Cr	Ni	Yield Strength, ksi (Mpa)	Tensile Strength, ksi (Mpa)	Elongation, min (%)	Hardness (Brinell/Rockwell)
AISI GR 4140 HR	ALL	0.38-0.43	0.75-1.0	0.15-0.35	0.04 Max	0.04 Max	N/A	0.15-0.25	0.8-1.1	N/A	621	855	15	-
A449 Type 1	1/4" - 1"	0.28 - 0.55	0.60 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	92 (635)	120 (825)	-	255-321 / 25-34C
	1 1/8" - 1 1/2"	0.28 - 0.55	0.60 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	81 (560)	105 (725)	-	223-285 / 19-30C
	1 3/4" - 3"	0.28 - 0.55	0.60 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	58 (400)	90 (620)	-	183-235 / --
A307 Gr. B	ALL	0.29 Max	0.90 Max	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	-	60-100 (415-690)	18	121-212 / 69-95B
F1554 Gr. 36	0-3/4"	0.26 Max	0.60 - 0.90	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	36 (248)	58-80 (400-552)	23	-
	3/4" - 1 1/2"	0.27 Max	0.60 - 0.90	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	36 (248)	58-80 (400-552)	23	-
	1 1/2" - 4"	0.28 Max	0.60 - 0.90	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	36 (248)	58-80 (400-552)	23	-
F1554 Gr. 55	ALL	N/A	N/A	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	55 (380)	75-95 (517-655)	21	-
F1554 Gr. 105	ALL	N/A	N/A	N/A	0.04 Max	0.05 Max	0.20 Min	N/A	N/A	N/A	105 (724)	125-150 (862-1034)	15	-
304 SS	ALL	0.08 Max	2 Max	1 Max	0.045 Max	0.03 Max	N/A	N/A	18.0-20.0	8.0-10.5	30(207)	75(517)	20	B75
316 SS	ALL	0.08 Max	2 Max	1 Max	0.045 Max	0.03 Max	N/A	2.0-3.0	16.0-18.0	10.0-14.0	30(207)	75(517)	20	B75
GR 4.6	ALL	0.55 Max	N/A	N/A	0.05 Max	0.06 Max	N/A	N/A	N/A	N/A	240	400	22	114-209
GR 4	ALL	0.50 Max	N/A	N/A	0.06 Max	0.15 Max	N/A	N/A	N/A	N/A	-	-	-	188-302
GR 8	ALL	0.58 Max	0.25 Min	N/A	0.06 Max	0.15 Max	N/A	N/A	N/A	N/A	-	-	-	233-353
GR 8.8	ALL	0.25-0.55	N/A	N/A	0.035 Max	0.035 Max	N/A	N/A	N/A	N/A	640	800	12	242-318
Q235B	ALL	0.12-0.20	0.30-0.70	0.30 Max	0.045 Max	0.045 Max	N/A	N/A	N/A	N/A	235	375	26	-
Q355B	ALL	0.20 Max	1.00-1.60	0.55 Max	0.04 Max	0.04 Max	N/A	N/A	N/A	N/A	355	470-630	21	-
A563 DH	ALL	0.18-0.58	0.57 Min	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	-	-	-	248-352
F436	ALL	N/A	N/A	N/A	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	-	-	-	26-45 HRC
A325 Type 1	1/2" - 1"	0.30-0.52	0.60 Min	0.15-0.30	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	635	830	-	253-319
	1 1/8" - 1 1/2"	0.30-0.52	0.60 Min	0.15-0.30	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	560	725	-	223-286
A572 GR.50	ALL	0.23 Max	1.35 Max	0.4 Max	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	345	450	18	-
A36	ALL	0.26 Max	N/A	0.4 Max	0.04 Max	0.05 Max	N/A	N/A	N/A	N/A	250	400-550	23	-

SECTION 13. Fixings 4

13-B

Dimensional & Coating

Thickness Reports

Hardware Thread and Dimension Certificate

Project Number: 25135-28392

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: Zhang Jumin

Trelleborg Rep: Gisael Gomez

Date: 2022/2/28

			HH Bolt and Threaded Rod				Heavy Hex Bolt Only (SEE DRAWING BELOW)			Threaded Rod Only	
Item	BOM Callout	Quantity	Material Grade	Size of Bolt or T-Rod (Ds)	Length of Bolt or T-Rod (L)	Thread Pitch[1]	Head Width (S)	Head Height (K)	Thread Length (B)	Fully Threaded or Threaded Each End?	Length of Threads at Each End
1	25135-7M01-2	48	F1554 Gr. 105	1-3/4"	1130MM	5				Each End	95MM/125MM
2	25135-7M01-2	48	F1554 Gr. 105	1-3/4"	1131MM	5				Each End	95MM/123MM
3	25135-7M01-2	48	F1554 Gr. 105	1-3/4"	1130MM	5				Each End	96MM/123MM
4	25135-7M01-2	48	F1554 Gr. 105	1-3/4"	1130MM	5				Each End	95MM/125MM
5	25135-7M01-2	48	F1554 Gr. 105	1-3/4"	1129MM	5				Each End	96MM/124MM
6	25135-8M01-2	60	F1554 Gr. 105	1-3/4"	991MM	5				Each End	115MM/125MM

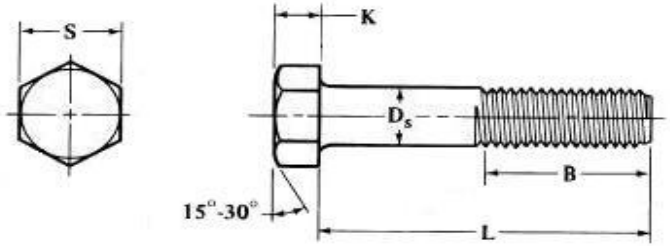
NOTES:

Note 1: Required Thread Details

English Size	Threads/inch
1/4"	20
3/8"	16
1/2"	13
5/8"	11
3/4"	10
7/8"	9
1"	8
1 1/8"	7
1 1/4"	7
1 3/8"	6
1 1/2"	6
1 5/8"	5 1/2
1 3/4"	5
1 7/8"	5
2"	4 1/2
2 1/4"	4 1/2
2 1/2"	4
2 3/4"	4
3"	4

Metric Size	Thread Pitch
M10	1.5
M12	1.75
M14	2
M16	2
M20	2.5
M22	2.5
M24	3
M27	3
M30	3.5
M36	4
M42	4.5
M48	5
M52	5
M56	5.5
M64	6
M72	6
M80	6
M90	6

Typical Heavy Hex Bolt



Hardware Thread and Dimension Certificate

Project Number: 25135-28392

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: Zhang Jumin

Trelleborg Rep: Gisael Gomez

Date: 2022/2/28

			HH Bolt and Threaded Rod				Heavy Hex Bolt Only (SEE DRAWING BELOW)			Threaded Rod Only	
Item	BOM Callout	Quantity	Material Grade	Size of Bolt or T-Rod (Ds)	Length of Bolt or T-Rod (L)	Thread Pitch[1]	Head Width (S)	Head Height (K)	Thread Length (B)	Fully Threaded or Threaded Each End?	Length of Threads at Each End
1	25135-8M01-2	60	F1554 Gr. 105	1-3/4"	991MM	5				Each End	115MM/127MM
2	25135-8M01-2	60	F1554 Gr. 105	1-3/4"	991MM	5				Each End	114MM/126MM
3	25135-8M01-2	60	F1554 Gr. 105	1-3/4"	990MM	5				Each End	115MM/127MM
4	25135-8M01-2	60	F1554 Gr. 105	1-3/4"	992MM	5				Each End	114MM/127MM
5	25135-8M01-2	60	F1554 Gr. 105	1-3/4"	992MM	5				Each End	115MM/125MM
6											

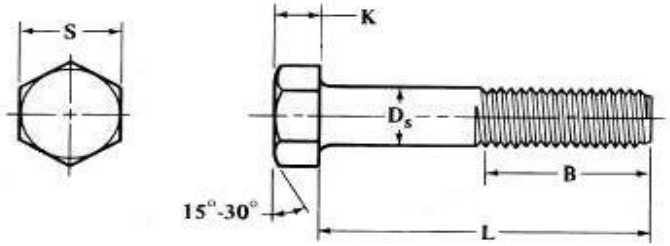
NOTES:

Note 1: Required Thread Details

English Size	Threads/inch
1/4"	20
3/8"	16
1/2"	13
5/8"	11
3/4"	10
7/8"	9
1"	8
1 1/8"	7
1 1/4"	7
1 3/8"	6
1 1/2"	6
1 5/8"	5 1/2
1 3/4"	5
1 7/8"	5
2"	4 1/2
2 1/4"	4 1/2
2 1/2"	4
2 3/4"	4
3"	4

Metric Size	Thread Pitch
M10	1.5
M12	1.75
M14	2
M16	2
M20	2.5
M22	2.5
M24	3
M27	3
M30	3.5
M36	4
M42	4.5
M48	5
M52	5
M56	5.5
M64	6
M72	6
M80	6
M90	6

Typical Heavy Hex Bolt



SECTION 13. Fixings 4

13-C:

Galvanizing Certificate of Compliance

TRELLEBORG

Galvanizing Certificate of Compliance

Date: 2022-03-29
Project: 25135-28392
Items: Galvanized 1-3/4”x1130mm Anchor Hardware Sets
Galvanized 1-3/4”x991mm Anchor Hardware Sets

Galvanizing of all hardware was done in accordance with ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware. All hardware was coated according to the requirements of class C or D hardware specified in section 3 of ASTM A153. Galvanizing was performed at the place of manufacture in Dalian, China.

Trelleborg

Gisael Gomez
Name

Dalian Longquan Hardware Co.

Zhang Jumin

SECTION 13. Fixings 4

13-D:

Fixings Photos



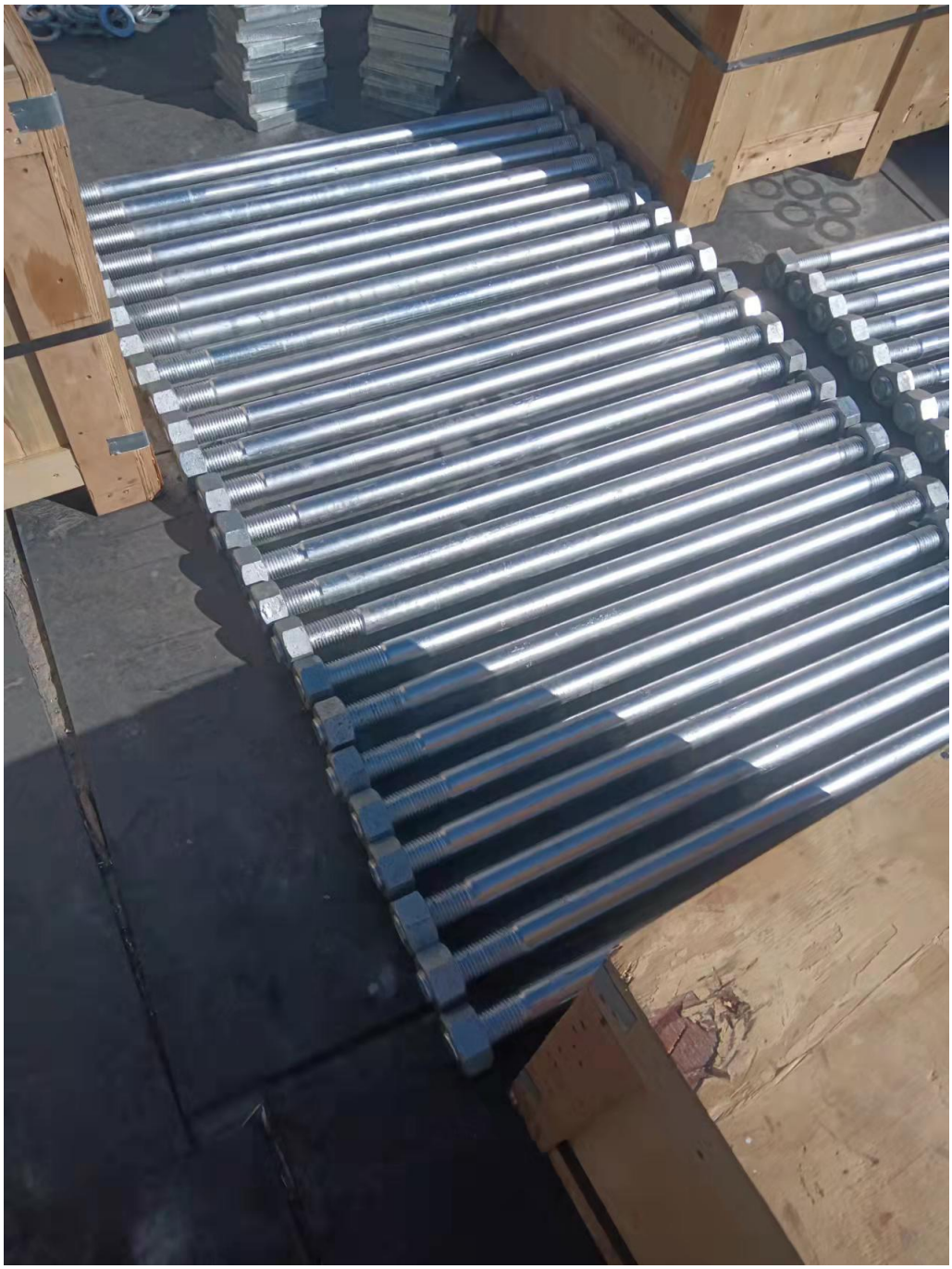






















SECTION 14. Template 5

SECTION 14. Template 5

14-A:

Material Certs & Test

Reports

Steel Mill Certificate

Project Number: 25135-28391/28392

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: Yan tingjun

Trelleborg Rep: Gisael Gomez

Date: 2022/3/25

Item	Heat/Batch #	Grade	Size (note1)	Qty.	Weight (Tons)	Chemical Composition (%)								Yield Strength (Mpa)	Tensile Strength (Mpa)	Elongation (%)	Impact Test (note 2)	
						C	Si	Mn	P	S	Cr	Ni	Mo				Temp. (°C)	Impact Energy (J)
1	20BD8038	Q355B	8mm		29.52	0.174	0.21	0.92	0.011	0.01				407	476	33	20	72/76/72
2	20210252	Q355B	10mm		1.478	0.16	0.32	1.2	0.009	0.005				369	555	23.5	20	116
6																		
7																		
8																		
9																		
10																		

NOTES:
1. Thickness of plate or diameter of round bar.
2. Impact test sample size =

鞍钢股份有限公司
Angang Steel Company Limited

产品质量证明书
MILL TEST CERTIFICATE

中国辽宁省鞍山市铁西区鞍钢厂区 邮编 114003
Angang Production Area,Tiexi District,Anshan City,Liaoning Province,China
Tel 400-688-0898 Fax 0412-6728486

订货单位 Buyer	德邻陆港（鞍山）有限责任公司	中文产品名称 Product	低合金结构用钢	订单号 Order No.	214210059 －13	证明书编号 Certificate No.	4210100939
收货单位 Consignee	德邻陆港（鞍山）有限责任公司代德邻陆港（鞍山）有限责任公司	英文产品名称 Product		商检批次号 Ins.Lot.No.		发货日期 Date of Delivery	2021-01-07
客户名称 Customer		生产许可证号 Licence No.		购单号 Purchase No.	20210103	到站 Destination	配送
标准 Specification	Q/ASB 271-2019	计重方式 Weight Mode	检斤 Actual Wei ht	总重量(kg) Total Weight	29,520	车号 Wagon No.	辽CB0400

序号 No.	钢牌号 Steel Grade	熔炼号 Heat No.	批号 Batch No.	规格 (mm*mm*mm) Size	卷/捆号 Coil/Pack No.	生产日期 MFG Date	重量(kg) Weight	卷/捆号 Coil/Pack No.	生产日期 MFG Date	重量(kg) Weight	卷/捆号 Coil/Pack No.	生产日期 MFG Date	重量(kg) Weight
1	Q355B	20BD8038	4210100091	8*1500*C	M52A811010	2021-01-01	29,520						
2													
3													

熔炼号 Heat No.	化学成分Chemical Composition(熔炼分析 Heat Analysis) %																			
	C 10^{-3}	Si 10^{-3}	Mn 10^{-2}	P 10^{-3}	S 10^{-3}	Als 10^{-3}	Nb 10^{-3}	V 10^{-3}	Ti 10^{-3}	Cr* 10^{-3}	Ni* 10^{-3}	Cu* 10^{-3}	Mo* 10^{-3}	B 10^{-4}	N 10^{-4}	RE 10^{-4}	Ceq 10^{-2}	Pcm 10^{-2}	10^{-4}	10^{-4}	10^{-4}
20BD8038	174	210	92	11	10	16		2		23	22	9	11				34				

批号 Batch No.	屈服 Y.S.	抗拉 T.S.	伸长 EL	冷弯 Bend d=2a α=180°	冲击功(J) Impact Energy 20 °C			冲击剪切面积 Impact SA %			晶粒度 Grain Size	带状组织 Banded Structure	硬度 Hardness	低倍 Microstr-ucture	脱碳 Decarboni-zation	夹杂 Inclusion				落锤试验 DWTT(SA)%		屈强比 Y.S./T.S.
	MPa		%													A	B	C	D	℃		
4210100091	407	476	33	合格	72	76	72															

备注 Remarks		冲击试样尺寸 Sample Size (mm)	10*5*55;
注释 Notes	Y.S.=Yield Strength T.S.=Tensile Strength EL=Elongation * : not over 0.02% when not listed for American standard product.		

本产品已按上述标准要求制造和检验，其结果符合要求，特此证明。贵方查询有关问题，请与我公司联系。
We hereby certify that material described herein has manufactured and tested with satisfactory results in accordance with the requirements of the above material specification. If you have any questions, please contact our company.

发货单位 Deliver Department	鞍钢股份有限公司热轧带钢厂 Hot Strip Mill Plant of ANSTEEL			出口目的港 Export Destination	
发货人 Deliverer	英伟	副厂长 Deputy Director		总件数 Total Pieces	1
检查人 Inspector	马宏				

55

凌源钢铁股份有限公司

产品质量证明书

LINGYUAN IRON&STEEL CO.,LTD

CERTIFICATE OF QUALITY AND QUANTITY

LG-JL-KJ-30

收货用户 沈阳珠江金属材料公司

到站地址 凌源

订货单位 CUSTOMER	沈阳珠江金属材料公司	标准 STANDARD	GB/T1591-2018	交货状态 CONDITION OF DELIVERY	热轧HOT ROLLED	证明书号 CERTIFICATE NO.	2021020260000520
产品名称 PRODUCT	热轧圆钢	牌号 STEEL GRADE	Q355B	发货日期 DATE OF DELIVERY	20210202	合同号 CONTRACT NO.	Y992424023

炉号 HEAT NO.	规格 DIMENSIONS mm * m	定尺		非定尺		化学成分(%) CHEMICAL COMPOSITON													力学工艺性能 MECHANICAL PROPERTIES				冷弯 BEND TEST	冷顶锻	车号 VEHICLE NO.
		捆数 BUNDLES	重量 WEIGHT 吨(t)	捆数 PIECES	重量 WEIGHT 吨(t)	CeV -2 x10	C -2 x10	Si -2 x10	Mn -2 x10	P -3 x10	S -3 x10	Ti -2 x10	V -2 x10	Ni -2 x10	Als -3 x10	Cr -2 x10	Cu -2 x10	Mo -2 x10	-2 x10	ReH MPa	Rm MPa	A %	AKV2 J	a=180° a=3d		
20210252	10 * 12	1	1.478	0	0	40	16	32	120	9	5	1	0	1	17	5	3	0		369	555	23.5	116	合格		辽BC7055
																				380	560	23.5		合格		
合计 TOTAL		1	1.478	0	0	备注 REMARK	1.本证明书加盖产品质量专用章后方可生效； 2.销售部门（或代理商）出具本证明书复印件时必须如实填写提货单位名称、日期、品名、规格、件数、重量，加盖其红色印章后方可生效。																		证明章 QUALITY PROVE SEAL		

地址：中国辽宁省凌源市钢铁路3号
ADDRESS:NO.3 GANGTIE ROAD,LINGYUAN CITY,LIAONING PROVINCE,CHINA

电话：0421-6838215
TEL：0421-6838215

开证员 OPERATOR 张春元

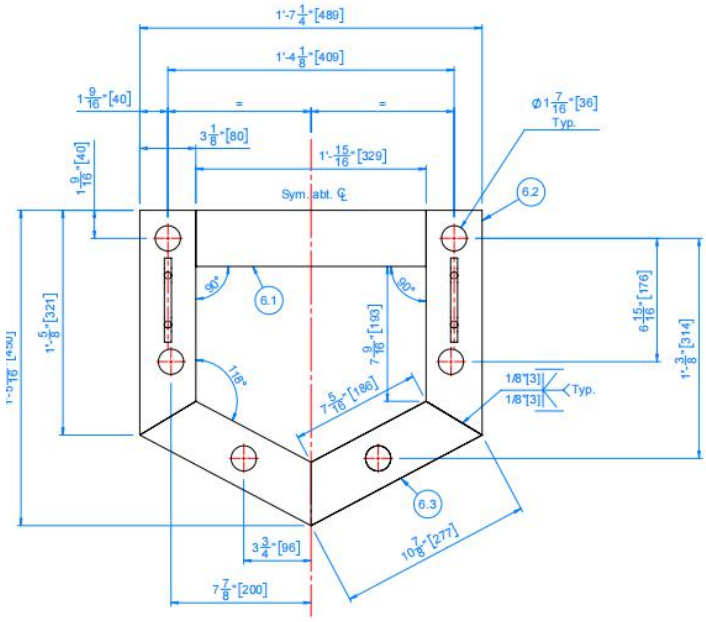
日期 DATE 20210202

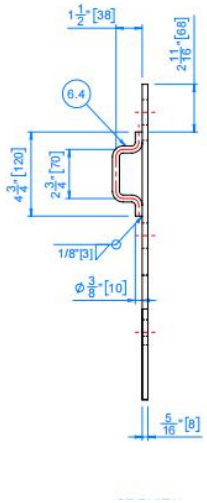
SECTION 14. Template 5

14-B:

Dimensional & Coating Thickness Reports

PO#25135-28391	TRELLEBORG MARINE SYSTEMS
Item: MSB-50 BOLLARD TEMPLATE	
Dimensional checking records（10%）	





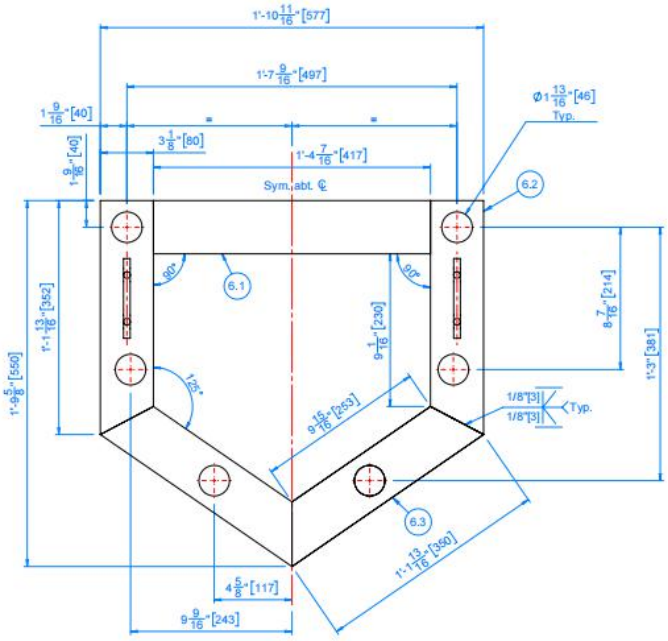
Dimension	**489**	**40**	**409**	**80**	**329**	**40**	450	321	96	**200**	**227**	**186**	**193**	**176**
Actual Value 01	490	39	408	79	330	40	449	320	95	200	228	187	192	175

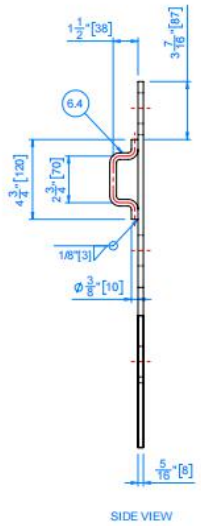
Dimension	**314**	**38**	**120**	**70**	**68**	**Φ36**								
Actual Value 01	315	39	121	69	68	**Φ36**								

Inspected by: Li Bo

Date: 2022-03-27

PO#25135-28392	**TRELLEBORG** **MARINE SYSTEMS**
Item: MSB-75 BOLLARD TEMPLATE	
Dimensional checking records（10%）	





Dimension	**577**	**40**	**497**	**80**	**417**	**40**	352	550	117	**243**	**253**	**350**	**230**	**214**
Actual Value 01	576	40	496	79	417	40	351	550	118	243	252	349	229	214

Dimension	**381**	**38**	**70**	**120**	**87**	**Φ46**								
Actual Value 01	380	39	70	119	88	Φ46								

Inspected by: Li Bo

Date: 2022-03-27

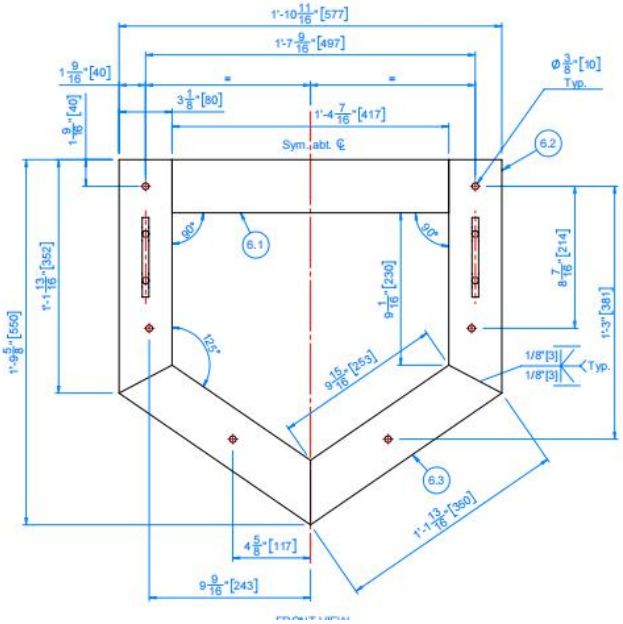
PO#25135-28392

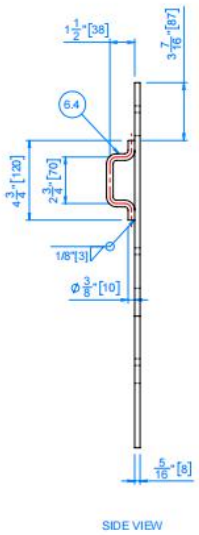
Item: MSB-75 BOLLARD TEMPLATE

Dimensional checking records（10%）

TRELLEBORG

MARINE SYSTEMS





Dimension	**577**	**40**	**497**	**80**	**417**	**40**	352	550	117	**243**	**253**	**350**	**230**	**214**
Actual Value 01	578	40	496	79	416	39	352	550	117	242	253	349	231	214

Dimension	**381**	**38**	**70**	**120**	**87**	**Φ10**								
Actual Value 01	380	38	69	119	88	Φ10								

Inspected by: Li Bo

Date: 2022-03-27

SECTION 14. Template 5

14-C:

Coating Inspection Report

Template Coating Millage Inspection Report

Project Number: 25135-28391/28392
Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER
Factory Rep: Zhang Fuqian
Trelleborg Rep: Gisael Gomez
Coating Type: Carbozinc 859
Minimum Thickness: 75µm
Test Gage Type/Serial Number: Elcometer 456
Drawing Reference: 25135-3T01/7T01/8T01

TRELLEBORG

Template SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1] Specified	Min.	Max.	Average	Other (notes)	Pass / Fail
25135-3T01 1/2	Primer Coat[2]	20℃/15℃ /8.1℃ /46%	03-27-2022	24	03-28-2022	BLD008050	75	104	123	114	Carbozinc 859	P
	Int. Coat 1[2]											
	Int. Coat 2 If RQD[2]											
	Top Coat											
Template SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1] Specified	Min.	Max.	Average	Other (notes)	Pass / Fail
25135-3T01 2/2	Primer Coat[2]	20℃/15℃ /8.1℃ /46%	03-27-2022	24	03-28-2022	BLD008050	75	100	114	107	Carbozinc 859	P
	Int. Coat 1[2]											
	Int. Coat 2 If RQD[2]											
	Top Coat											
Template SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1] Specified	Min.	Max.	Average	Other (notes)	Pass / Fail
25135-7T01 1/2	Primer Coat[2]	20℃/15℃ /8.1℃ /46%	03-27-2022	24	03-28-2022	BLD008050	75	112	119	116	Carbozinc 859	P
	Int. Coat 1[2]											
	Int. Coat 2 If RQD[2]											
	Top Coat											
Template SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1] Specified	Min.	Max.	Average	Other (notes)	Pass / Fail
25135-7T01 2/2	Primer Coat[2]	20℃/15℃ /8.1℃ /46%	03-27-2022	24	03-28-2022	BLD008050	75	111	115	113	Carbozinc 859	P
	Int. Coat 1[2]											
	Int. Coat 2 If RQD[2]											
	Top Coat											
Template SN:		A.T./S.T./Dew Point/Hum.[3,4]	Apply Date (mm/dd/yy)	Dry Time (hrs)	Inspection Date (mm/dd/yy)	Batch Ref. Name	Thickness (µm)[1] Specified	Min.	Max.	Average	Other (notes)	Pass / Fail
25135-8T01 1/1	Primer Coat[2]	20℃/15℃ /8.1℃ /46%	03-27-2022	24	03-28-2022	BLD008050	75	99	122	111	Carbozinc 859	P
	Int. Coat 1[2]											
	Int. Coat 2 If RQD[2]											
	Top Coat											

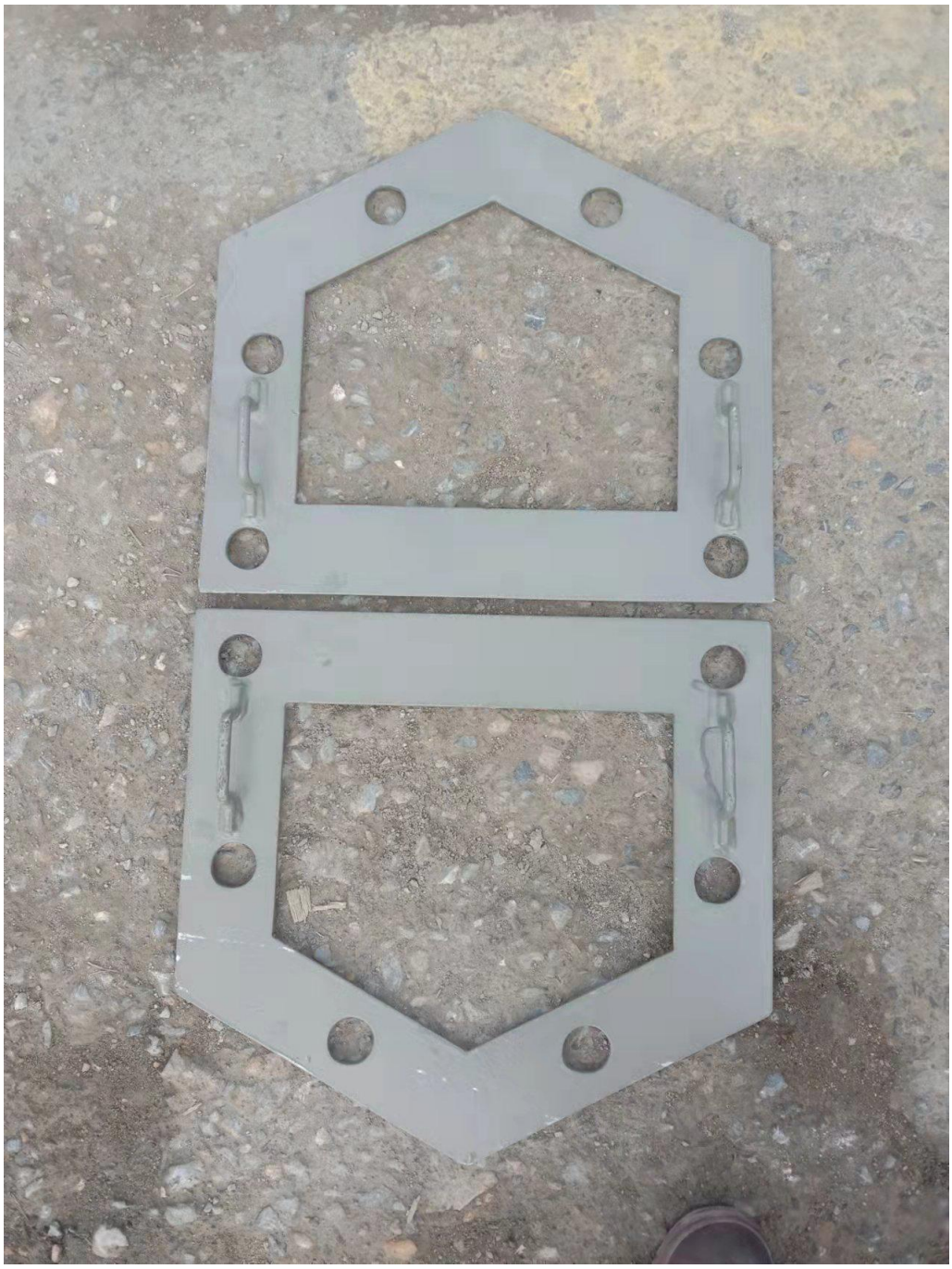
NOTES:
*1. Thickness is based on the total thickness at that point. To acquire an intermediate thickness take the current total and subtract the total from the preceding coat.
*2. If no readings are required for this coat, it will be left blank.
*3. A.T. = Air Temperature at application time.
*4. S.T. = Surface Temperature at application time.

SECTION 14. Template 5

14-D:

Template photos





SECTION 15. Fixings

SECTION 15. Fixings

15–A:

Material Certs & Test Reports

Hardware Steel Mill Certificate

Project Number: 25135 - 28757

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: HAIFENG ZHAO

Trelleborg Rep: Gisael Gomez

Date: 12-07-2022

TRELLEBORG

Item	Heat/Batch #	Grade/Type	Size (note1)	Chemical Composition (%) (note 2)									Yield Strength (MPa) (note 2)	Tensile Strength (MPa) (note 2)	Elongation (%) (note 2)	Hardness (note 2 & 3)
				C	Si	Mn	P	S	Cr	Ni	Mo	Cu				
1	21302455-4	GR. 105	Φ25	0.410	0.260	0.69	0.024	0.0020	1.09	0.01	0.17	0.024	1005	1121	16	
2	Y216-04701	GR. 105	δ20	0.420	0.220	0.65	0.012	0.004	1.02	0.01	0.16	0.01	995	1123	14	
3	1211-5271	q235b	δ3	0.15	0.20	0.53	0.018	0.034					250	445	30.5	
4	1211-5242	q235b	δ5	0.15	0.18	0.55	0.020	0.009					235	415	32	
5																
6																
7																
8																
9																
10																

NOTES:

1. Diameter of round bar or plate.
2. Chemical composition and mechanical property requirements limits listed in table below for specified grade.
3. If using Rockwell Hardness test, list which scale used (i.e. A, B, C, etc.).

	SIZE	Chemical Properties (%)									Mechanical Properties (Coarse Thread)			
		C	Si	Mn	P	S	Cr	Ni	Mo	Cu (when specified)	Yield Strength, ksi (Mpa)	Tensile Strength, ksi (Mpa)	Elongation in 2in, min (%)	Hardness (Brinell/Rockwell)
A449 Type 1	1/4" - 1"	0.28 - 0.55		0.60 Min	0.04 Max	0.05 Max				N/A	92 (635)	120 (825)	-	255-321 / 25-34C
	1 1/8" - 1 1/2"	0.28 - 0.55		0.60 Min	0.04 Max	0.05 Max				N/A	81 (560)	105 (725)	-	223-285 / 19-30C
	1 3/4" - 3"	0.28 - 0.55		0.60 Min	0.04 Max	0.05 Max				N/A	58 (400)	90 (620)	-	183-235 / --
A307 Gr. B	ALL	0.29 Max		0.90 Max	0.04 Max	0.05 Max				N/A	-	60-100 (415-690)	18	121-212 / 69-95B
F1554 Gr. 36	0-3/4"	0.26 Max		0.60 - 0.90	0.04 Max	0.05 Max				0.20 Min	36 (248)	58-80 (400-552)	23	-
	3/4" - 1 1/2"	0.27 Max		0.60 - 0.90	0.04 Max	0.05 Max				0.20 Min	36 (248)	58-80 (400-552)	23	-
	1 1/2" - 4"	0.28 Max		0.60 - 0.90	0.04 Max	0.05 Max				0.20 Min	36 (248)	58-80 (400-552)	23	-
F1554 Gr. 55	ALL	N/A		N/A	0.04 Max	0.05 Max				0.20 Min	55 (380)	75-95 (517-655)	21	-
F1554 Gr. 105	ALL	N/A		N/A	0.04 Max	0.05 Max				0.20 Min	105 (724)	125-150 (862-1034)	15	-
304 SS	ALL	0.08 Max	1.00 Max	2.00 Max	0.045 Max	0.03 Max	18.00-20.00	8.00-11.00		N/A	30(207)	75(517)	20	B75
316 SS	ALL	0.08 Max	1.00 Max	2.00 Max	0.045 Max	0.03 Max	16.00-18.00	10.00-14.00	2.00-3.00	N/A	30(207)	75(517)	20	B75
Gr. 4.6	ALL	0.55 Max			0.05 Max	0.06 Max				N/A	240	400	22	114-209
Gr. 8.8	ALL	0.25-0.55			0.035 Max	0.035 Max				N/A	640	800	12	242-318
Q235B	ALL	0.12-0.20		0.30-0.70	0.045 Max	0.035 Max				N/A	235	375	26	-
C45	ALL	0.42-0.55		0.50-0.80	0.035 Max	0.035 Max				N/A	355	600	16	-

产品质量证明书
INSPECTION CERTIFICATE

№ NBJ 0241477

地址：中国山东省莱芜市钢城区府前大街99号
ADD: No.99Fuqian Street,GangCheng District,LaiWu ShanDong,China

质保书号/Sheet No.： 210522106　　产品名称/Description of Goods： 合金结构钢　　钢号/Grade： 42CrMoA

合同号/Contract No.： 055928　　交货状态/Condition： 热轧　　执行标准/Specification： GB/T3077-2015

用途/Usage：　　出口批号/Export No.：　　生产许可证/Production Permit No.：

收货单位/Sold To：　　R-LGPBB-QESP16-15

序号 No.	炉号 Heat No.	规格 Size (mm)	件数 Bundles	支数 Pieces	重量 Net Weight (MT)	化学成分/Chemical Composition																
						C(%)	Si(%)	Mn(%)	P(%)	S(%)	Cr(%)	Ni(%)	Cu(%)	Ti(%)	Mo(%)	V(%)	W(%)	B ×10⁻⁴	Al(%)	N ×10⁻⁶	O ×10⁻⁶
1	Y216-04701	20	10	1254	29.57	0.42	0.22	0.65	0.012	0.004	1.02	0.01	0.01	0.007	0.160	0.007		0.0005	0.027		
2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
3	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

序号 No.	热顶锻 Forging Test	一般疏松 Scattered Porosity Grade	中心疏松 Center Unsoundness Grade	偏析 Segregation Grade	中心偏析 Center Segregation Grade	超声波检验 Ultrasoinc Inspection	非金属夹杂物/Nonmetal Impurity									脱碳层 Decarburization mm	晶粒度 Grain Size Grade	带状组织 Bandstructure Grade	抗拉强度 Tensile Strength Rm (N/mm²)	屈服强度 Yield Strength ReL (N/mm²)	延伸率 Percentage Elongation A(%)	收缩率 Percentage Reduction of Area Z(%)	冲击功 Charpy Impact Ak(J)	硬度 Brinell Hardness HB	末端淬透性 Terminal Hardenability		
							A		B		C		D		DS										J9	J15	-
							细 T	粗 H	细 T	粗 H	细 T	粗 H	细 T	粗 H													
1	合格	0.5	1.0	0.5	0	----	1	0	0	0.5	0	0	0.5	0	0				1123	995	14	51	114				
		0.5	1.0	0.5	0		1	0	0.5	0	0	0	0.5	0	0				1131	1004	12	51	110				
2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
		----	----	----	----		----	----	----	----	----	----	----	----	----	----			----	----	----	----	----				
3	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
		----	----	----	----		----	----	----	----	----	----	----	----	----	----			----	----	----	----	----				
4	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
		----	----	----	----		----	----	----	----	----	----	----	----	----	----			----	----	----	----	----				

本公司是中国冶金行业首批通过ISO9001、ISO14001、OHSAS18001三体系认证企业，可为冶金、机械、汽车、造船、石油、化工、军工等行业提供5大类、10多个钢种、60多个规格的优质特殊钢。其中齿轮钢、轴承钢、45和40Cr热轧圆钢四种优特钢产品获得"山东名牌产品"荣誉称号，20CrMnTiH、45、40Cr热轧圆钢三种优特钢产品获得"冶金产品实物质量金杯奖"荣誉称号。
优钢产品销售电话：(0634)6891909　售后服务电话：(0634)6891016

说明 Explain	①材料的表面质量和外形尺寸均合格。Surface quality and shape size of material are all qualified. ②有异议时，来函请标明钢号、批号、规格、发货日期、原因，并将实物保留备查。When there is any complain,you are kindly requested to mark the Steel Grade,Heat No.,Size,Delivery Date,Causes and materials in the condition.③本质量证明书复印无效。The press copy invalid.
备注 Remarks	

填写日期/Issued Date： 2021-05-22　填写人/Principat： 孙晓琳　复核人/Signature： 马破　质量部门盖章有效/ Stamp of Quality Assurance　第1页/共3页

湘钢®

湖南华菱湘潭钢铁有限公司
HUNAN VALIN XIANGTAN IRON AND STEEL CO., LTD.
棒材产品质量证明书
ROUND BAR INSPECTION CERTIFICATE

湘钢销售部售后服务
电话：0731-58659017
地址：湖南省湘潭市岳塘区
邮编：411101
编号：QR166-028

证书号 CERTIFICATE NO	5320160409038	产品名称 PRODUCT	合金圆钢	牌号 STEEL GRADE	42CrMoA	发货日期 DELIVERY DATE	2021-04-09
合同号 CONTRACT NO	31160570	标准 SPECIFICATION	GB/T 3077-1999	车号 TRAIN NO.	0723909	整车到站 DESTINATION	江边
加工用途 MAKING USE		生产许可证号 LICENSE NO.		交货状态 DELIVERY STATE	热轧	运输方式 TRANSPORTED BY	铁路
订货单位 CUSTOMER				收货单位 PURCHASER			

炉号 HEAT NO.	轧制批号 LOT NO.	生产日期 DATE OF PRODUCTION	规格 SIZE GRADE	数量 QTY (件)	重量 WEIGHT (T)	化学成分，% CHEMICAL COMPOSITION, %																				
						C	Si	Mn	P	S	Cr	Cu	Ni	As	Pb	Sn	V	Mo	Ti	W							
						-2 ×10	-2 ×10	-2 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10	-3 ×10							
21302455-4	B0073	2021-04-08	Φ25	7	20.878	41	26	69	24	2	1089	24	14	7	0	0	8	172	8	2							

炉号 HEAT NO.	轧制批号 LOT NO.	力学性能 MECHANICAL PROPERTIES						工艺性能 PROCESSING PROPERTIES				低倍组织，级 MACROSCOPIC STRUCTURE, GRADE			高倍组织 HIGH POWER STRUCTURE		
		屈服强度 Y.S (Mpa)	抗拉强度 T.S (Mpa)	断后伸长率 A (%)	断面收缩率 Z (%)	冲击功 Akv2 (J)	硬度 HB	冷弯 C.B.	热顶锻 H.T.	末端淬透性 JOMINY HARDENABILITY J9	末端淬透性 JOMINY HARDENABILITY J15	偏析 SEGREGATION	一般疏松 GENERAL PORINESS	中心疏松 CENTRAL PORINESS	晶粒度 G.S	脱碳层 DEC. mm	夹杂物 INCLUSION
21302455-4	B0073	1005	1121	16	56	98	185		1/3合格			0	1	1			

件数合计(件)：
Total Qty 7

重量合计(t)：
Total Weigh 20.878

1. 本产品已按上述要求进行制造和检验，其结果符合要求，特此证明。
2. 酸浸低倍组织只填报疏松与偏析级别，白点、皮下气泡、缩孔等标准不允许有的缺陷，均保证符合标准出厂，故只检验，不填报。

备 注：硬度值为退火硬度值
REMARKS

质量管理负责人
Quality Control Principal

兴化市兆泰金属材料有限公司

质 量 证 明 书

ZT/QR07-016　　证明书号：2021040503

订货单位：无锡利勤钢贸有限公司　　电话：0523-83600889

产品名称：碳素结构钢中板　　传真：0523-83906736　　日期：2021-04-05

执行标准：GB/T3274-2007、GB/T700-2006　　地址：江苏省兴化市戴南镇史堡村

轧制批号	牌号	产品规格 厚×宽×长(mm)			数量(张)	重量(t)	化学成分(%) C 碳 ×100	Si 硅 ×100	Mn 锰 ×100	P 磷 ×1000	S 硫 ×1000	Cr 铬 ×100	Ni 镍 ×100	Cu 铜 ×100	屈服强度 ReH MPa	抗拉强度 Rm MPa	延伸率 A %	冷弯 180° d= a	V型冲击功 J 温度 ℃	试验值1	试验值2	试验值3	平均值
1211-5462	Q235B	18	2000	L	1		16	20	40	38	39				250	395	29.0	合格	20	75	74	68	72
1211-5309	Q235B	18	2000	L	19		15	23	42	15	29				245	405	32.0	合格	20	68	69	71	69
1211-5303	Q235B	16	2000	L	2		18	20	53	12	22				240	405	28.5	合格	20	68	72	68	69
1211-5235	Q235B	14	2200	L	34		12	17	47	25	18				235	420	33.0	合格	20	66	72	83	74
1211-5237	Q235B	12	2200	L	24		15	20	53	21	26				240	410	28.0	合格	20	70	75	68	71
1211-5236	Q235B	12	2200	L	8		15	17	50	16	13				240	430	30.0	合格	20	88	75	68	77
1211-5238	Q235B	10	2200	L	1		15	17	52	17	16				245	425	30.0	合格	20	88	75	68	77
1211-5239	Q235B	10	2200	L	27		17	24	54	20	10				245	380	27.0	合格	20	68	69	71	69
1211-5242	Q235B	5	2200	L	64		15	18	55	20	9				235	415	32.0	合格	20	68	66	72	69
1211-5241	Q235B	8	2200	L	8		14	20	56	8	3				245	405	32.0	合格	20	88	75	68	77
1211-5241	Q235B	4	2000	L	12		14	20	56	8	3				245	405	32.0	合格	20	88	75	68	77
1211-5271	Q235B	3	2000	L	40		15	20	53	18	34				250	445	30.5	合格	20	88	75	68	77
1211-5370	Q235B	6	2000	L	42		13	18	42	16	19				245	405	26.0	合格	20	88	75	68	77
1211-5366	Q235B	12	1950	L	2		17	17	51	21	13				245	415	27.5	合格	20	68	72	68	69
1211-5366	Q235B	12	2000	L	42		17	17	51	21	13				245	415	27.5	合格	20	68	72	68	69
1211-5368	Q235B	10	2000	L	22		16	17	44	19	31				245	430	28.0	合格	20	88	75	68	77
1211-5364	Q235B	20	2000	L	21		17	13	50	32	27												
1211-5544	Q235B	30	2200	L	2		16	23	58	19	23												
					371																		

备注：
1、交货状态：热轧；
2、质量证明书复印件不作为有效证明文件；
3、用户验货后使用，如有异议应及时告知批号、牌号，并保留实物及标志和质量证明书。
4、毛边板执行《毛边钢板技术协议ZS/JZ 2005》只保证化学成分，内部质量、力学性能和工艺性能不作为交货条件，请勿作重要部件使用。

制表：　　质量证明书专用章

审核：

SECTION 15. Fixings

15–B:

Dimensional Reports

Hardware Thread and Dimension Certificate

Project Number: 25135 - 28757

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: HAIFENG ZHAO

Trelleborg Rep: Gisael Gomez

Date: 12-7-2022

TRELLEBORG

			HH Bolt and Threaded Rod				Heavy Hex Bolt Only (SEE DRAWING BELOW)			Threaded Rod Only	
Item	BOM Callout	Quantity	Material Grade	Size of Bolt or T-Rod (Ds)	Length of Bolt or T-Rod (L)	Thread Pitch[1]	Head Width (S)	Head Height (K)	Thread Length (B)	Fully Threaded or Threaded Each End?	Length of Threads at Each End
1		136	GR.105	1"	203.5 mm	8 UNC				Fully Threaded	
2			GR.105	1"	203.0 mm	8 UNC				Fully Threaded	
3			GR.105	1"	203.8 mm	8 UNC				Fully Threaded	
4			GR.105	1"	203.2 mm	8 UNC				Fully Threaded	
5			GR.105	1"	203.0 mm	8 UNC				Fully Threaded	
6			GR.105	1"	202.8 mm	8 UNC				Fully Threaded	

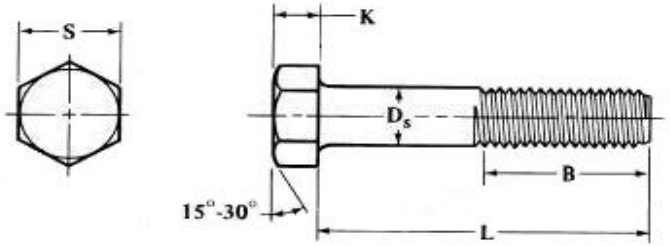
NOTES:

Note 1: Required Thread Details

English Size	Threads/inch
1/4"	20
3/8"	16
1/2"	13
5/8"	11
3/4"	10
7/8"	9
1"	8
1 1/8"	7
1 1/4"	7
1 3/8"	6
1 1/2"	6
1 5/8"	5 1/2
1 3/4"	5
1 7/8"	5
2"	4 1/2
2 1/4"	4 1/2
2 1/2"	4
2 3/4"	4
3"	4

Metric Size	Thread Pitch
M10	1.5
M12	1.75
M14	2
M16	2
M20	2.5
M22	2.5
M24	3
M27	3
M30	3.5
M36	4
M42	4.5
M48	5
M52	5
M56	5.5
M64	6
M72	6
M80	6
M90	6

Typical Heavy Hex Bolt



Hardware Thread and Dimension Certificate

Project Number: 25135 - 28757

Project Name: CONNECTICUT PORT AUTHORITY - STATE PIER

Factory Rep: HAIFENG ZHAO

Trelleborg Rep: Gisael Gomez

Date: 12-7-2022

TRELLEBORG

			HH Bolt and Threaded Rod				Heavy Hex Bolt Only (SEE DRAWING BELOW)			Threaded Rod Only	
Item	BOM Callout	Quantity	Material Grade	Size of Bolt or T-Rod (Ds)	Length of Bolt or T-Rod (L)	Thread Pitch[1]	Head Width (S)	Head Height (K)	Thread Length (B)	Fully Threaded or Threaded Each End?	Length of Threads at Each End
1		36	GR.105	3/4"	191.2 mm	10 UNC				Fully Threaded	
2			GR.105	3/4"	191.6 mm	10 UNC				Fully Threaded	
3			GR.105	3/4"	191.0 mm	10 UNC				Fully Threaded	
4		36	GR.105	3/4"	63.8 mm	10 UNC	31.2 mm	13.0 mm	63.8 mm		
5			GR.105	3/4"	63.6 mm	10 UNC	31.4 mm	12.8 mm	63.6 mm		
6			GR.105	3/4"	63.8 mm	10 UNC	31.2 mm	13.0 mm	63.8 mm		

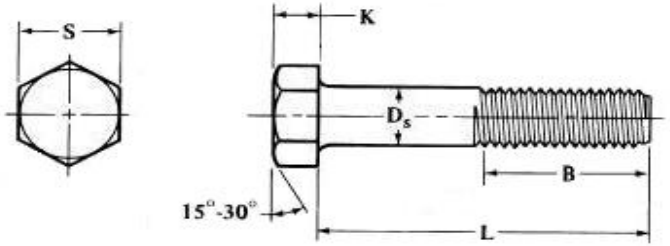
NOTES:

Note 1: Required Thread Details

English Size	Threads/inch
1/4"	20
3/8"	16
1/2"	13
5/8"	11
3/4"	10
7/8"	9
1"	8
1 1/8"	7
1 1/4"	7
1 3/8"	6
1 1/2"	6
1 5/8"	5 1/2
1 3/4"	5
1 7/8"	5
2"	4 1/2
2 1/4"	4 1/2
2 1/2"	4
2 3/4"	4
3"	4

Metric Size	Thread Pitch
M10	1.5
M12	1.75
M14	2
M16	2
M20	2.5
M22	2.5
M24	3
M27	3
M30	3.5
M36	4
M42	4.5
M48	5
M52	5
M56	5.5
M64	6
M72	6
M80	6
M90	6

Typical Heavy Hex Bolt



Packing List (Detailed)

Job Name:	**CONNECTICUT PORT AUTHORITY - STATE PIER**	**ETD:**	
Job No.:	**25135 - 28757**	**ETA:**	
Country of Origin:	**CHINA**	**Destination Port:**	**N/A**
Port of Export:	**N/A**	**B/L No:**	**N/A**

TRELLEBORG

Item No.	Drawing No.	Products Description	QTY	Net Wt.	Gross Wt.	PKG QTY	Package Dimension				Cont Type/No Seal No
							L	W	H	V	
			(pc)	(kg)	(kg)		(mm)	(mm)	(mm)	(m³)	
1		EC2 Anchor Φ 1"- 8 UNC - 2A* 8" L (Fully threaded) ,ASTM F1554 Gr.105 HDG	36	22.48	32.23	1	280	270	160	0.01	
2		Hex Nut Φ 1"- 8 UNC -2B ,ASTM A563 DH HDG as per ASTM A153 or A123	36	6.01							
3		Round Washer OD 2 1/2" * ID 1 1/16" * 3/16" thk ,Q235B HDG as per ASTM A153 or A123	36	3.41							
4		Hex Bolt Φ 3/4"- 10 UNC - 2A*2 1/2"L (Fully threaded) ,ASTM F1554 Gr.105 HDG	36	7.005	29.13	1	280	270	160	0.01	
5		Hex Nut Φ 3/4"- 10 UNC -2B ,ASTM A563 DH HDG as per ASTM A153 or A123	72	5.88							
6		Round Washer OD 2" * ID 13/16" * 1/8" thk ,Q235B HDG as per ASTM A153 or A123	108	4.13							
7		EC2 Anchor Φ 3/4"- 10 UNC - 2A * 7 1/2"L (Fully threaded) ,ASTM F1554 Gr.105 HDG	36	11.80							
8		EC2 Anchor Φ 1"- 8 UNC - 2A * 8" L (Fully threaded) ,ASTM F1554 Gr.105 HDG	36	22.48	32.28	1	280	270	160	0.01	
9		Hex Nut Φ 1"- 8 UNC -2B ,ASTM A563 DH HDG as per ASTM A153 or A123	36	6.01							
10		Round Washer OD 2 1/2" * ID 1 1/16" * 3/16" thk ,Q235B HDG	36	3.41							
11		EC2 Anchor Φ 1"- 8 UNC - 2A* 8" L (Fully threaded) ,ASTM F1554 Gr.105 HDG	30	18.74	27.03	1	280	270	160	0.01	
12		Hex Nut Φ 1"- 8 UNC -2B ,ASTM A563 DH HDG as per ASTM A153 or A123	30	5.01							
13		Round Washer OD 2 1/2" * ID 1 1/16" * 3/16" thk ,Q235B HDG as per ASTM A153 or A123	30	2.84							
14		EC2 Anchor Φ 1"- 8 UNC - 2A* 8" L (Fully threaded) ,ASTM F1554 Gr.105 HDG	4	2.50	3.91	1	280	270	70	0.01	
15		Hex Nut Φ 1"- 8 UNC -2B ,ASTM A563 DH HDG as per ASTM A153 or A123	4	0.67							
16		Round Washer OD 2 1/2" * ID 1 1/16" * 3/16" thk ,Q235B HDG as per ASTM A153 or A123	4	0.39							
17		EC2 Anchor Φ 1"- 8 UNC - 2A* 8" L (Fully threaded) ,ASTM F1554 Gr.105 HDG	30	18.74	26.94	1	280	270	160	0.01	
18		Hex Nut Φ 1"- 8 UNC -2B ,ASTM A563 DH HDG as per ASTM A153 or A123	30	5.01							
19		Round Washer OD 2 1/2" * ID 1 1/16" * 3/16" thk ,Q235B HDG as per ASTM A153 or A123	30	2.84							
			Total:	**149.35**	**151.52**	**6**				**0.07**	

Sold To:

Purchase Order No.:
Vessel Name:
Voyage Number:
Invoice Number:

Tel: 337-321-4240
Fax: 337-321-4241

TRELLEBORG MARINE SYSTEMS NORTH AMERICA, INC.
1186 PETROLEUM PARKWAY
BROUSSARD, LA 70518

www.trelleborg.com









Galvanizing Certificate of Compliance

Date: Dec. 7th, 2022
Project: 25135 - CONNECTICUT PORT AUTHORITY - STATE PIER

Galvanizing of all hardware was done in accordance with ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware. All hardware was coated according to the requirements of class C or D hardware specified in section 3 of ASTM A153. Galvanizing was performed at the place of manufacture in Dongtai, Jiangsu, China.

Trelleborg Marine Systems

Gisael Gomez

Name: Gisael Gomez

Hiawa Hardware & Machinery Co., Ltd

Name: HAIFENG ZHAO

SECTION 16. Chain system

SECTION 16. Chain system

16–A:

Material Certs & Test Reports

产品质量证明书

Quality Certificate

山东寿光巨能特种钢有限公司

Shandong Shouguang Juneng Special Steel Co., Ltd

中国认可 国际互认 检测 TESTING CNAS L6603

记录编号（Form No）：TSJ-05-27

产品名称Description	优质碳素结构钢	生产许可编号Certificate No		证书顺序号Certificate No..	B20200922047
用户Consignee	山东天保工贸有限公司	执行标准 Standard	GB/T699-2015	合同号 Contract No	

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
45	0101023	Φ30	6.5	7	20.335	热轧		

化学成分(Chemical Composition) (%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.45	0.23	0.62	0.0180	0.007	0.05	0.01	----	0.02	----	-----	-----	----	----	0.018	0.016	-----	----	----	----	----	----	----	----	----	----

低倍组织/级 * Marcroscopically Organization/Grade							非金属夹杂物/级 * Nonmetalic Inclusion/Grade									脱碳/mm*	晶粒度/等级	组织/等级*
一般疏松 Common Loseness	中心疏松 Center Loseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A		B		C		D		DS	Decarb-nization	Warfcrgrade	Structure
							粗 Thick	细 Thin	粗 Thick	细 Thin	粗 Thick	细 Thin	粗 Thick	细 Thin				
0	1	0	0	----	----		----	----	----	----	----	----	----	----	----	----	----	----
0	1	0	0	----	----		----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----		----	----	----	----	----	----	----	----	----	----	----	----

热处理Heat Treatment			力学性能 * Mechanical Performance					工艺性能Technical Performance					
温度℃ (T)	时间min (Time)	介质 (Medium)	Rel Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度T/℃	布氏硬度HB* HB Rigidity	洛氏硬度HRC* HRC Rigidity	热顶锻 Hot Forge	端淬性HRC Hardenability	表面质量 Surface	探伤 testing
850	50	空气	416	660	46	25.0	----	----	177	----	合格		合格	
----	----	----	418	672	46	25.5	----	----	191	----	合格			
----	----	----	----	----	----	----	----	----	185	----	----			

产品信息 Product Information

备注 Note

1.. 带“*”检测项目的试验方法通过国家实验室（CNAS）认可
(With "*" detection project is the National laboratory (CNAS) Accrediation project.)
2. 本质量证明书以原件为主，复印无效。
(No duplicate will be accepted.)

售后服务(Service)
销售热线(Sale hot line)：+86-0536-5186588
技术热线(Technical hot line)：+86-0536-5186588
地址：山东寿光市特钢路9号
(Add No. 9 Tegang Road, Shouguang, Shandong province)

主管(印章) (Charge)：刘勇

判定员 (Chief of check point)：杨振勇

山东巨能特钢有限公司 质量证明专用章 3707831703

日期(Date) 2020/9/22

产品质量证明书

山东寿光巨能特钢有限公司
Shandong Shouguang Juneng Special Steel Co.,Ltd

Quality Certificate

记录编号（Form No）：TSJ-05-27

产品名称Description	船用锚链圆钢	生产许可证编号Certificate No	----	证书顺序号Certificate No..	B20210316019
用户Consignee	青岛锚链股份有限公司	执行标准Standard	GB/T18669-2012	合同号Contract No	----

牌号 Brand	炉号 Heat No.	规格 Dimension mm	长度 Length m	捆数 Bundles	重量 Weight t	交货状态 Condition of Supply	压缩比 Compression ratio	熔炼流程 Smelting process
CM690	1201311	Φ16	6.46	2	9.5	热轧(Hot Rolled)	----	----

化学成分Chemical Composition(%)

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	W	V	Ti	B	Sb	Al	Als	Nb	O	H	N	Ca	Pb	Sn	As	Bi	Ceq
0.29	0.26	1.70	0.013	0.008	0.03	0.01	---	0.01	---	0.001	0.014	---	---	0.036	0.034	0.001	---	---	---	---	---	---	---	---	---

低倍组织/级 * Macroscopically Organization/Grade							非金属夹杂物/级 * Nonmetallic Inclusion/Grade									脱碳/mm*	晶粒度/等级 *	组织/等级*
一般疏松 Common Looseness	中心疏松 Center Looseness	中心偏析 Centerline Segregation	锭型偏析 Pattern Segregation	一般点偏 General dot Segregation	边缘点偏 Edgedot Segregation	备注	A		B		C		D		DS	Decarb-nization	Wafergrade	Structure
							粗 Thick	细 Thin	粗 Thick	细 Thin	粗 Thick	细 Thin	粗 Thick	细 Thin				
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
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热处理Heat Treatment			力学性能 * Mechanical Performance						工艺性能Technical Performance					
温度℃ (T)	时间min (Time)	介质 (Medium)	ReI Mpa	Rm Mpa	Z %	A %	AK 单值Single value	AK 温度 T/℃	布氏硬度HB * HB Rigidity	洛氏硬度HRC * HRC Rigidity	热顶锻 Hot Forge	端淬性HRC Hardenability	表面质量 Surface	探伤 testing
870	40	水	710	814	71	22.5	156	0℃	----	----	---	----	合格	----
600	60	水	----	----	----	----	160	0℃	----	----	---			
----	----	---	----	----	----	----	156	0℃	----	----	---			

产品信息 Product Information

备注 Note

1..带“ * ”检测项目为国家实验室（CNAS）认可项目。
(with “ * ” detection project is the National Laboratory （CNAS）Accreditation project.)
2.本质量证明书以原件为主，复印无效。
(No duplicate will be accepted.)

售后服务(Service)：
销售热线(Sales hot line)：+86-0536-5186688
技术热线(Technical chen line)：+86-0536-5186588
地址：山东寿光特钢路9号
(Add:No.9 Tegang Road Shouguang Shandong province)

主管(印章) (Charge)：刘勇

判定员 (Chief of Check Point)： 王丽凤

日期(Date) 2021/3/16

SECTION 16. Chain system

16–B:

Dimensional Reports

TRELLEBORG

TEST AND INSPECTION REPORT

THIS IS TO REPORT THAT THE FOLLOWING ITEMS WERE CHECKED AND CARRIED OUT TEST AND INSPECTION ACCORDING TO THE CUSTOMER'S REQUIREMENTS

REPORT NO. : SW2301908-1

PROJECT : PO NO. 25135-28757

PARTICULARS

PRODUCT SPECIFICATION	:	OPEN LINK CHAIN 16MM X 1 LINKS				
GRADE	:	U3		MATERIAL:	CM690	
DIAMETER	:	16	MM			
WIDTH OF LINK	:	24	MM	LENGTH OF LINK:	64	MM
CONSISTS OF	:	52	PCS	EACH OF:	1	LINKS
TOTAL WEIGHT	:	18.5	KGS			

DIMENSIONAL CHECK

COMMON LINK DIA.	:	16.1	16.2	16.1	16.3	16.2	MM
WIDTH	:	24.1	24.2	24.1	24.2	24.1	MM
LENGTH	:	64.1	64.0	64.2	64.3	64.2	MM

PHYSICAL TEST

PROOF LOAD	:	92.5	KN
BREAKING LOAD	:	185	KN

SURFACE FINISHED

HOT DIPPED GALVANIZED	:	VISUAL CHECK IS SATISFIED					
MIN. 85 MICRONS THICK	:	89	92	92	95	97	μM

MECHENICAL PROPERTY

CERT NO.	HEAT NO.	YIELD STRENGTH	TENSILE STRENGTH	ELONGATION
B20210316019	1201311	710 Mpa	814 Mpa	22.5 %

CHEMICAL COMPOSITION

CERT NO.	HEAT NO.	C	Si	Mn	P	S	Cr
B20210316019	1201311	0. 29	0. 26	1. 70	0.013	0.008	0. 03

INSPECTOR:

REVIEWED BY:

DATE OF ISSUE: 2023.01.11

DATE OF ISSUE: 2023.01.11

TRELLEBORG

TEST AND INSPECTION REPORT

THIS IS TO REPORT THAT THE FOLLOWING ITEMS WERE CHECKED AND CARRIED OUT TEST AND INSPECTION ACCORDING TO THE CUSTOMER'S REQUIREMENTS

REPORT NO. : SW2301908-2

PROJECT NO. : PO NO. 25135-28757

PARTICULARS

PRODUCT SPECIFICATION	:	3.25T US TYPE G2130 BOW SHACKLE				
GRADE	:	S		MATERIAL:	45	
NOMINAL DIAMETER	:	16	MM	(5/8")		
DIAEMTER OF BODY	:	16	MM	DIAEMTER OF PIN:	19	MM
WIDTH	:	27	MM	LENGTH:	60	MM
CONSISTS OF	:	104	PCS			
TOTAL WEIGHT	:	85	KGS			

DIMENSIONAL CHECK

DIAEMTER OF BODY	:	16.0	16.1	16.1	16.2	16.0	MM
DIAEMTER OF PIN	:	19.2	19.1	19.0	19.1	19.2	MM
WIDTH	:	27.1	27.2	26.9	26.9	27.1	MM
LENGTH	:	60.5	60.6	60.7	60.5	60.5	MM

PHYSICAL TEST

WORKING LOAD	:	31.9	KN
BREAKING LOAD	:	195	KN

SURFACE FINISHED

HOT DIPPED GALVANIZED	:	VISUAL CHECK IS SATISFIED					
MIN. 85 MICRONS THICK	:	91	93	95	95	97	μM

MECHENICAL PROPERTY

CERT NO.	HEAT NO.	YIELD STRENGTH	TENSILE STRENGTH	ELONGATION
B20200922047	0101023	418 Mpa	672 Mpa	25.5 %

CHEMICAL COMPOSITION

CERT NO.	HEAT NO.	C	Si	Mn	P	S	Cr
B20200922047	0101023	0.45	0.23	0.62	0.018	0.007	0.05

INSPECTOR: 孙秋峰

REVIEWED BY:

DATE OF ISSUE: 2023.01.11

DATE OF ISSUE: 2023.01.11

SECTION 17. Ladder

SECTION 17. Ladder

17–A:

Material Certs & Test Reports

本钢集团

本钢板材股份有限公司
BENGANG STEEL PLATES Co., LTD

产品质量证明书
PRODUCT QUALITY CERTIFICATE

辽宁省本溪市平山区北台镇 邮编117017
Beitai Town, Pingshan District, 117017
Benxi City, Liaoning Province, PRC
电话: 021-12224200
TEL: 021-12224200

客户名称 SOLD TO	烟台本钢钢铁销售有限公司			产品名称 PRODUCT	热轧钢卷		
收货单位 CONSIGNEE	烟台本钢钢铁销售有限公司			装车作业单号 TALLY NO.	RH20023156	证明书编号 CERTIFICATE NO.	200212H0753
标准 STANDARD	GB/T 1591-2018 ; Q355B			客户编号 CUSTOMER NO.	6SD00625	订单编号 ORDER NO.	DH20020045023
生产许可证 PROD LIC		交货状态 DELIVERY STATE	热轧	交运日期 SHIPPING DATE	2022/02/12	证明书日期 ISSUE DATE	2022/02/12
检验 INSP.	本钢板材检化验中心	T/C	1/0	车号 CAR NO.	1967808	到站 END LOCATION	BJJ-金州

项目 ITEM NO.	钢卷编号 COIL NO.	炉号 HEAT NO.	等级 CLASS NO.	尺寸及规格 MATERIAL DESCRIPTION 厚度*宽度*长度 THICK WIDTH LENGTH	数量 QTY	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION % C -2 X10	Si -2 X10	Mn -2 X10	P -3 X10	S -3 X10	Als -3 X10	C2 -2 X10	Cr -2 X10	Mo -2 X10	V -2 X10	Ni -2 X10	Cu -2 X10	Ti -3 X10	*A1 屈服 ReH N/MM2	*A2 抗拉 RM N/MM2	*A3 伸长 A %	备注 REMARKS
SPECIFICATION							21 MAX	55 MAX	160 MAX	35 MAX	35 MAX	INF	45 MAX	INF	INF	INF	INF	INF	200 MAX	355 MIN	470 630	20.0 MIN	
06	D202208951S	0C11314	1	8.00mm*1500mm*C	1	29.370	11	30	129	19	11	2	36	2	0	0	0	1	1	373	508	28.5	
				TOTAL:	1	29.370																	

注释 NOTES

*A1 屈服强度 YIELD STRENGTH
*A2 抗拉强度 TENSILE STRENGTH
*A3 伸长率 ELONGATION
*B1 弯 曲 BENDING
*C1 冲击单值 1 IMPACT VALUE 1

C2=[C]+[Mn]/6+([Cr]+[Mo]+[V])/5+([Cu]+[Ni])/15

等级 1=合格品 CLASS 1=ELIGIDILITY

冲击试验温度(Impact TEMP)=20℃
冲击试验规格(Impact size)=7.5X10X55

VISUAL INSPECTION(SURFACE) AND DIMENSION CHECK : OK

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SURVEYOR TO

兹证明本表所列产品，均按标准进行制造和试验，并且符合规范之要求。本产品质量证明书盖章有效。

WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS BEEN MANUFACTURED AND TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE STANDARD TECHNIQUE. EFFECTIVELY SEAL THE PRODUCT QUALITY CERTIFICATE.

本钢板材制造部
BENGANG STEEL PLATE MANUFACTURE DEPARTMENT

006483063770

A-764

本钢集团
本钢板材股份有限公司
BENGANG STEEL PLATES Co., LTD

产品质量证明书
PRODUCT QUALITY CERTIFICATE

辽宁省本溪市平山区北台镇 邮编117017
Beitai Town, Pingshan District, 117017
Benxi City, Liaoning Province, PRC
电话: 021-12221200
TEL: 021-12221200

客户名称 SOLD TO	烟台本钢钢铁销售有限公司			产品名称 PRODUCT	热轧钢卷		
收货单位 CONSIGNEE	烟台本钢钢铁销售有限公司			装车作业单号 TALLY NO	RH20023156	证明书编号 CERTIFICATE NO.	200212H0753
标准 STANDARD	GB/T 1591-2018 ; Q355B			客户编号 CUSTOMER NO.	6SD00625	订单编号 ORDER NO.	DH20020045023
生产许可证 PROD LIC		交货状态 DELIVERY STATE	热轧	交运日期 SHIPPING DATE	2022/03/12	证明书日期 ISSUE DATE	2022/03/12
检验 INSP.	本钢板材检化验中心	T/C	1/0	车号 CAR NO.	1967808	到站 END LOCATION	BJJ-金州

项目 ITEM NO.	钢卷编号 COIL No.	炉号 HEAT NO.	等级 CLASS NO.	尺寸及规格 MATERIAL DESCRIPTION 厚度*宽度*长度 THICK WIDTH LENGTH	数量 QTY	重量 WEIGHT t	*B1 弯曲 180° d=2a	*C1 冲击单值1	*C2 冲击单值2	*C3 冲击单值3	生产日期 P.D	备注 REMARKS
SPECIFICATION							INF	18 MIN	18 MIN	18 MIN	YYYY/MM/DD	
06	D202208951S	0C11314	1	8.00mm*1500mm*C	1	29.370	OK	90	90	92	2022/03/06	
				TOTAL:	1	29.370						

注释 NOTES

*A1 屈服强度 YIELD STRENGTH
*A2 抗拉强度 TENSILE STRENGTH
*A3 伸长率 ELONGATION
*B1 弯 曲 BENDING
*C1 冲击单值 1 IMPACT VALUE 1

C2=[C]+[Mn]/6+([Cr]+[Mo]+[V])/5+([Cu]+[Ni])/15

等级 1=合格品 CLASS 1=ELIGIDILITY

冲击试验温度(Impact TEMP)=20℃
冲击试验规格(Impact size)=7.5X10X55

VISUAL INSPECTION(SURFACE) AND DIMENSION CHECK : OK

Page23

SURVEYOR TO

兹证明本表所列产品，均按标准进行制造和试验，并且符合规范之要求。本产品质量证明书盖章有效。

WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS BEEN MANUFACTURED AND TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE STANDARD TECHNIQUE. EFFECTIVELY SEAL THE PRODUCT QUALITY CERTIFICATE.

本钢板材制造部
BENGANG STEEL PLATE MANUFACTURE DEPARTMENT

006483063770

A-76

本钢集团
本钢板材股份有限公司
BENGANG STEEL PLATES Co., LTD

产品质量证明书
PRODUCT QUALITY CERTIFICATE

辽宁省本溪市平山区北台镇 邮编117017
Beitai Town, Pingshan District, 117017
Benxi City, Liaoning Province, PRC
电话: 024-42224200
TEL: 024-42224200

客户名称 SOLD TO	烟台本钢钢铁销售有限公司			产品名称 PRODUCT	热轧钢卷		
收货单位 CONSIGNEE	烟台本钢钢铁销售有限公司			装车作业单号 TALLY NO.	RH20025776	证明书编号 CERTIFICATE NO.	200220H0456
标准 STANDARD	GB/T 1591-2018 ; Q355B			客户编号 CUSTOMER NO.	6SD00625	订单编号 ORDER NO.	DH20020048522
生产许可证 PROD LIC		交货状态 DELIVERY STATE	热轧	交运日期 SHIPPING DATE	2022/05/20	证明书日期 ISSUE DATE	2022/05/20
检验 INSP.	本钢板材检化验中心	T/C	1/0	车号 CAR NO.	1502977	到站 END LOCATION	BJJ-金州

项目 ITEM NO.	钢卷编号 COIL NO.	炉号 HEAT NO.	等级 CLASS NO.	尺寸及规格 MATERIAL DESCRIPTION 厚度*宽度*长度 THICK WIDTH LENGTH	数量 QTY	重量 WEIGHT t	化学成分 CHEMICAL COMPOSITION % C	Si	Mn	P	S	Als	C2	Cr	Mo	V	Ni	Cu	Ti	*A1 屈服 ReH	*A2 抗拉 RM	*A3 伸长 A	备注 REMARKS
							-2 X10	-2 X10	-2 X10	-3 X10	-3 X10	-3 X10	-2 X10	-2 X10	-2 X10	-2 X10	-2 X10	-2 X10	-3 X10	N/MM2		%	
SPECIFICATION							24 MAX	55 MAX	160 MAX	35 MAX	35 MAX	INF	45 MAX	INF	INF	INF	INF	INF	200 MAX	355 MIN	470 630	20.0 MIN	
05	D201123664S	0C21864	1	10.00mm*1500mm*C	1	29.700	14	29	133	24	10	1	37	2	0	0	1	2	0	367	502	28.5	
05	D201123663S	0C21864	1	10.00mm*1500mm*C	1	29.680	14	29	133	24	10	1	37	2	0	0	1	2	0	367	502	28.5	
				TOTAL:	2	59.400																	

注释 NOTES

*A1 屈服强度 YIELD STRENGTH
*A2 抗拉强度 TENSILE STRENGTH
*A3 伸长率 ELONGATION
*B1 弯 曲 BENDING
*C1 冲击单值 1 IMPACT VALUE 1

C2=[C]+[Mn]/6+([Cr]+[Mo]+[V])/5+([Cu]+[Ni])/1
5
等级 1=合格品 CLASS 1=ELIGIDILITY

冲击试验温度(Impact TEMP)=20℃
冲击试验规格(Impact size)=7.5X10X55

VISUAL INSPECTION(SURFACE) AND DIMENSION CHECK : OK

Page24

SURVEYOR TO

兹证明本表所列产品，均按标准进行制造和试验，并且符合规范之要求。本产品质量证明书盖章有效。

WE HEREBY CERTIFY THAT MATERIAL DESCRIBED HEREIN HAS BEEN MANUFACTURED AND TESTED WITH SATISFACTORY RESULTS IN ACCORDANCE WITH THE STANDARD TECHNIQUE. EFFECTIVELY SEAL THE PRODUCT QUALITY CERTIFICATE.

本钢板材制造部
BENGANG STEEL PLATE MANUFACTURE DEPARTMENT

753607206708

本钢集团
本钢板材股份有限公司
BENGANG STEEL PLATES Co., LTD

产品质量证明书
PRODUCT QUALITY CERTIFICATE

辽宁省本溪市平山区北台镇 邮编117017
Beitai Town, Pingshan District, 117017
Benxi City, Liaoning Province, PRC
电话: 024-42224200
TEL: 024-42224200

客户名称 SOLD TO	烟台本钢钢铁销售有限公司			产品名称 PRODUCT	热轧钢卷		
收货单位 CONSIGNEE	烟台本钢钢铁销售有限公司			装车作业单号 TALLY NO.	RH20025776	证明书编号 CERTIFICATE NO.	200220H0456
标准 STANDARD	GB/T 1591-2018 ; Q355B			客户编号 CUSTOMER NO.	6SD00625	订单编号 ORDER NO.	DH20020048522
生产许可证 PROD LIC		交货状态 DELIVERY STATE	热轧	交运日期 SHIPPING DATE	2022/05/20	证明书日期 ISSUE DATE	2022/05/20
检验 INSP.	本钢板材检化验中心	T/C	1/0	车号 CAR NO.	1502977	到站 END LOCATION	BJJ-金州

项目 ITEM NO.	钢卷编号 COIL NO.	炉号 HEAT NO.	等级 CLASS NO.	尺寸及规格 MATERIAL DESCRIPTION 厚度*宽度*长度 THICK WIDTH LENGTH	数量 QTY	重量 WEIGHT t	*B1 弯曲 180° d=2a	*C1 冲击单值1	*C2 冲击单值2	*C3 冲击单值3	生产日期 P.D	备注 REMARKS
SPECIFICATION							INF	18 MIN	18 MIN	18 MIN	YYYY/MM/DD	
05	D201123664S	0C21864	1	10.00mm*1500mm*C	1	29.700	OK	94	92	95	2022/05/14	
05	D201123663S	0C21864	1	10.00mm*1500mm*C	1	29.680	OK	94	92	95	2022/05/14	
				TOTAL:	2	59.400						

注释 NOTES

*A1 屈服强度 YIELD STRENGTH
*A2 抗拉强度 TENSILE STRENGTH
*A3 伸长率 ELONGATION
*B1 弯 曲 BENDING
*C1 冲击单值 1 IMPACT VALUE 1

C2=[C]+[Mn]/6+([Cr]+[Mo]+[V])/5+([Cu]+[Ni])/1
5
等级 1=合格品 CLASS 1=ELIGIDILITY

冲击试验温度(Impact TEMP)=20℃
冲击试验规格(Impact size)=7.5X10X55

VISUAL INSPECTION(SURFACE) AND DIMENSION CHECK : OK

Page25

SURVEYOR TO

兹证明本表所列产品，均按标准进行制造和试验，并且符合规范之要求。本产品质量证明书盖章有效。

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本钢板材制造部
BENGANG STEEL PLATE MANUFACTURE DEPARTMENT

753607206708

日照钢铁
RIZHAO STEEL

质量证明书
MILL TEST CERTIFICATE

日照钢铁轧钢有限公司
Rizhao Steel Wire Co., Ltd.
山东省日照市沿海路600号/276806
No. 600, Yanhai Road, Rizhao City, Shandong, P.R. China/276806
TEL：客户监督 4001380006 质保书服务 06332968271

订货单位 CONSIGNEE：

发货日期 DATE OF ISSUE：2022 年 YY 01 月 MM 09 日 DD

执行标准 STANDARD：GB/T 3274-2017

质保书号 MILLSHEETNO.：220109H00860

交货状态 DELIVERY STATE：热轧 Hot Rolled

产品名称 PRODUCT：热轧卷板 Hot Rolled Coil

合同号 CONTRACTNO.：CDH2201040022

牌号(级别代号) STEEL GRADE：Q355B

最后客户 FINAL CUSTOMER：1303456

品级 QUALITY CLASS：正品 Qualified Product

H00860-1

钢卷号 ROLL STEEL NO.	炉号 HEAT NO.	规格及重量 MATERIAL DESCRIPTION			化学成份 CHEMICAL ANALYSIS(%)													A1(TT)拉伸试验 G.L.=5.65√S0			B1 弯曲试验		REMARK
		规格mm DIMENSION	件数 QTY	重量t WEIGHT	C %	Si %	Mn %	P %	S %	Als %	Ti %	CEV %	Cu %	Cr %	Ni %	Nb %	N ppm	屈服 Y.S. ReH	抗拉 T.S. Rm	伸长 EL A5.65√S0			
					x10⁻²	x10⁻²	x10⁻²	x10⁻³	x10⁻³	x10⁻¹	x10⁻³	x10⁻²	x10⁻²	x10⁻²	x10⁻²	x10⁻³	x10⁻⁰	N/mm2(MPa)		%			
规范范围 SPECIFICATION					0 24	0 55	0 160	0 35	0 35		0 200	0 45	40	30	30		120	355	470 630	20			
H2B22103632	D22700262	14*2.000	1	31.98	14	19	42	21	8	113	45	22	1	5	1	3	60	435	569	23.5	合格		
H2B22103638	D22700262	14*2.000	1	31.83	14	19	42	21	8	113	45	22	1	5	1	3	60	432	563	28.0	合格		
		TOTAL：	2	63.81																			

注释 NOTE

CEV=C+Mn/6+(Cr+V+Mo)/5+(Cu+Ni)/15
G.L=拉伸标距 Gauge Length
A1(TT)=Tensile Test Tail
Y.S=Yield Strength
T.S=Tensile Strength
E.L=Percentage Elongation After Fracture
B1=Bend Test
B1：弯曲角度 bend angle=180°
B1：弯心直径 mandrel diameter=2a

备注 REMARK

表面及外形尺寸 SURFACE AND SIZE：合格 QUALIFIED
无质量证明书专用章印记无效 INVALID WITHOUT SEAL

日照钢铁轧钢有限公司质量检验专用章

成品质量负责人
CHIEF OF INSPECTOR

尊敬的客户：用前先要验证，如有异议请保留实物并来函说明
FOR CUSTOMERS: TEST BEFORE USE, CLAIM FOR DISCREPANCIES WITH DEFAULT GOODS

本公司已通过 ISO9001 质量体系认证
APPROVED BY ISO9001

沙钢

沙钢集团安阳永兴特钢有限公司

ShaGang Group AnYang YongXing Special Steel Co., Ltd

生产许可

SGYX01.02.219

河南省安阳市水冶镇 邮编：455133
Shuiye, Anyang, Henan Code:455133
TEL: (0372)3238055; 3238066;3238010
FAX: (0372) 3238063

热轧圆钢质量证明书

Hot Rolled Steel Bars Quality Certificate

订货单位CUSTOMER		用户代码CUSTOMER CODE	N20063	合同号CONTRACT NO.	Y14A06AYX001
牌号STEEL GRADE	Q355B	出库单号 DELIVERY ID.	0A2214	发货日期DATE OF DELIVERY	2021-04-15
交货标准SPECIFICATION	GB/T1591-2018	质证书号CERTIFICATE ID.	0A22142473	签发日期DATE OF ISSUE	2021-04-15 02:30:27
		用 途 USE			

序号 NO.	轧批号 HEAT NO.	产品规格Size of Product 直径 Dia. mm	长度 Length m	件数 Bind-ings	重量 QTY t	化学成分CHEMICAL COMPOSITION % C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V	拉伸试验TENSILE TEST Rm MPa	ReL MPa	A %	A11.3 %	Z %	实验状态 TestCondition	冲击试验 IMPACT TEST NOTCH 2mmV 温度 ℃	冲击功IMPACT ENERGY J (试样厚度THICKNESS 10mm) 1	2	3	AVE	顶锻试验 Forging TEST 热态 Hot state	冷态 Cold state	硬度试验 Hardness 硬度值	试验状态 Test Condition
						2	2	2	3	3	2	2	2	2	3															
						Ti	Alt																							
						2	3																							
						1=×10 2=×100 3=×1000 4=×10000 5=×100000																										
1	0212301001	20	6.0	6	10.880	18	34	140	16	6	3.7	1.1	2.5	0.8	2	580	400		29.0	29.0								完好	完好		
						0.2	6									585	420		30.0	30.0											
2	0212300723	25	6.0	5	8.957	18	30	141	14	6	3.1	1.4	2.1	0.8	2	560	370		29.0	29.0								完好	完好		
				-		0.2	6									560	385		30.0	30.0											
3	0212300725	25	6.0	1	1.792	16	30	139	18	3	3.7	1.1	2.2	0.8	2	555	380		30.0	30.0								完好	完好		
						0.2	6									570	395		32.0	32.0											
合计 Total				12	21.629		说明 NOTES	*1. Ceq=C+Mn/6+ (Cr+V+Mo) /5+ (Cu+Ni) /15;																							

综合判定 FINAL RESULT	合格 PASS	注意事项 ATTENTIVE ITEMS

1. 质量证明书复印件不作有效证明文件，除非盖章。The copy of this Certificate is invalid except stamped.
2. 用户验货后使用如有异议应及时告知炉号、牌号，并保留实物及标志。Please inform us the steel grade and the heat number of the unqualified material(s) found in inspection on time if there are dissents on our products and keep the original material(s) and the marking card.

沙钢集团安阳永兴特钢有限公司 质检专用章 (2)

检验专用章 SEAL

合格
PASS

A-625

SECTION 17. Ladder

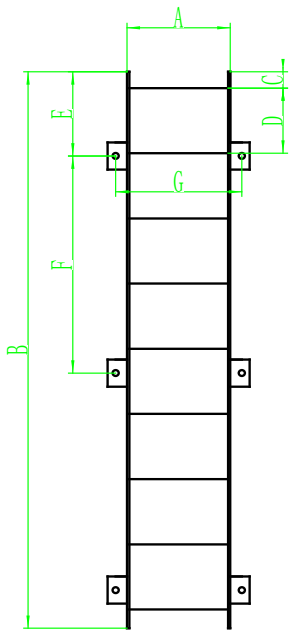
17–B:

Dimensional Reports

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M03
Product	Ladder assembly-1	Sum Total	6 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**	**E**	**F**	**G**		
Nominal mm	**477**	**2604**	**76**	**305**	**300**	**1016**	**603**		
Tolerance mm	**±6**	**±11**	**±3**	**±1**	**±2**	**±1**	**±1**		
Actual mm	478	2605	75	304	300	1015	602		

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

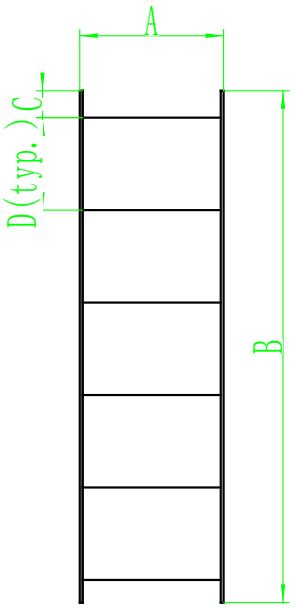
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M03
Product	Ladder assembly-2	Sum Total	6 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**					
Nominal mm	**477**	**1689**	**89**	**305**					
Tolerance mm	**±6**	**±8**	**±2**	**±1**					
Actual mm	477	1690	88	305					

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

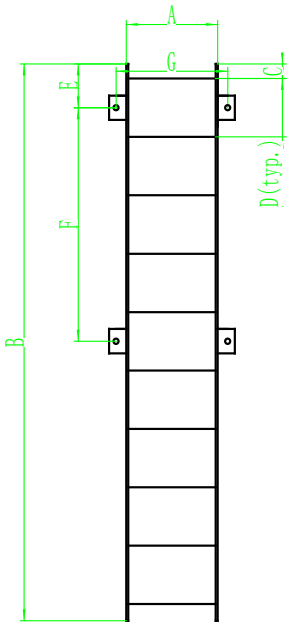
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M05
Product	Ladder assembly-1	Sum Total	9 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**	**E**	**F**	**G**		
Nominal mm	**477**	**2908**	**76**	**305**	**229**	**1219**	**603**		
Tolerance mm	**±6**	**±11**	**±2**	**±1**	**±2**	**±1**	**±1**		
Actual mm	477	2908	77	305	230	1220	602		

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

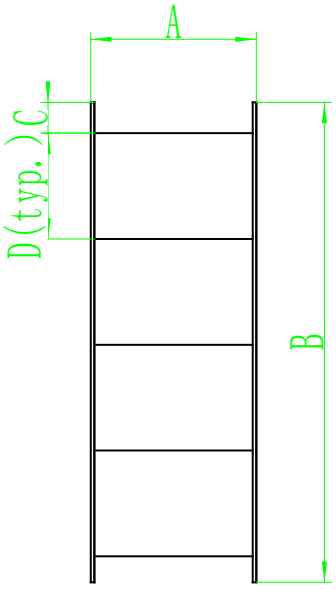
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M05
Product	Ladder assembly-2	Sum Total	9 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**					
Nominal mm	**477**	**1384**	**89**	**305**					
Tolerance mm	**±6**	**±8**	**±2**	**±1**					
Actual mm	477	1385	89	305					

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

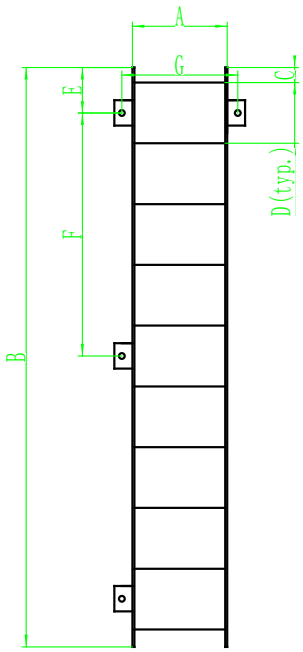
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M05
Product	Ladder assembly-1	Sum Total	5 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**	**E**	**F**	**G**		
Nominal mm	**477**	**2908**	**76**	**305**	**229**	**1219**	**603**		
Tolerance mm	**±6**	**±11**	**±2**	**±1**	**±2**	**±1**	**±1**		
Actual mm	477	2908	77	305	230	1220	602		

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

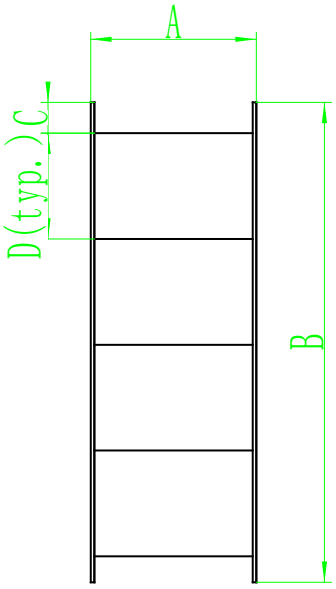
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M07
Product	Ladder assembly-2	Sum Total	5 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**					
Nominal mm	**477**	**1384**	**89**	**305**					
Tolerance mm	**±6**	**±8**	**±2**	**±1**					
Actual mm	477	1386	90	304					

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

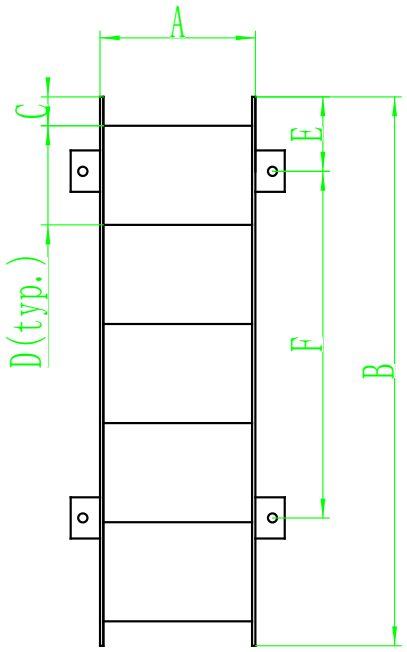
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M09
Product	Ladder assembly-1	Sum Total	1 Piece
Material	Q355B		



Position:	**A**	**B**	**C**	**D**	**E**	**F**			
Nominal mm	**477**	**1689**	**76**	**305**	**229**	**1067**			
Tolerance mm	**±6**	**±8**	**±2**	**±1**	**±2**	**±1**			
Actual mm	478	1690	75	305	230	1066			

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

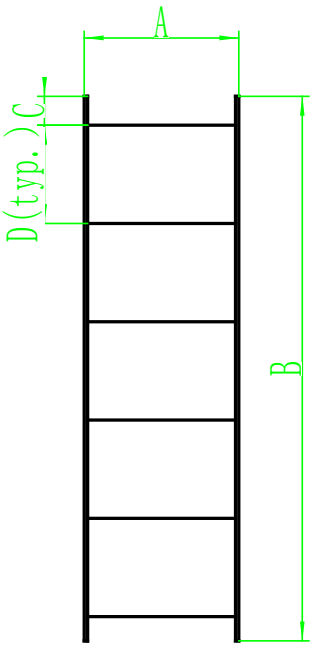
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M09
Product	Ladder assembly-2	Sum Total	1 Piece
Material	Q355B		



Position:	**A**	**B**	**C**	**D**					
Nominal mm	**477**	**1689**	**76**	**305**					
Tolerance mm	**±6**	**±8**	**±2**	**±1**					
Actual mm	476	1688	77	305					

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

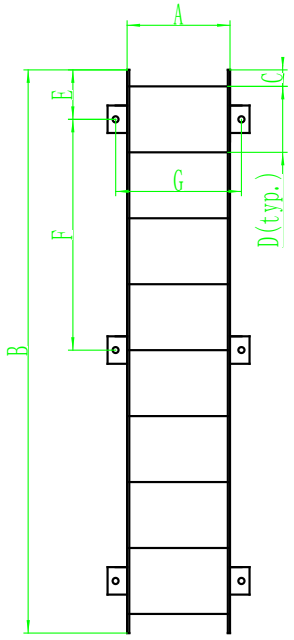
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M11
Product	Ladder assembly-1	Sum Total	5 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**	**E**	**F**	**G**		
Nominal mm	**477**	**2604**	**76**	**305**	**229**	**1067**	**603**		
Tolerance mm	**±6**	**±11**	**±2**	**±1**	**±2**	**±1**	**±1**		
Actual mm	478	2605	75	305	230	1015	602		

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

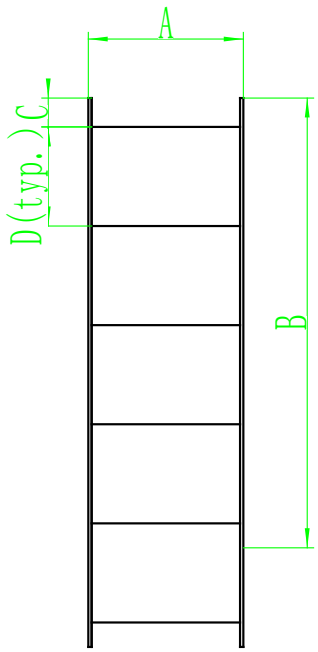
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M11
Product	Ladder assembly-2	Sum Total	5 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**					
Nominal mm	**477**	**1689**	**76**	**305**					
Tolerance mm	**±6**	**±8**	**±2**	**±1**					
Actual mm	476	1689	77	305					

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

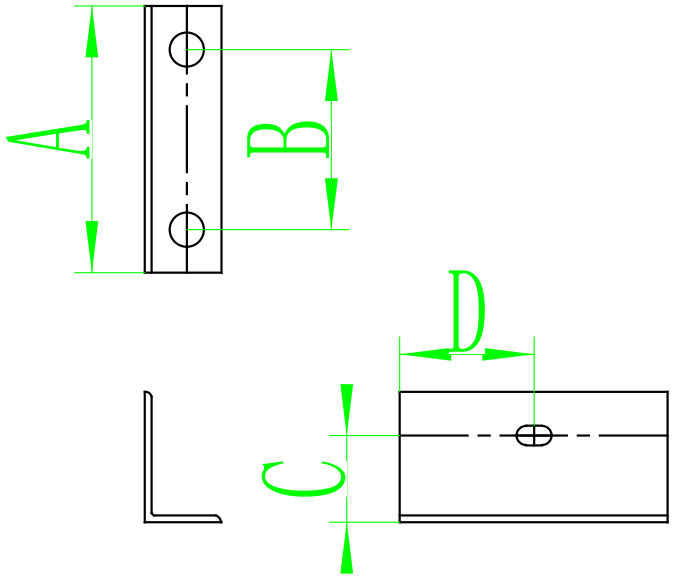
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M05
Product	Bottom L Bracket	Sum Total	18 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**	**D**					
Nominal mm	**311**	**210**	**101**	**156**					
Tolerance mm	**±4**	**±1**	**±2**	**±2**					
Actual mm	310	210	100	156					
	311	211	101	156					

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

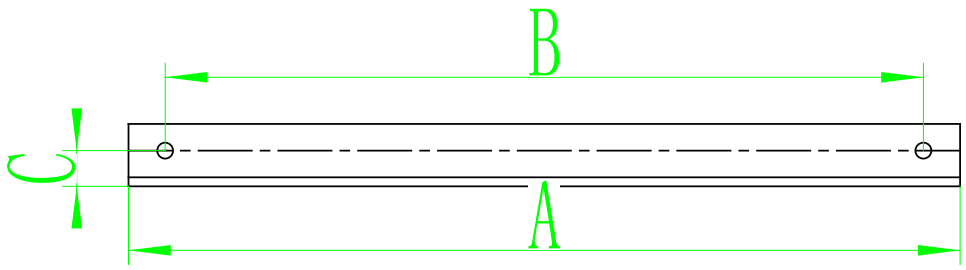
Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

TRELLEBORG

DIMENSIONAL INSPECTION REPORT

PO No.	25135-28757	Drawing No.	25135-4M05
Product	Bottom L Angle	Sum Total	18 Pieces
Material	Q355B	Inspection Rate	10%



Position:	**A**	**B**	**C**						
Nominal mm	**1181**	**1077**	**51**						
Tolerance mm	**±8**	**±1**	**±2**						
Actual mm	1182	1077	50						
	1180	1076	51						

Check Conclusion:

We hereby certify all the relevant dimensions about this project have been checked as per related drawing and standards. The results are acceptable.

Inspector: Hongqi Zhang	**Customer:**
Date: 2022.12.25	**Date**:

TRELLEBORG MARINE SYSTEMS Quality Department

SECTION 17. Ladder

17–C:

NDT Reports

TRELLEBORG

MT REPORT

Project No.	25135-28757			**Drawing No.**	25135-4M03/05/07/0911
Quantity.	6+6+9+9+5+5+1+1+5+5	**Unit**	Piece	**Testing Range**	All the welds between carbon-steel members
Title	Support bar with cleats			**Percentage**	10%
Test Purpose	Surface quality testing of welds with MT			**Test Date**	2022.12.25

MT RESULT

INSTRUMENT MODEL	MP-A2L	**TESTING TIME**	AFTER WELDING AND GRINDING
TEST FORM	FILLET WELDS	**METHOD OF MAGNETIZATION**	A.C ELECTROMAGNETIC YOKES
SURFACE CONDITION	GROUND	**MAGNETIC PARTICLE TYPE CONCENTRATION**	BLACK MAGNETIC PARTICLE SOLUTION 10-25g/L
TESTING METHOD	CONTINUOUS METHOD		
MAGNETIZED TIME	MORE THAN 0.5S	**SENSITIVITY：**	STANDARD TEST PIECE
MAGNETIZED DIRECTION	TWO DIRECTIONS	**MAGNETIZED CRITERION**	ALTERNATING CURRENT ≥4.5KG
TESTING STANDARD	AWS D1.1	**ACCEPTANCE STANDARD**	AWS D1.1

INSPECTION RESULT：

According to the standards and requirements, MPI was carried out on all the specified welds for this project at the fabrication yard. The inspection result shows no evidence of defects such as cracks was found during the inspection.

Tested area is generally satisfied.

Inspector: 张建华

Date: 2022.12.25

Checked By:

TRELLEBORG MARINE SYSTEMS Quality Department

Date:

SECTION 3. Ladder

17–D:

HDG Reports

TRELLEBORG

烟台市福源金属表面工程有限公司
Yantai Fuyuan Metal Surface Engineering Co., Ltd.
镀锌质量检验报告单
Testing Report of Galvanized Quality

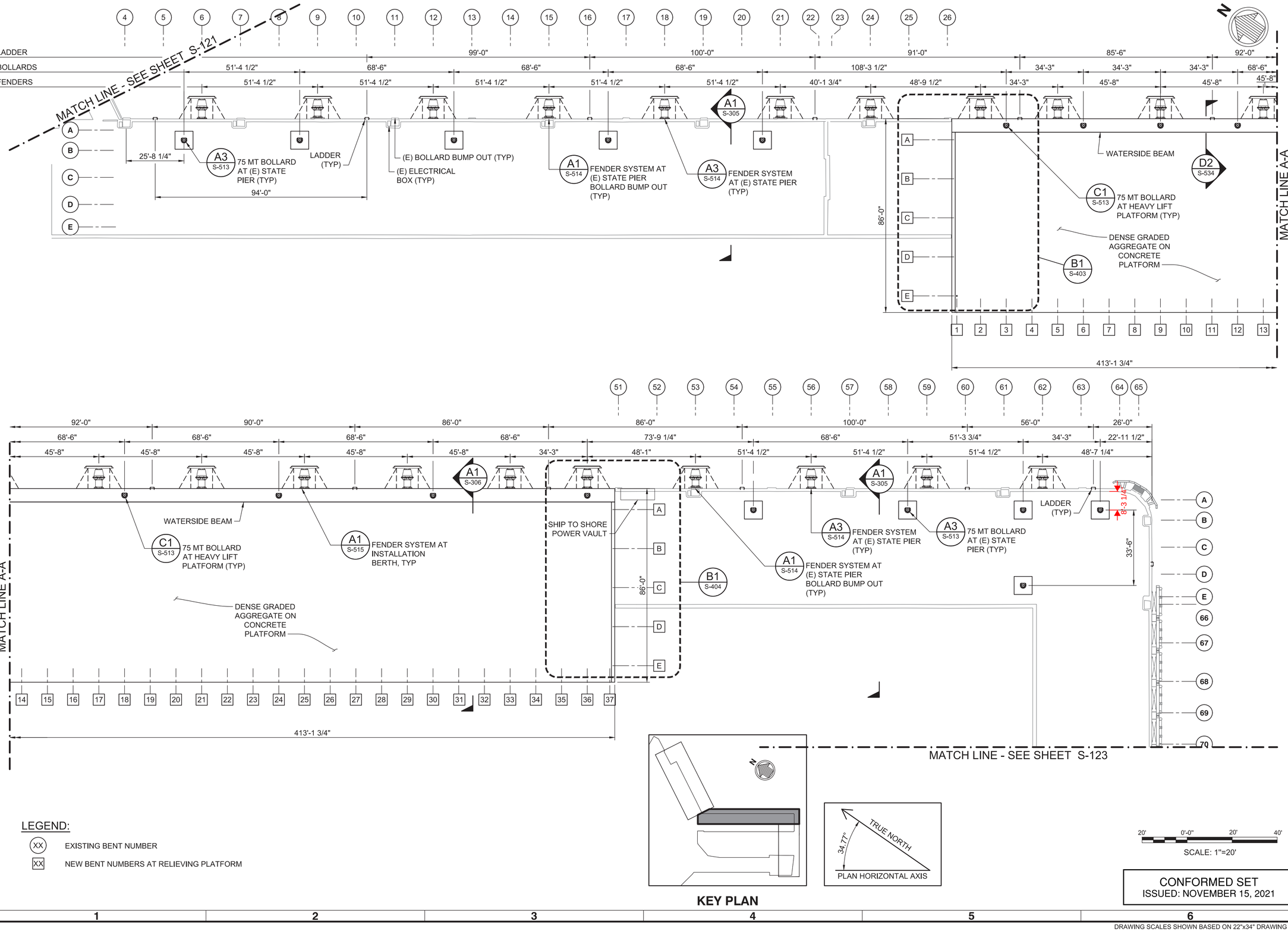
编号 No.:	25135				
顾客名称 Customer Name	山东蓬建钢结构有限公司 Shandong Pengjian Steel Structure Co., LTD		镀件名称 Galvanized Part Name	Ladder assembly Bottom L angle Bottom L bracket	
每批量 Per Batch	6+6+9+9+18+18+5+5+5+5 pieces 1+1 piece				
执行标准 Execute Standard	BS EN ISO 1461				
检验项目 Test items	技术要求 Technical Requirement	实测结果 The Actual Test Results		结论 Conclusion	备注 Remarks
镀件外观 Galvanized Part Complexion	表面清洁平滑、无损伤、 无结瘤、，无锌灰和漏锁现象 Smooth and clean surface, no damage, no heel, no zinc ash and galvanized leakage phenomena	符合要求 Satisfactory		合格 Acceptance	

镀层厚度 Cladding material	平均厚度要求最小值≥ 100 um Average Thickness Minimum	点数 Number					实测平均厚度 The Actual Average Thickness
		119	143	130	109	150	130.1
		112	114	111	126	133	119.1
		151	135	140	137	132	139.2
		125	105	127	131	124	122.5
		128	117	140	112	106	120.4
全项总结论 Total items Conclusion	合格 检验员02						

质检员 / 日期：2023.1.10
Quality checker/Date 包敦元

校核员 / 日期：
Examinant/Date:

TRELLEBORG MARINE SYSTEMS Quality Department



KEY PLAN

LEGEND:

(XX) EXISTING BENT NUMBER

[XX] NEW BENT NUMBERS AT RELIEVING PLATFORM

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Connecticut PORT AUTHORITY

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

DECK PLAN (INSTALLATION BERTH)

Rev.	Date	Description	Appr.
0			

Date: 2021-03-12
M&N Project No.: 10630
Drawing code:
Drawing Scale: 1:1 (D SHEET)
Plot scale: 1:1

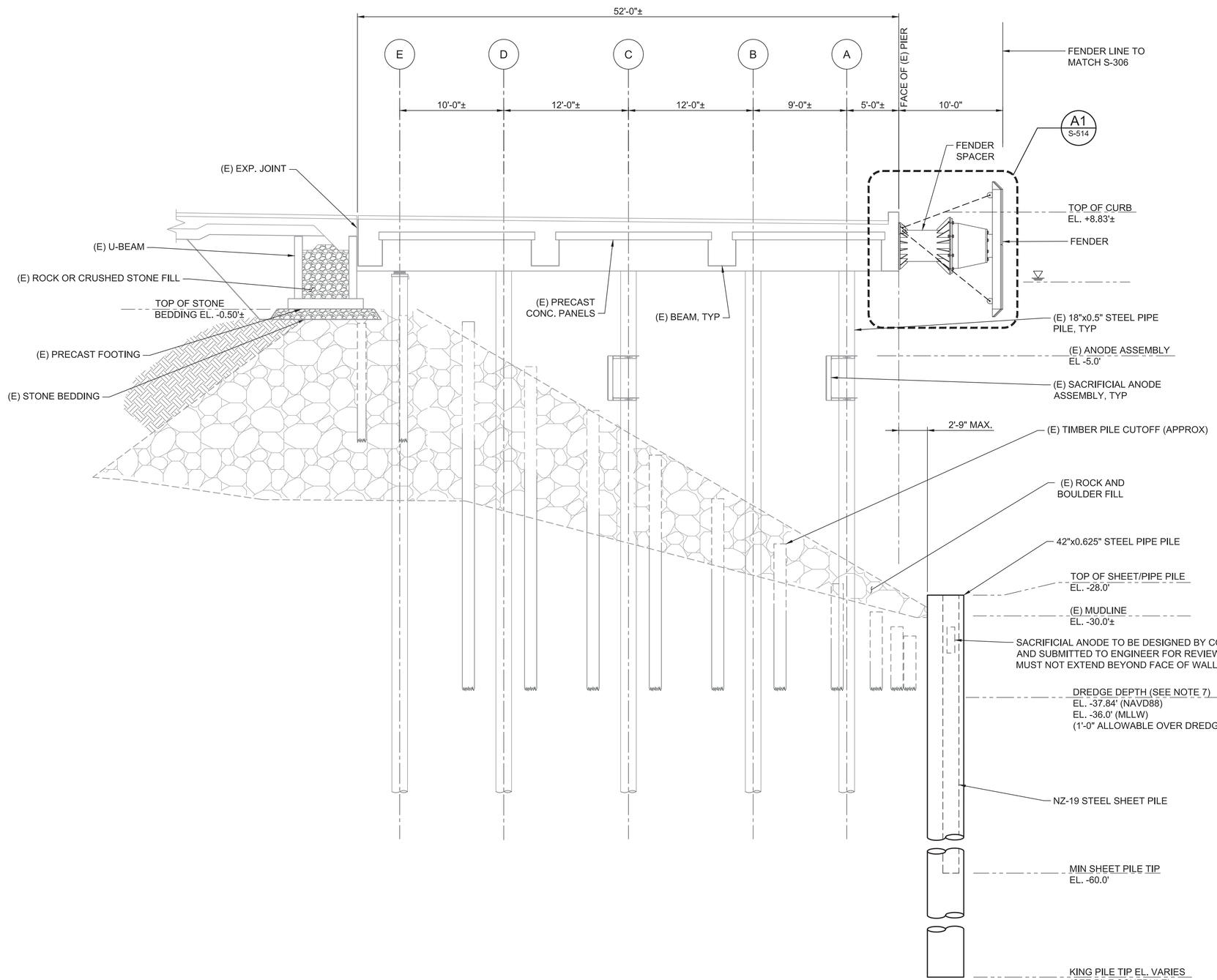
Designed by: EH
Drawn by: CMI
Cad by: BA
Reviewed by: MT
Submitted by: JOSHUA SINGER MOFFATT & NICHOL

moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED PROFESSIONAL ENGINEER
Matthew Trowbridge

Sheet Reference No.
S-122
INDEX: 151 OF 232

File: C:\BOS\Projects\10630 Detail Design State pier\500 CADD_Active_DesignSet\02_Structural\10630S-122 ; Plotted: 3/12/2021 10:59 PM by MOYA IGLESIAS, CRISTIAN ; Saved: 3/12/2021 3:40 PM by CMOYAIGLESIAS



A1 / S-113 — INSTALLATION BERTH AT EXISTING STATE PIER SECTION
SCALE: 3/16" = 1'-0"

S-114
S-122

8'-0" 0'-0" 4'-0" 8'-0"
SCALE: 3/16"=1'-0"

NOTES:

1. LAYOUT AND DIMENSIONS OF EXISTING STRUCTURES ARE BASED ON EXISTING DRAWINGS. CONDITIONS ON-SITE MAY VARY AND SECTIONS SHALL BE USED AS A VISUAL AID AND NOT AS VERIFIED EXISTING CONDITIONS. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS.
2. SIZE AND DEPTH OF ROCK AND BOULDER FILL SHOWN DOES NOT NECESSARILY REFLECT ACTUAL SIZE. CONTRACTOR SHALL VERIFY IN FIELD.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING AND MAINTAINING THE STABILITY OF THE EXISTING ROCK AND BOULDER FILL. SLOPE SHOWN IS FOR ILLUSTRATION PURPOSES.
4. ALL ELEVATIONS SHOWN IN NAVD88, UON.
5. CONSTRUCTION SEQUENCE NOTES:
   A. INSTALL TOE WALL.
   B. DREDGE BERTH POCKET AND PREPARE SEABED FOR ROCK PAD PLACEMENT.
   C. PLACE ROCK PAD.
   D. REPLENISH ANY RIP RAP REMOVED DURING CONSTRUCTION.
6. ALL EXISTING CONDITIONS ARE DRAWN PER AVAILABLE AS-BUILTS. CONDITIONS TO BE VERIFIED BY CONTRACTORS PRIOR TO WORK.
7. SEE DREDGE PLANS FOR PLAN EXTENTS OF VARYING DREDGE DEPTHS.
8. THE CONDITION OF THE EXISTING STATE PIER STEEL PIPE PILES IS UNKNOWN. CONTRACTOR SHALL PERFORM ULTRASONIC THICKNESS (UT) TESTING OF THE EXISTING STEEL PIPE PILES THAT WILL BE PROTECTED IN PLACE. THE UT TESTING SHALL OCCUR ON EVERY EXISTING PILE THAT WILL BE INCORPORATED INTO THE NEW TERMINAL WITH MEASUREMENTS TAKEN AT 3 LOCATIONS (PILE TO DECK CONNECTION, SPLASH ZONE, MUDLINE). TESTING RESULTS SHALL BE SUBMITTED TO ENGINEER FOR REVIEW. CONTRACTOR SHALL INCLUDE COST OF UT TESTING IN BIDS.
9. NOT IN CONTRACT: PILES THAT ARE FOUND TO HAVE WALL THICKNESS LESS THAN 0.45" SHALL BE REPAIRED/ JACKETED WITH HDPE SLEEVE OR DENSO TAPE WRAP SYSTEM.
10. NOT IN CONTRACT: THE INSPECTION OF THE EXISTING STATE PIER PILES SHALL BE PERFORMED EVERY FOUR YEARS. PROVIDE PILE JACKET IF THE PILE THICKNESS IS FOUND TO BE LESS THAN 0.45".
11. NOT IN CONTRACT: PILES THAT ARE FOUND TO HAVE WALL THICKNESS LESS THAN 0.4" SHALL BE REPAIRED WITH A STRUCTURAL JACKET. SUBMIT JACKET DETAIL TO ENGINEER FOR REVIEW. JACKET DESIGN SHALL REPLACE THE LOST CAPACITY OF THE STEEL SECTION AND BE DEVELOPED ADEQUATELY BEYOND THE DETERIORATED SECTION.

1

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Connecticut PORT AUTHORITY

Mark	Description	Date	Appr
1	NOTES REVISED	04-09-21	MT

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

INSTALLATION BERTH SECTION AT EXISTING STATE PIER

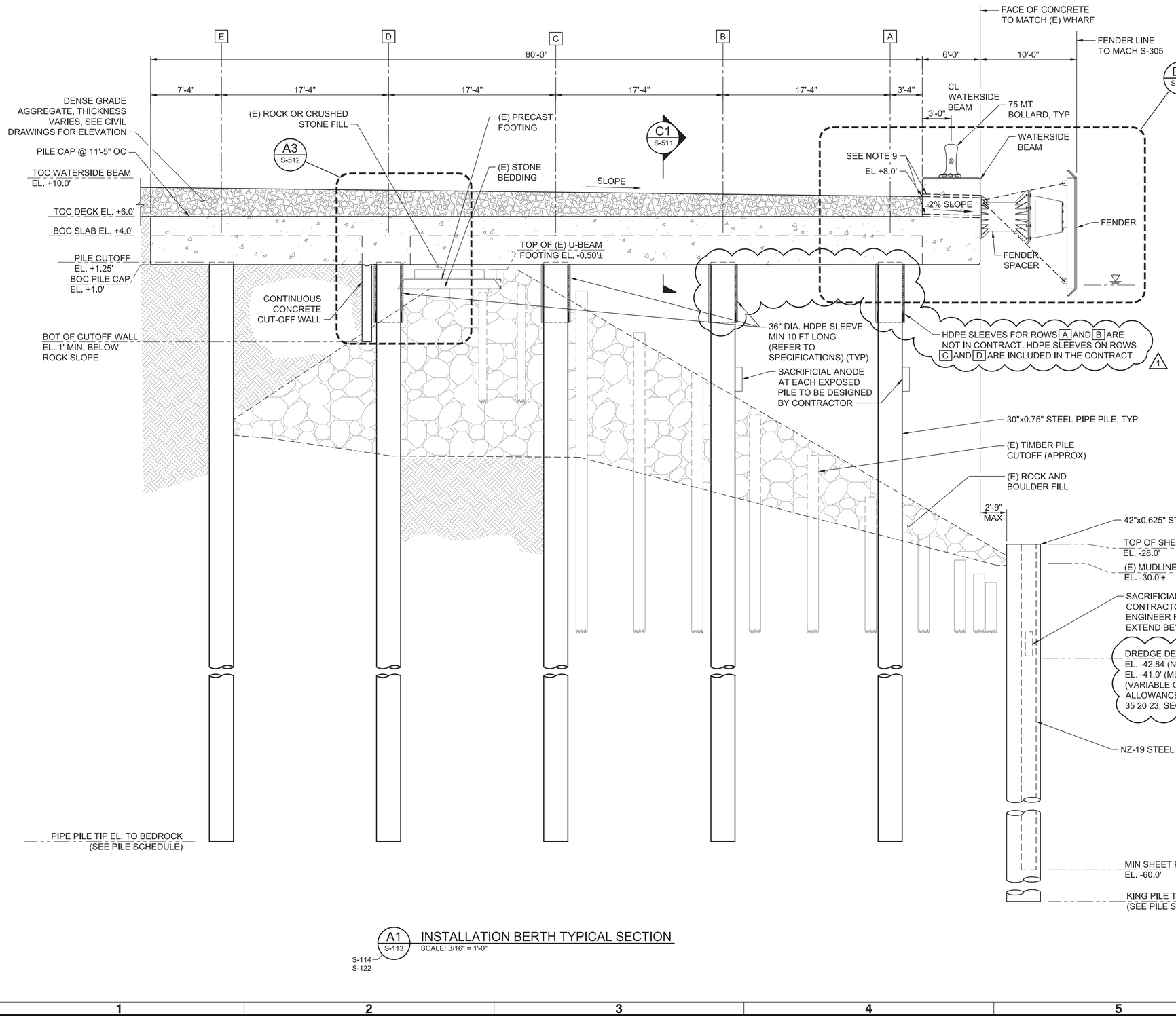
Designed by: EH	Drawn by: CMI	Checked by: BA	Reviewed by: MT
Submitted by: JOSHUA SINGER, MOFFATT & NICHOL	Date: 2021-03-12	M&N Project No. 10630	Drawing code:
Plot scale: 1:1 (0 SHEET)	Drawing Scale:	Rev: 1	

moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7320

STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED
PROFESSIONAL ENGINEER
Matthew Trowbridge

Sheet Reference No.
S-305
INDEX: 157 OF 232

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A1 S-113 INSTALLATION BERTH TYPICAL SECTION
SCALE: 3/16" = 1'-0"
S-114
S-122

NOTES:

1. CONTRACTOR TO DEMO EXISTING STRUCTURES AS REQUIRED TO FACILITATE INSTALLATION OF IMPROVEMENTS IN THIS CONTRACT.
2. CONTRACTOR TO REPLACE AND RECOMPACT ANY DISTURBED FILL MATERIAL.
3. LAYOUT AND DIMENSIONS OF EXISTING STRUCTURES ARE BASED ON EXISTING DRAWINGS. CONDITIONS ON-SITE MAY VARY AND SECTIONS SHALL BE USED AS VISUAL AID AND NOT AS VERIFIED EXISTING CONDITIONS. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS.
4. SIZE AND DEPTH OF ROCK AND BOULDER FILL SHOWN DOES NOT NECESSARILY REFLECT ACTUAL SIZE. CONTRACTOR SHALL VERIFY IN FIELD.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING AND MAINTAINING THE STABILITY OF THE EXISTING ROCK AND BOULDER FILL. SLOPE SHOWN IS FOR ILLUSTRATION PURPOSES.
6. ALL ELEVATIONS SHOWN IN NAVD88, UON.
7. CONSTRUCTION SEQUENCE NOTES:
   A. INSTALL TOE WALL.
   B. DREDGE BERTH POCKET AND PREPARE SEABED FOR ROCK PAD REPLACEMENT.
   C. DEMOLISH, REMOVE, AND DISPOSE PORTION OF EXISTING STATE PIER.
   D. INSTALL HEAVY LIFT PLATFORM PILES.
   E. REPLENISH ANY RIP RAP REMOVED DURING CONSTRUCTION.
   F. CONSTRUCT HEAVY LIFT PLATFORM.
   G. PLACE ROCK PAD.
8. ALL EXISTING CONDITIONS ARE DRAWN PER AVAILABLE AS-BUILTS. CONDITIONS TO BE VERIFIED BY CONTRACTOR PRIOR TO WORK.
9. 3" DIA PVC PIPE TOP SCUPPER SPACED AT 25'-0" OC MAX AND BOTTOM SCUPPER SPACED AT 50'-0" OC MAX. ADJUST SPACING OF PVC PILE TO AVOID LADDER AND FENDER LOCATIONS. SEE C4 S-536

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

Connecticut PORT AUTHORITY

Mark	Description	Date	Appr
1	ADDED CALLOUT FOR HDPE SLEEVES	04-09-21	MT
1	SWITCH POCKET DREDGE ELEVATIONS	04-09-21	SBJ

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

INSTALLATION BERTH
TYPICAL SECTION

Designed by: EH	Drawn by: CMI	Checked by: BA	Reviewed by: MT
Submitted by: JOSHUA SINGER MOFFATT & NICHOL	Date: 2021-03-12	M&N Project No. 10630	Rev. 1
Drawing Scale: Plot scale: 1:1 (D SHEET)	Drawing scale:		

moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7300

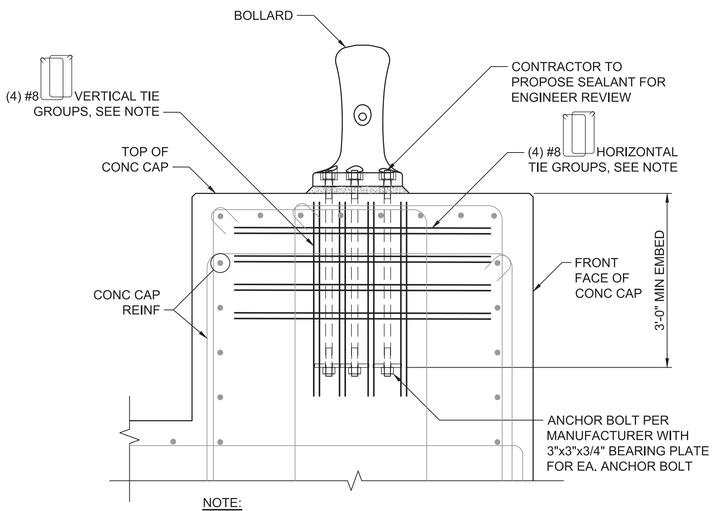
STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED PROFESSIONAL ENGINEER
Matthew Trowbridge

Sheet Reference No.
S-306
INDEX: 158 OF 232

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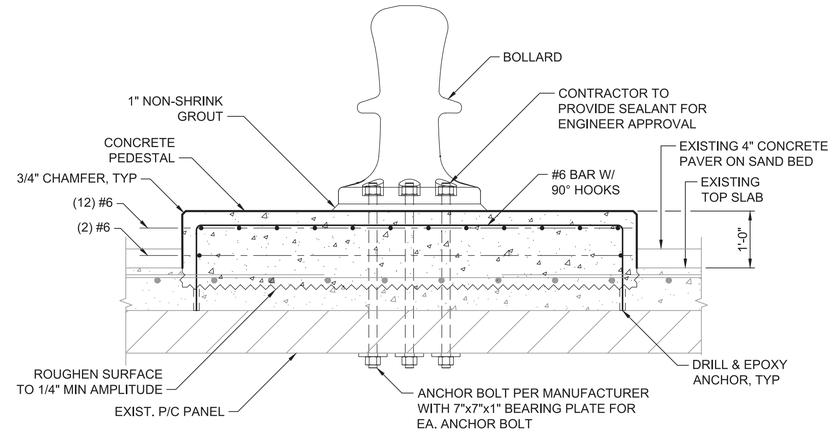
DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

C1 S-122 — 75 MT BOLLARD AT HEAVY LIFT AREA
SCALE: 3/4" = 1'-0"

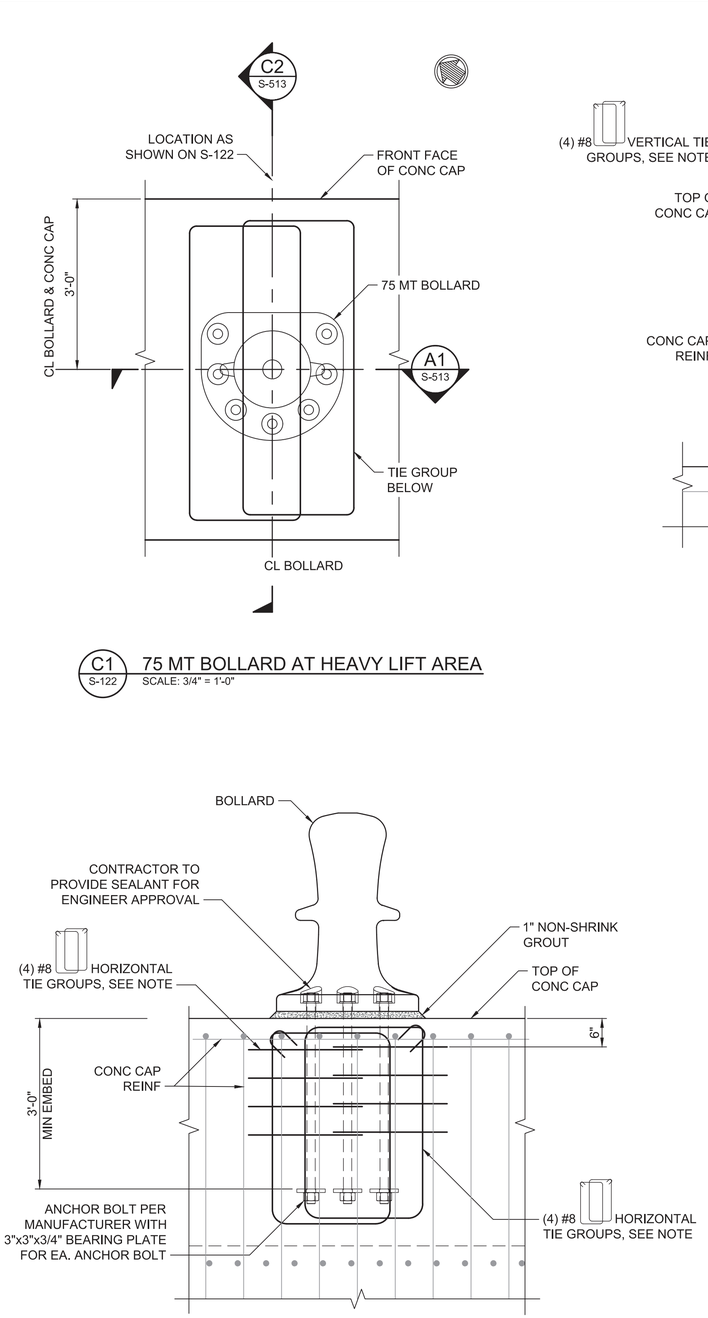


NOTE:
BOLLARD CONNECTION DETAIL IS RESPONSIBILITY OF CONTRACTOR. CONTRACTOR TO VERIFY THAT ANCHORAGE SIZE AND EMBEDMENT IS ADEQUATE. NOTE THAT SUPPLEMENTARY STEEL REINFORCEMENT MAY BE REQUIRED TO ADEQUATELY ANCHOR BOLLARD TO CONCRETE. CONTRACTOR TO SUBMIT SIGNED/SEALED CALCULATIONS AND SHOP DRAWINGS BY A CONNECTICUT REGISTERED PROFESSIONAL ENGINEER.

C2 S-513 — SECTION
SCALE: 3/4"=1'-0"

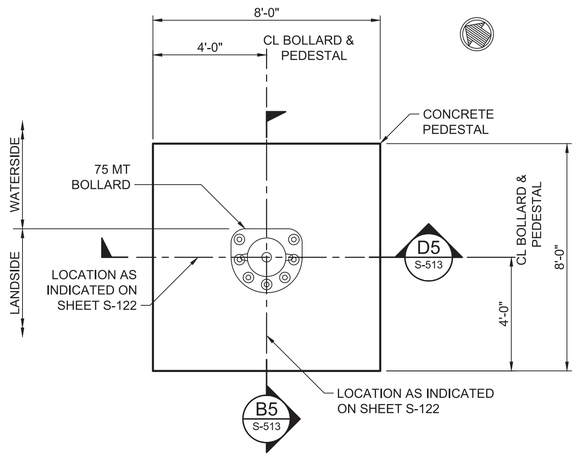


D5 S-513 — SECTION
SCALE: 1/2" = 1'-0"



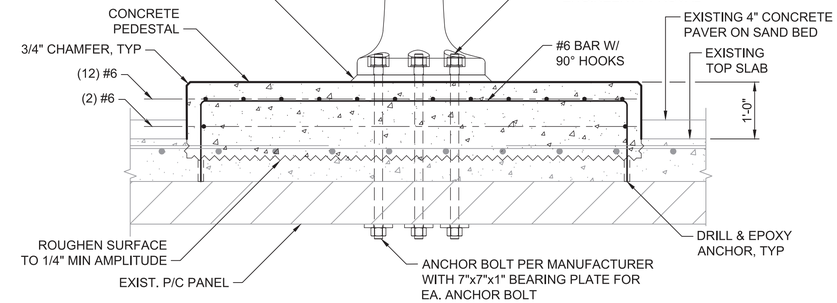
NOTE:
BOLLARD CONNECTION DETAIL IS RESPONSIBILITY OF CONTRACTOR. CONTRACTOR TO VERIFY THAT ANCHORAGE SIZE AND EMBEDMENT IS ADEQUATE. NOTE THAT SUPPLEMENTARY STEEL REINFORCEMENT MAY BE REQUIRED TO ADEQUATELY ANCHOR BOLLARD TO CONCRETE. CONTRACTOR TO SUBMIT SIGNED/SEALED CALCULATIONS AND SHOP DRAWINGS BY A CONNECTICUT REGISTERED PROFESSIONAL ENGINEER.

A1 S-513 — SECTION
SCALE: 3/4" = 1'-0"



NOTE:
DO NOT CUT OR DAMAGE (E) REBAR. CONTRACTOR TO SCAN PRIOR TO DRILLING THROUGH (E) CONDITION. NOTIFY SEOR IN CASE OF UNAVOIDABLE OBSTRUCTIONS.

A3 S-122 — 75 MT BOLLARD AT EXISTING STATE PIER
SCALE: 3/8" = 1'-0"



B5 S-513 — SECTION
SCALE: 1/2" = 1'-0"

2'-0" 0'-0" 2'-0" 4'-0"
SCALE: 1/2"=1'-0"

2'-0" 0'-0" 1'-0" 2'-0"
SCALE: 3/4"=1'-0"

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

Connecticut PORT AUTHORITY

Mark	Description	Date	Appr.

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

INSTALLATION BERTH
BOLLARD DETAILS

Rev.	0
Date:	2021-03-12
M&N Project No.	10630
Drawing code:	
Drawing Scale:	
Plot scale:	1:1 (0 SHEET)
Designed by:	EH
Drwn by:	CMI
Chkd by:	BA
Reviewed by:	MT
Submitted by:	JOSHUA SINGER MOFFATT & NICHOL

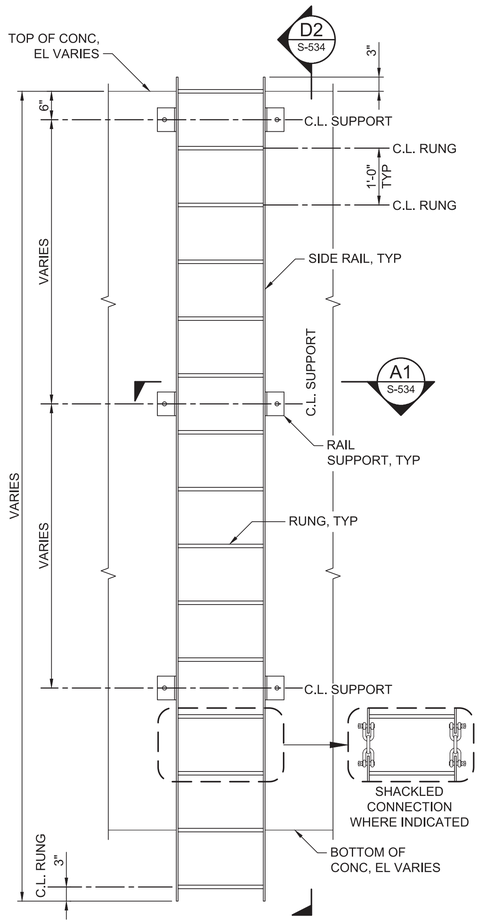
moffatt & nichol
180 WELLS AVENUE, SUITE 302
NEWTON, MA 02459
617-299-7330

STATE OF CONNECTICUT
MATTHEW TROWBRIDGE
34080
LICENSED
PROFESSIONAL ENGINEER

Sheet Reference No.
S-513
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File: Q:\BOS\Projects\10630 Detail Design State pier\500 CADD_Active_Design Set\02_Structural\10630S-513 - Plotted: 3/12/2021 11:08 PM by MOYA IGLESIAS, CRISTIAN - Saved: 3/5/2021 2:03 PM by BFORD

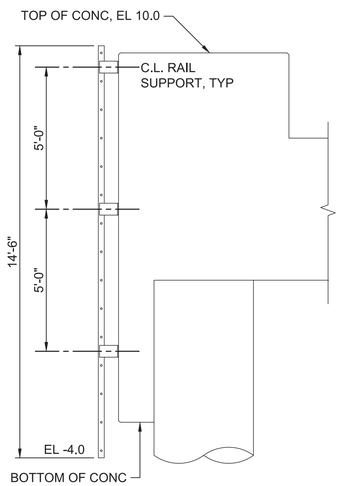
DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



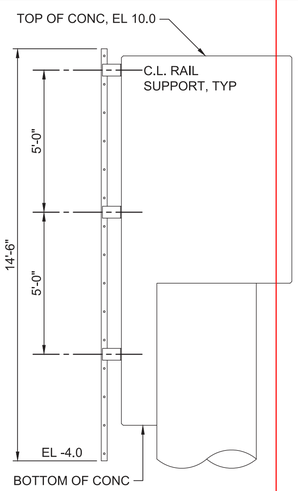
NOTES:

1. ALL LADDER COMPONENTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION AND DEBURRING.
2. ALL STEEL COMPONENTS SHALL BE ASTM GRADE A36 UON.
3. ANCHOR BOLTS INSTALLATION SHALL BE PER MANUFACTURER'S INSTRUCTIONS.
4. PAINT SHALL BE MARINE GRADE EPOXY PAINT.

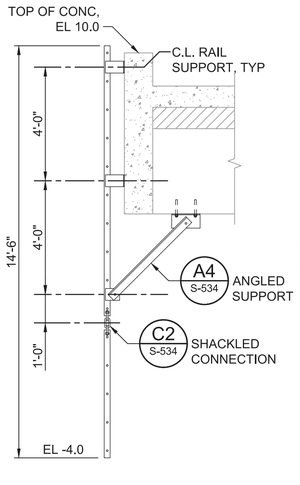
B1 / S-121 — SAFETY LADDER
S-122, S-123 — SCALE: 3/4"=1'-0"



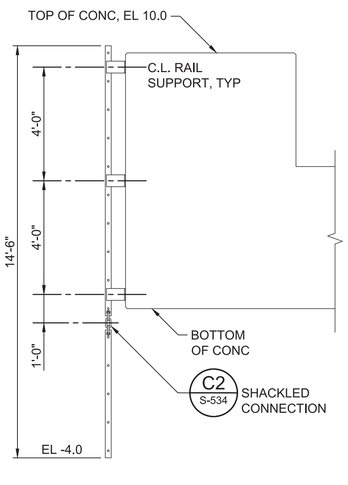
DELIVERY BERTH LADDER



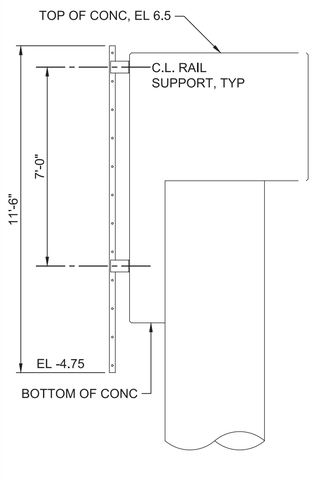
NORTHEAST ANNEX & SOUTH WALL LADDER



EXISTING INSTALLATION BERTH LADDER



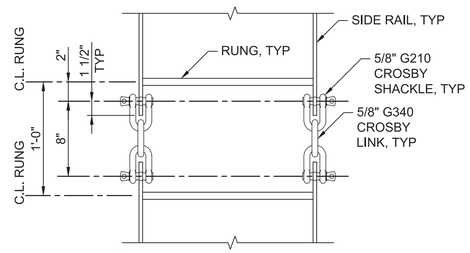
INSTALLATION BERTH LADDER



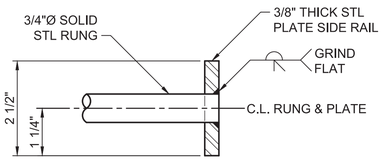
SOUTH WALL LADDER

NOTE:
DO NOT CUT OR DAMAGE EXISTING REBAR. CONTRACTOR TO SCAN PRIOR TO DRILLING THROUGH EXISTING CONDITION. NOTIFY ENGINEER IN CASE OF UNAVOIDABLE OBSTRUCTIONS.

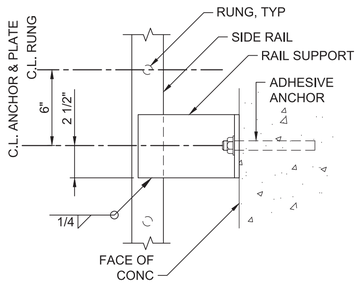
D2 / S-534 — SECTION
SCALE: 3/8"=1'-0"



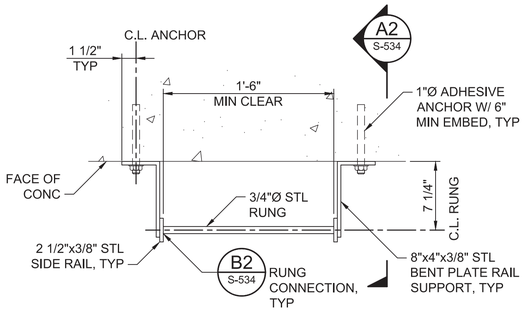
C2 / S-534 — SHACKLED CONNECTION
SCALE: 1 1/2"=1'-0"



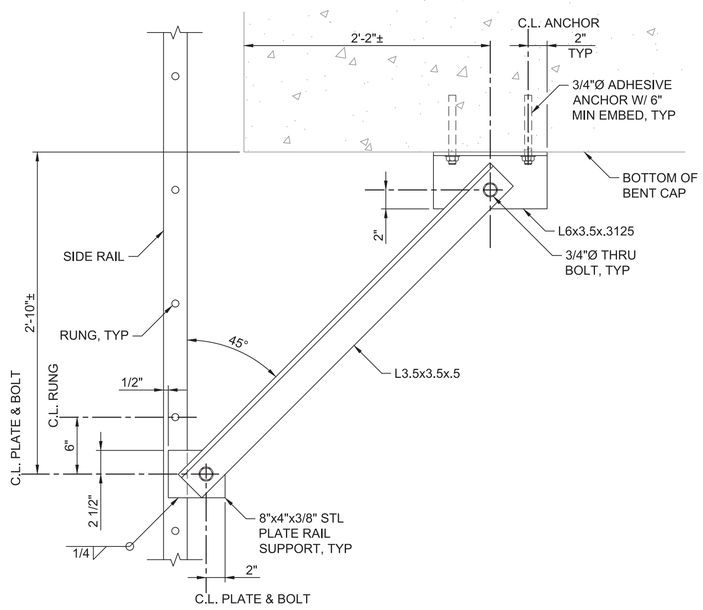
B2 / S-534 — RUNG CONNECTION
NOT TO SCALE



A2 / S-534 — SECTION
SCALE: 2"=1'-0"



A1 / S-534 — SECTION
SCALE: 1 1/2"=1'-0"



NOTE:
ANGLED CONNECTION REQUIRED ON BOTH SIDE RAILS.

A4 / S-534 — ANGLED SUPPORT
SCALE: 1 1/2"=1'-0"

4'-0" 0'-0" 2'-0" 4'-0"
SCALE: 3/8"=1'-0"

2'-0" 0'-0" 1'-0" 2'-0"
SCALE: 3/4"=1'-0"

1'-0" 0'-0" 6" 1'-0"
SCALE: 1 1/2"=1'-0"

6" 0' 6" 1'-0"
SCALE: 2"=1'-0"

CONFORMED SET
ISSUED: NOVEMBER 15, 2021

Connecticut Port Authority

Mark	Description	Date	Appr.

STATE PIER INFRASTRUCTURE IMPROVEMENTS
STATE PIER COMPLEX
NEW LONDON, CONNECTICUT

LADDER DETAILS

Designed by:	EH
Drawn by:	CMI
Checked by:	BA
Reviewed by:	MT
Submitted by:	JOSHUA SINGER MOFFATT & NICHOL
Date:	2021-03-12
M&N Project No.	10630
Drawing code:	
Drawing Scale:	
Plot scale:	1:1 (D SHEET)
Rev.	0

moffatt & nichol
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617-299-7330

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