

BWM DAY

CONFITARMA















BWTS - RETROFITTING EXPERIENCE

ROME, MAY 21ST 2019



FRATELLI d'AMICO
ARMATORI



SHIP'S NAME	FLAG	CLASS	TYPE	NEXT DRY DOCK DUE DATE	WBTS INSTALLATION DUE DATE	
					 USCG	 IMO
MARE ORIENS			AFRAMAX	18.09.2018	18.03.2021	18.09.2023
MARE NOSTRUM			AFRAMAX	26.02.2019	26.02.2019	26.02.2024
MARE TIRRENUM			AFRAMAX	04.03.2019	04.03.2019	04.03.2024
MARE DORICUM			SUEZMAX	07.10.2019	07.10.2019	07.10.2019
MAE PICENUM			SUEZMAX	31.01.2021	31.01.2021	31.01.2021
MARE SICULUM			SUEZMAX	31.03.2021	31.03.2021	31.03.2021





U. S. Department of Homeland Security
United States Coast Guard
Certificate of Approval

FILTRATION + UV



FILTRATION + ELECTROLYSIS



FILTRATION + CHEMICAL INJECTION



FRATELLI d'AMICO
ARMATORI



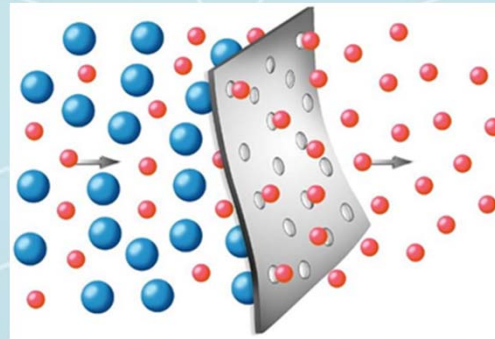
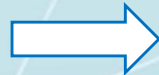
FILTRATION + UV VS FILTRATION + ELECTROLYSIS

BRIEF DESCRIPTION ON HOW THE SYTEM WORKS	<p>The system uses a two-step process of filtration and ultraviolet (UV) irradiation to sterilize organisms and stop their reproduction.</p> <p>UV systems are suitable for any vessel in theory, but primarily for those which do not take in too mud ballast water and have flow rates of up to around 1,000 cubic meters per hour. This includes ro-ro vessels, container ships, offshore supply vessels and ferries.</p>	<p>By passing an electric current through a small side-stream of seawater, they use the salt and the water molecules in a chemical reaction to generate sodium hypochlorite, a disinfectant, which is then reinjected into the ballast water to kill all organisms.</p> <p>Electrolytic treatment systems are more suited for larger vessels such as tankers and bulk carriers, which have large ballast water volumes and high flow rates in the range of up to 3,000 cubic meters per hour.</p>
ADVANTAGES	<p>UV systems are easy to install and retrofit, and have few safety concerns from a class point of view. They also operate independently, no matter what the water salinity and temperature are.</p>	<p>As well as being able to handle large capacities, electrolysis-based systems are very efficient and the treatment of the water is done on the intake only (possible neutralization on discharge). This means they provide on-board disinfection, and some systems even provide in-tank circulation treatment during the voyage, when treatment in the port is not feasible</p>
CHALLENGES	<p>The systems are dependent on the water transmittance (UV-T) and work less well in turbid water. The system becomes more sensitive to water turbidity and may require longer holding times to ensure mortality.</p> <p>Ballast waters need to go through the UV reactor both during the ballasting and the de-ballasting process.</p> <p>UV lamp life cycle is about 3000 hour.</p> <p>Furthermore UV lamps contain UV light which requires appropriate personal protective equipment. Lamps are fragile and in case of breakup, there is risk of exposure to mercury liquid or vapor; appropriates safety measures are required for the safety of workers.</p>	<p>The electrolytic reaction generates small amounts of hydrogen gas, a factor which needs to be accounted for in safety considerations. In addition, electrolytic systems are sensitive to low salinity and low temperatures. Finally, they are more complex to install, control and maintain compared to UV filter systems.</p>





➤ First Stage: Filtration



Less organisms means
less energy to eliminate
and be compliant

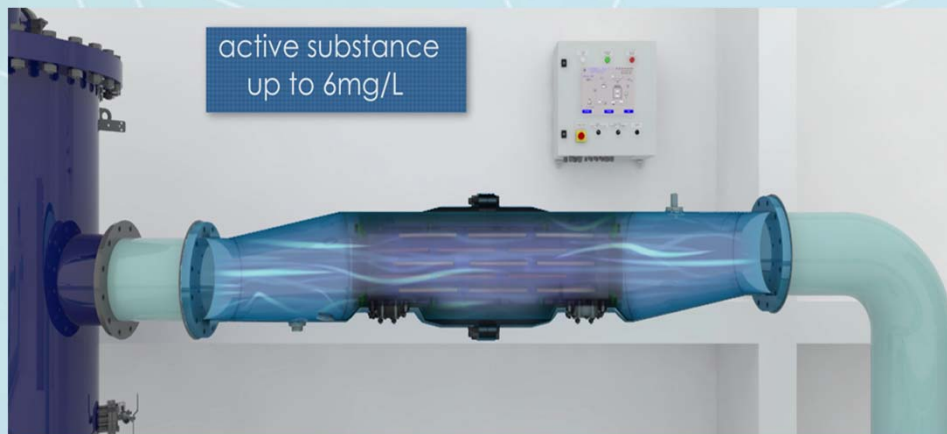


- ✓ Filtration removes any particle larger than 40µm
- ✓ 40µm screening was carefully selected so as to reduce the ecological load of the water and at the same time to guaranty minimum impact on the ballast system capacity

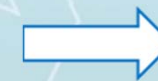


➤ Second Stage: Full Flow Electrolysis

➤ Filtered water is fed into the E/C



➤ Produced chlorine is diluted in the water (up to 6 mg/L) acting as disinfectant



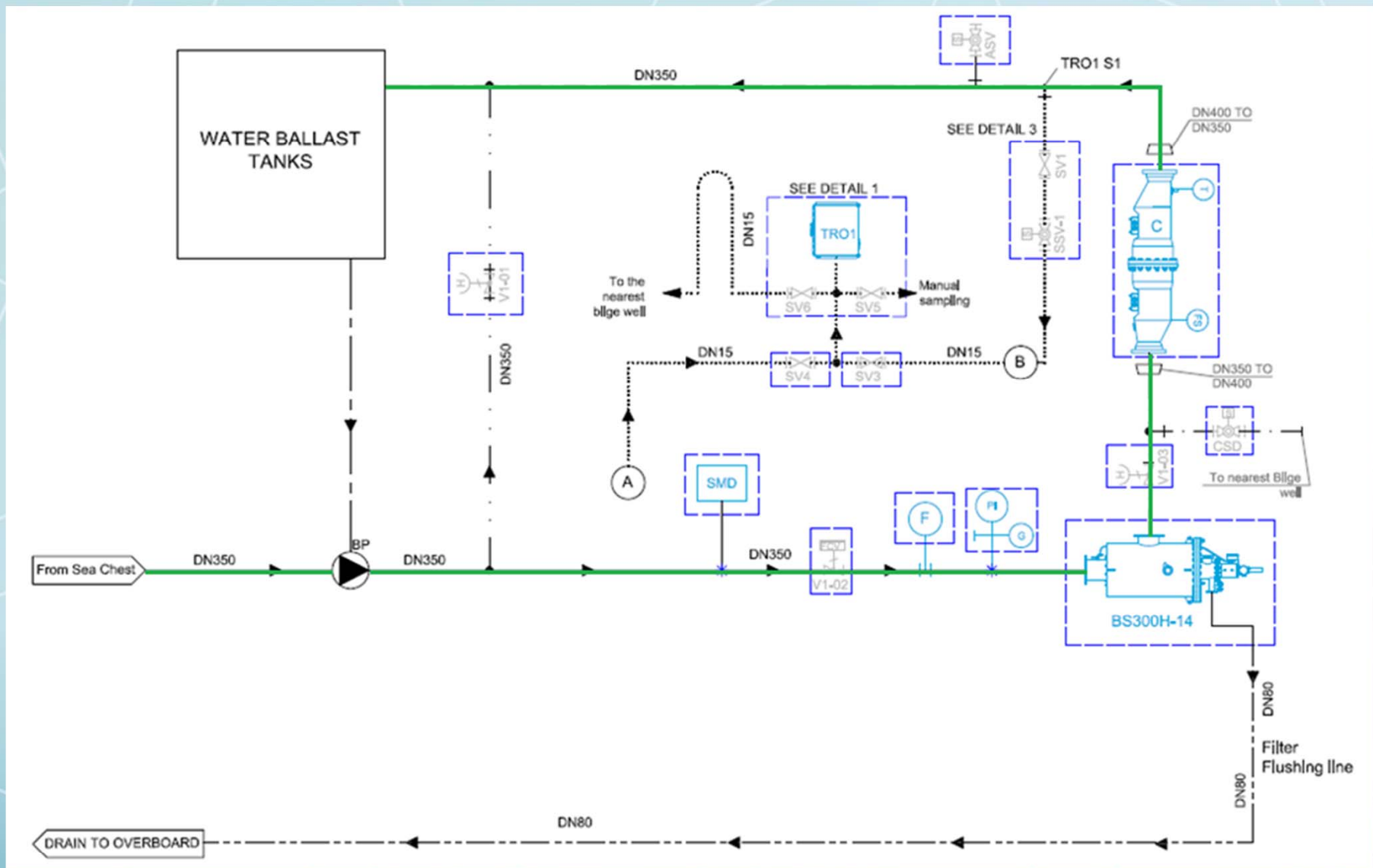
➤ An Electrochemical Cell produces sodium hypochlorite from seawater and DC current; the capacity is maximum 6 ppm for the specific flow (m^3/h) rating of the system.



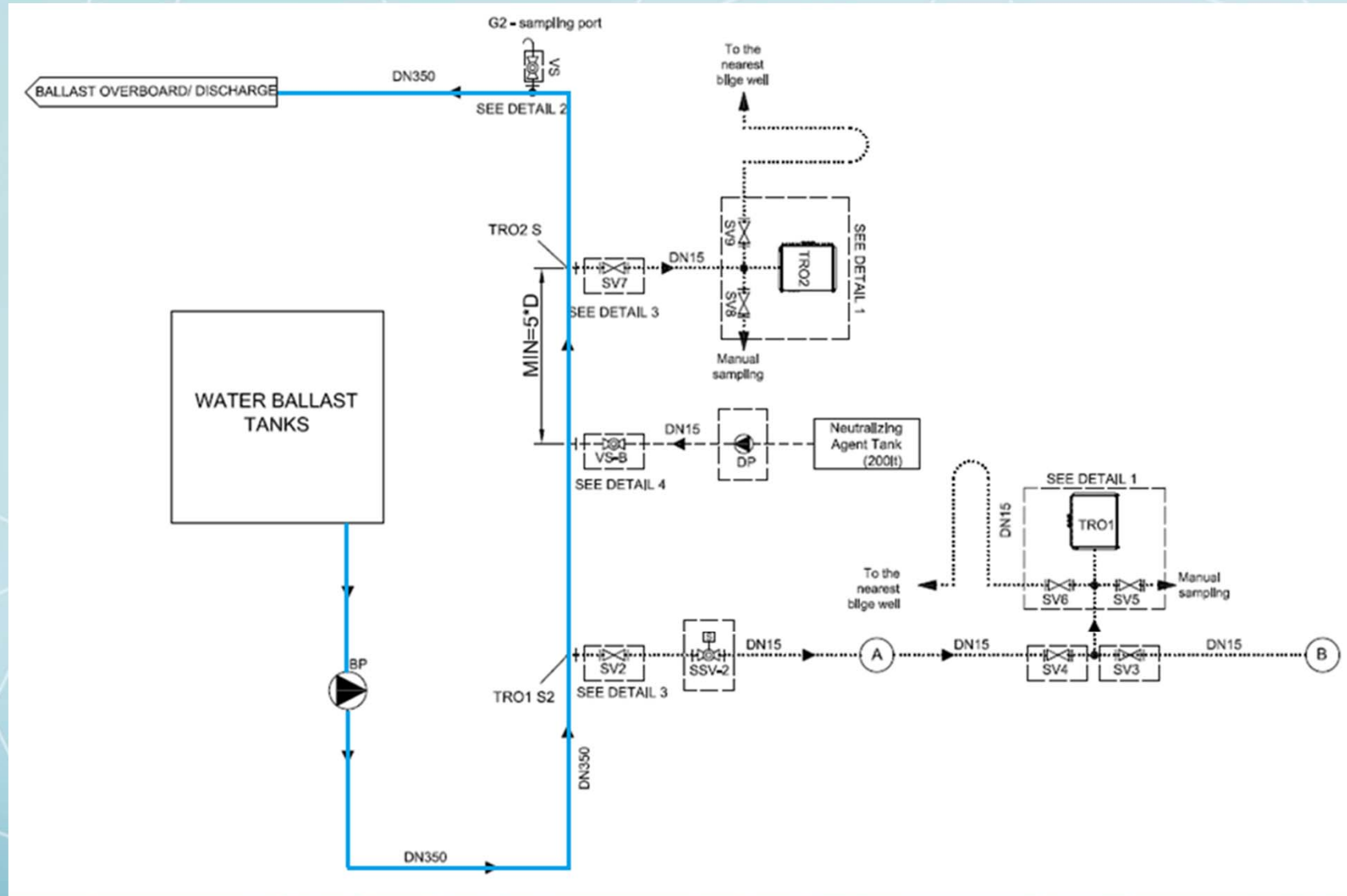
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➤ Ballasting



➤ Deballasting



➤ 1 Filter or 2 Filters ?

Ballast Pump Flow Rate: 2 x 1500 m³/h

1 x 3000 m³/h



VS

2 x 1500 m³/h



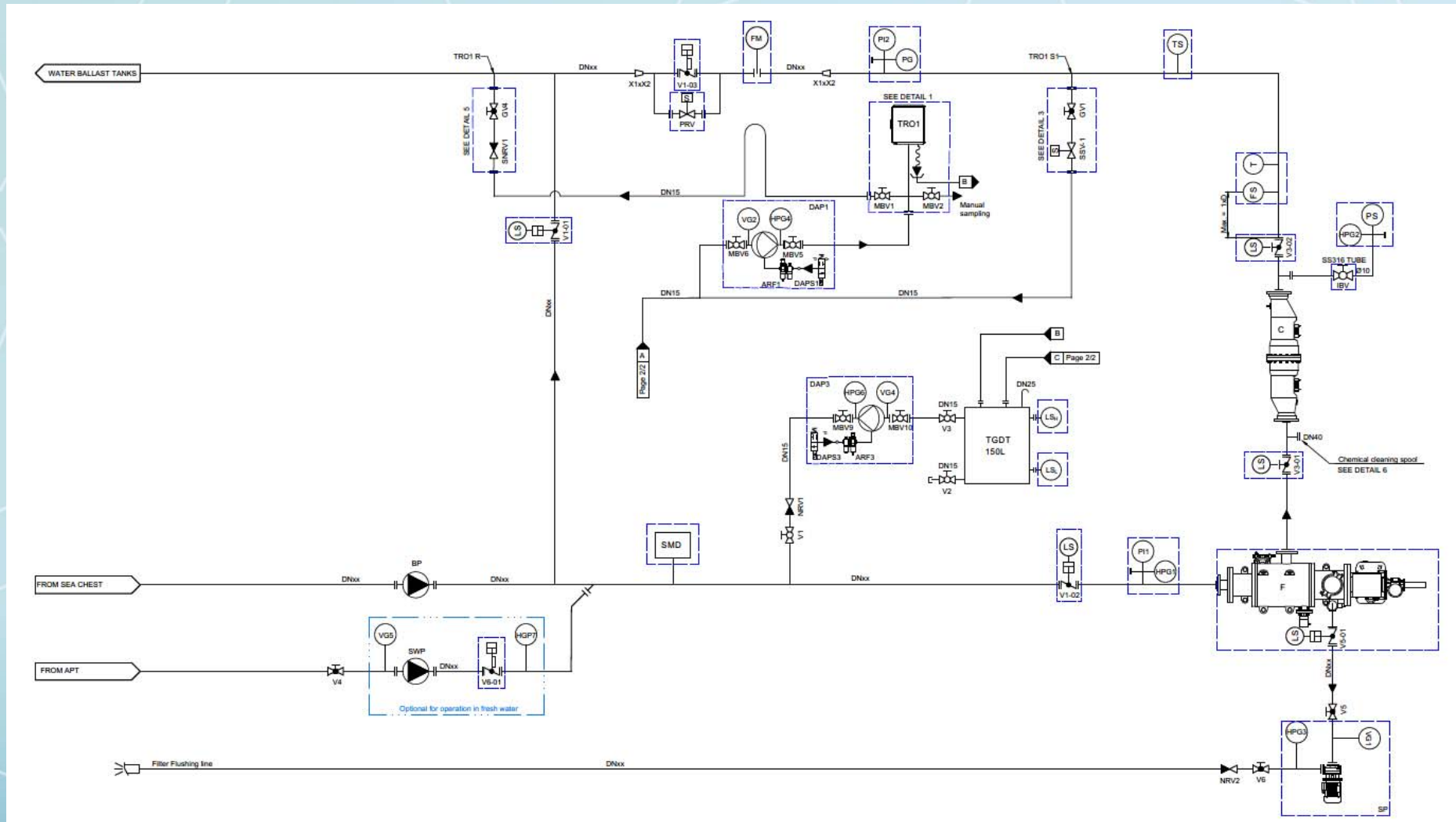
➤ Additional costs: 20-25 %



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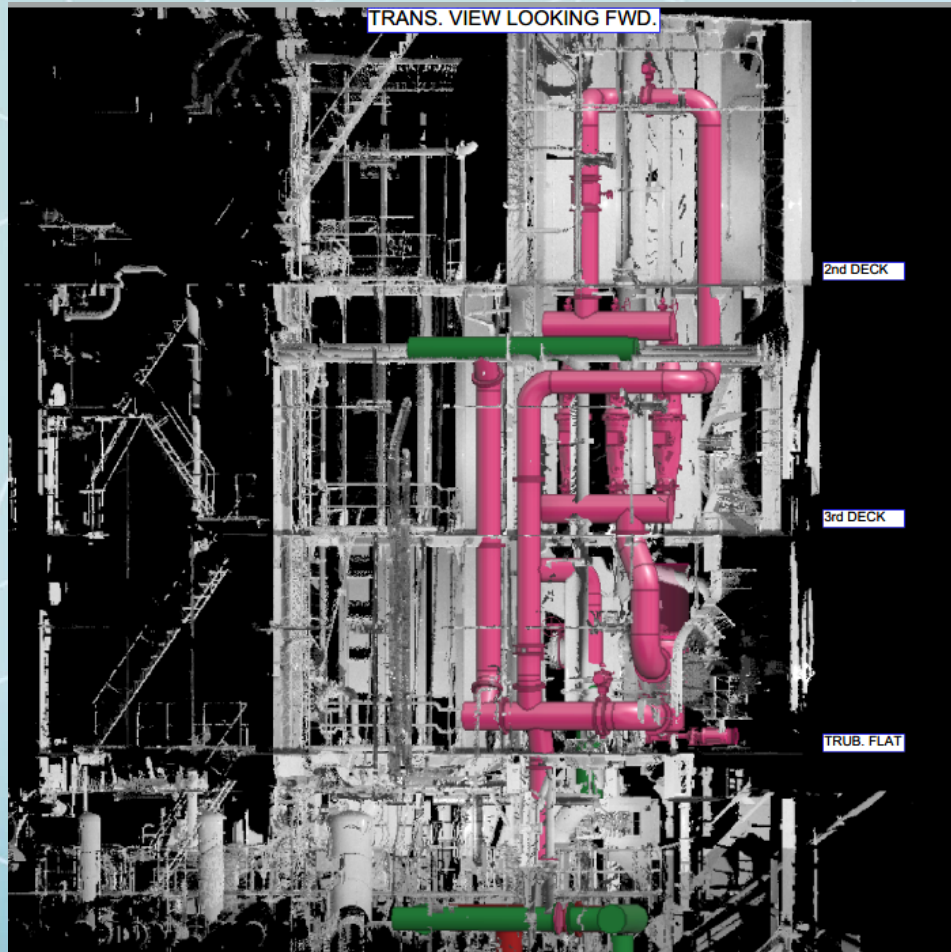
➤ WBTS in APT?



➤ Additional costs: abt 20 %



3D SCAN & FEASIBILITY STUDY



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ENGINEERING

- Principle design drawings;
- Class Approval confirmation;
- Production design drawings;
- Purchasing/Fabrication lists;
- Ballast Water Management Plan;
- Installation guidebook;
- Updated ship's drawings

DRAWING SYMBOLS

SPECIAL MARE/NOE MARK

SPECIAL NOTES:

- ALL DIMENSIONS FROM THE MARKING THE TO BE COINTEGRATED WITH THE DESIGN.
- NOTE DIMENSIONS TO MATCH UP FOR INTERFERENCE.
- FOR SPECIAL CONSTRUCTION, TO BE MARKED ACCORDING TO THE PLAN.
- ALL PARTS TO BE VERIFIED AT THE WORK SITE.
- FOR SPECIAL CONSTRUCTION, TO BE MARKED ACCORDING TO THE PLAN.
- ALL DIMENSIONS TO BE VERIFIED AT THE WORK SITE.
- FOR SPECIAL CONSTRUCTION, TO BE MARKED ACCORDING TO THE PLAN.
- ALL DIMENSIONS TO BE VERIFIED AT THE WORK SITE.

NOTES:

- ALL DIMENSIONS ARE IN MM UNLESS SPECIFIED OTHERWISE.
- EXCEPT AS NOTED ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.
- ALL DIMENSIONS TO BE VERIFIED ON THE WORK SITE.
- FOR SPECIAL CONSTRUCTION, TO BE MARKED ACCORDING TO THE PLAN.
- ALL DIMENSIONS TO BE VERIFIED AT THE WORK SITE.
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- FOR SPECIAL CONSTRUCTION, TO BE MARKED ACCORDING TO THE PLAN.
- ALL DIMENSIONS TO BE VERIFIED AT THE WORK SITE.

BILL OF MATERIAL

ITEM NO.	DESCRIPTION	SIZE & QUANTITY	MATERIAL	STANDARD	QUANTITY
1	PIPE	DN 100 X 4	ST 304	ASME	100
2	FLANGE	DN 100	ST 304	ASME	10
3	WELDED GASKET	DN 100	316	ASME	10
4	PIPE	DN 80 X 4	ST 304	ASME	80
5	FLANGE	DN 80	ST 304	ASME	8
6	WELDED GASKET	DN 80	316	ASME	8
7	PIPE	DN 60 X 4	ST 304	ASME	60
8	FLANGE	DN 60	ST 304	ASME	6
9	WELDED GASKET	DN 60	316	ASME	6
10	PIPE	DN 40 X 4	ST 304	ASME	40
11	FLANGE	DN 40	ST 304	ASME	4
12	WELDED GASKET	DN 40	316	ASME	4
13	PIPE	DN 20 X 4	ST 304	ASME	20
14	FLANGE	DN 20	ST 304	ASME	2
15	WELDED GASKET	DN 20	316	ASME	2
16	PIPE	DN 15 X 4	ST 304	ASME	15
17	FLANGE	DN 15	ST 304	ASME	1
18	WELDED GASKET	DN 15	316	ASME	1
19	PIPE	DN 10 X 4	ST 304	ASME	10
20	FLANGE	DN 10	ST 304	ASME	1
21	WELDED GASKET	DN 10	316	ASME	1
22	PIPE	DN 8 X 4	ST 304	ASME	8
23	FLANGE	DN 8	ST 304	ASME	1
24	WELDED GASKET	DN 8	316	ASME	1
25	PIPE	DN 6 X 4	ST 304	ASME	6
26	FLANGE	DN 6	ST 304	ASME	1
27	WELDED GASKET	DN 6	316	ASME	1
28	PIPE	DN 4 X 4	ST 304	ASME	4
29	FLANGE	DN 4	ST 304	ASME	1
30	WELDED GASKET	DN 4	316	ASME	1

ISO-METRIC DRAWING FOR BALLAST LINE

BWTS-001

MODEL NAME: MARE NOSTRUM DATE: 2003.03.19 DWS No: 10N1110/0001

DRAWN BY: J.A. JOB No: 10N1110 SHEET: 01 OF 08

CHECKED BY: J.A. SCALE: 1:50 REV: A SIZE: A3

KEY PLAN
PARTIAL 3RD DECK PLAN

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MM UNLESS SPECIFIED OTHERWISE.
- DIMENSIONS SHOWN DO NOT INCLUDE ALLOWANCE FOR GREEN.
- ALL MATERIAL USED TO BE RINA GRADE A OR EQUIVALENT.
- ALL WELDINGS TO BE TO SURVEYOR'S SATISFACTION.
- CONTINUOUS
- INTERCOSTAL
- MARKED DIMENSIONS ARE TO BE VERIFIED AT SITE.

REFERENCE DWG.

- CS18 75/76/77/78-210022 -4 2ND DECK
- CS18 75/76/77/78-210022 -14 FRAME '39
- CS18 75/76/77/78-210022 -5 3RD DECK

LEGEND

- EXISTING STRUCTURE
- NEW STRUCTURE
- EQUIPMENT

EQUIPMENT DATA

ELECTROLYTIC CELL WEIGHT DURING OPERATION : 1.000 T

PRINCIPAL PARTICULARS

- LENGTH (O.A.) : 245.50 m
- LENGTH (B.P.) : 234.00 m
- BREADTH (MLD.) : 42.00 m
- DEPTH (MLD.) : 21.50 m
- DRAUGHT (EXTREME) : 14.98 m

MARE NOSTRUM

NO.	DATE	INITIAL	ISSUE	NO.	DO
45361	04.03.19		INITIAL		DD
45361	04.03.19		DESCRIPTION		REVISD BY
45361	04.03.19		REVISIONS		

TITLE: ELECTROLYTIC CELL FOUNDATION

ARIES MARINE & ENGG. SERVICES
 P.O. BOX 24496, TOWER 400
 20^F FLOOR, MIRA ROAD, SHARJAH, U.A.E.
 Tel: +971(0)9 550 3300, Fax: +971(0)9 550 3100
 Website: www.ariesmar.com, Email: design@ariesgroup.ae

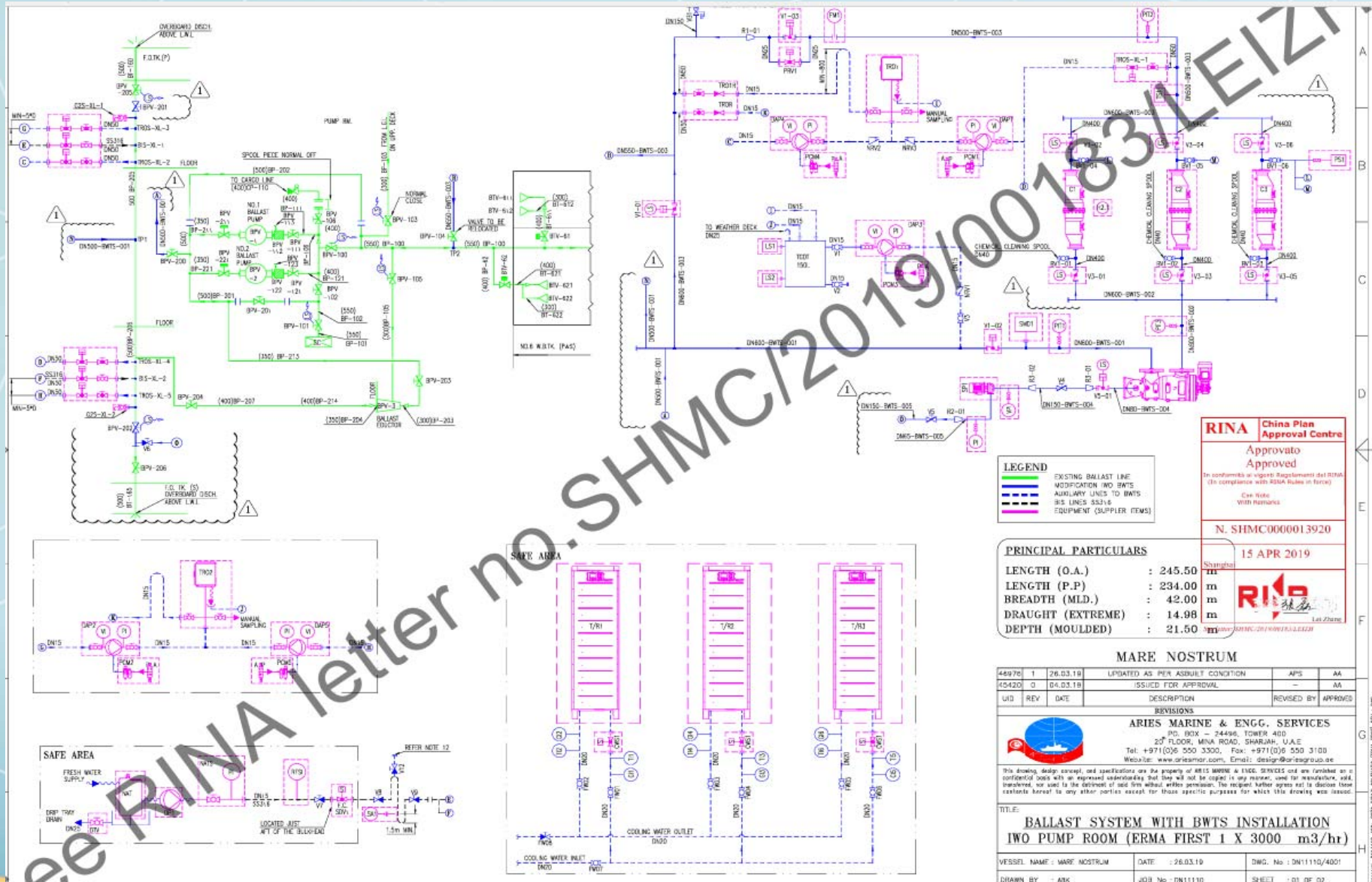
VESSEL NAME: MARE NOSTRUM **DATE:** 04.03.19 **DWG. No.:** 0N1110/0001

DRAWN BY: AC **JOB No.:** 0N1110 **SHEET:** 01 OF 01

CHECKED BY: SSS **SCALE:** 1:50 **REV:** 0 **SIZE:** A3

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RINA China Plan Approval Centre
 Approvato
 Approved
 In conformità ai vigenti Regolamenti del RINA
 (In compliance with RINA Rules in force)
 Via Cava
 Viterbo (RM)

N. SHMC0000013920

15 APR 2019

RINA
 RINA
 RINA

LEGEND

- EXISTING BALLAST LINE
- MODIFICATION IWO BWTS
- AUXILIARY LINES TO BWTS
- S/S LINES S5316
- EQUIPMENT (SUPPLIER ITEMS)

PRINCIPAL PARTICULARS

LENGTH (O.A.)	: 245.50
LENGTH (P.P.)	: 234.00
BREADTH (M.L.D.)	: 42.00
DRAUGHT (EXTREME)	: 14.98
DEPTH (MOULDED)	: 21.50

MARE NOSTRUM

44976	1	26.03.19	UPDATED AS PER ASBUILT CONDITION	APS	AM
45420	0	04.03.19	ISSUED FOR APPROVAL		AM
UID	REV	DATE	DESCRIPTION	REVISED BY	APPROVED

REVISIONS

ARIES MARINE & ENGG. SERVICES
 P.O. BOX - 24486, TOWER 400
 20th FLOOR, MINA ROAD, SHARJAH, U.A.E
 Tel: +971 (0)6 550 3300, Fax: +971 (0)6 550 3100
 Website: www.ariesmar.com, Email: design@ariesgroup.ae

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TITLE:
 BALLAST SYSTEM WITH BWTS INSTALLATION
 IWO PUMP ROOM (ERMA FIRST 1 X 3000 m3/hr)

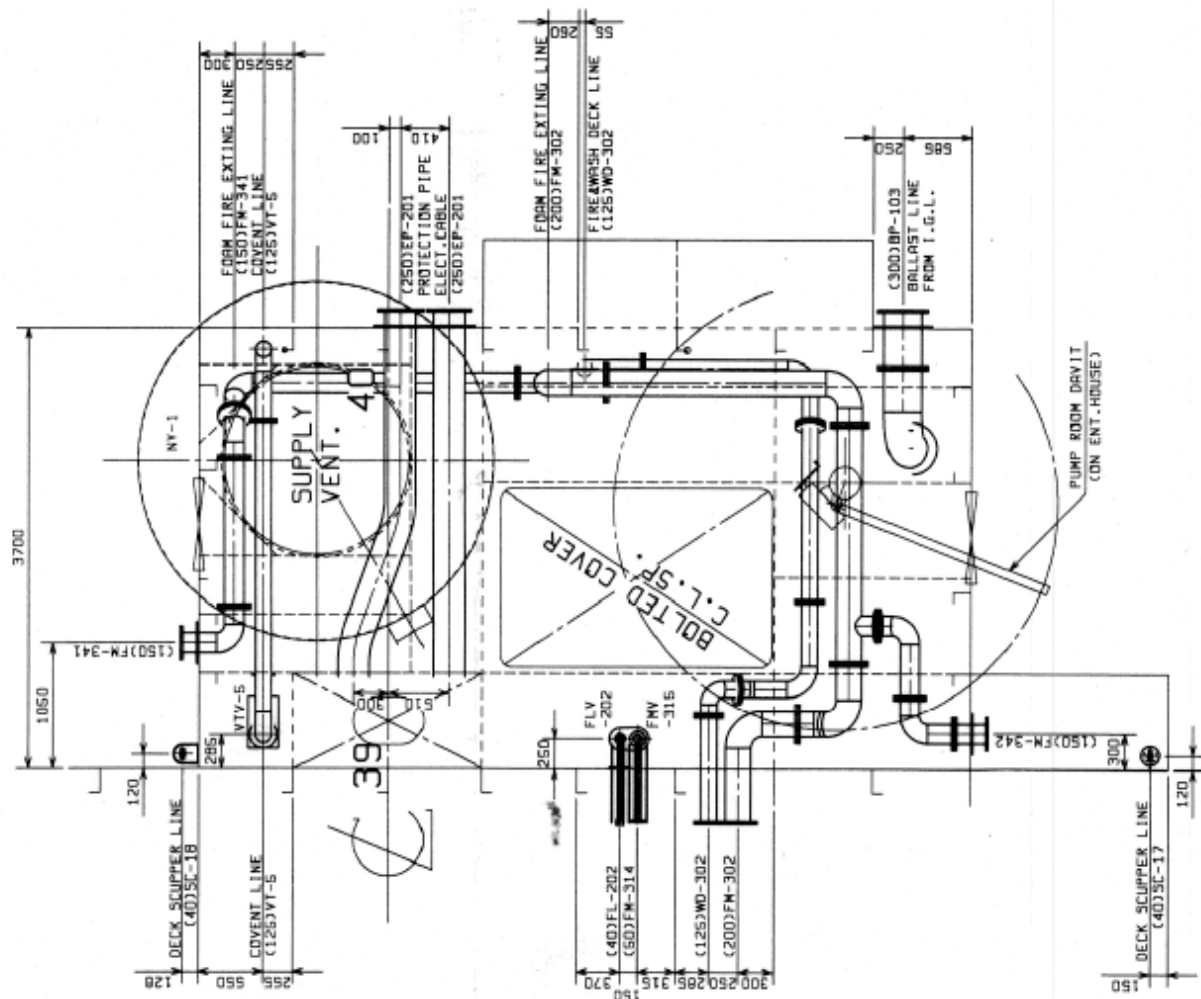
VESSEL NAME	MARE NOSTRUM	DATE	26.03.19	DWG. No.	DN11110/4001
DRAWN BY	ARK	JOB No.	DN11110	SHEET	01 OF 02



FRATELLI d'AMICO
 ARMATORI



ENT.HOUSE TOP UNDER PLAN (25250 ABOVE B.L.)



PUMP ROOM



FRATELLI d'AMICO
ARMATORI



PUMP ROOM - TURBINE FLAT PLAN

FILTER - automatic backwashing filter with nominal filtration capacity down 40µm.



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PUMP ROOM - 3RD DECK PLAN

ELECTROLYTIC CELLS



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ENGINE ROOM

Transformer/ Rectifier (T/R) Unit

It's the direct current power supply of the electrolyzers. The device transforms alternating current to low voltage direct current and is controllable via communication interface.



T/R Configuration	Three (3) T/R units of ten (10) power modules each
Max. Voltage (V)	0-50
Max. Current (Amperes)	2000
Cooling water supply per T/R unit (m ³ /h)	1.5
Cooling media	Fresh Water, temperature range: 20-45°C Max. water raise 10°C, 1-5 bar



ITALIAN COAST GUARD TYPE APPROVAL CERTIFICATE BWMS

4570-00000 35300707202000
IDENTIFICATIVO: 01181135022944

0 1 18 113502 294 4



Ministero delle Infrastrutture e dei Trasporti
Ministry of Infrastructure and Transport

Comando generale del Corpo delle Capitanerie di porto
Italian Coast Guard Headquarters

CERTIFICATO DI APPROVAZIONE DEL PROTOTIPO DEL SISTEMA DI CONTROLLO, TRATTAMENTO E GESTIONE DELL'ACQUA DI ZAVORRA
TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

Si certifica che il sistema di controllo e gestione dell'acqua di zavorra descritto di seguito è stato esaminato e provato in accordo ai requisiti delle specifiche contenute nelle Linee guida di cui alla Risoluzione MEPC.174(58). Il presente certificato ha validità solo per il sistema di controllo e gestione dell'acqua di zavorra sotto riferito.
This is to certify that the ballast water management system listed below has been examined and tested in accordance with the requirements of the specifications contained in the Guidelines of IMO Resolution MEPC.174(58). This certificate is valid only for the Ballast Water Management System referred to below.

Nome del sistema di controllo e gestione dell'acqua di zavorra:
Name of Ballast Water Management System:
ERMA FIRST BWTS

Costruttore del sistema di controllo e gestione dell'acqua di zavorra:
Ballast Water Management System manufactured by:
ERMA FIRST ESK Engineering Solution S.A.
Schisto Industrial Park (VIPAS),
Block 13, Keratsiniou-Skaramagas Ave., 188 63
Perama, Greece


Designazione del/dei tipo(i) e modello(i) e incorporanti:
Designation of type and model designation(s) and incorporating:
ERMA FIRST BWTS
Models: **BWTS 50-3000 (Cyclone version) and BWTS FIT 75-3000 (Filter version)**

Apparecchiature/componenti/disegni di viste d'insieme n.:
Equipment/components/drawings No.:
- ERMA FIRST BWTS 50-3000: 1-801-G-00 Drawings;
- ERMA FIRST BWTS FIT 75-3000: 2-801-G-00 Drawings.

Il titolo e la data di ciascun disegno sono riportati in Appendice 4 al Certificato di Tipo Approvato rilasciato dall'Amministrazione greca.
The title and the date of each drawing have been recorded in the Appendix 4 of the Type Approval Certificate issued by the Administration of Greece.

Capacità nominale di trattamento – TRC (m³/h):
Treatment Rated Capacity – TRC (m³/h):
- ERMA FIRST BWTS 50-3000: 50-3000 m³/h;
- ERMA FIRST BWTS FIT 75-3000: 90-3740 m³/h.

Pagina/Page 1 di/of 2



– Pressione massima di esercizio del sistema: 5 bar
Maximum System Working Pressure: 5 bar.

Copia del presente certificato di Tipo Approvato deve essere sempre mantenuta a bordo di ogni nave dotata del sistema di controllo e gestione dell'acqua di zavorra descritto.
A copy of this Type Approval Certificate shall be carried on board of each ship fitted with this Ballast Water Management System at all times.

La documentazione relativa al riferimento al protocollo di prova ed una copia dei risultati dei test di prova devono essere disponibili a bordo ai fini ispettivi.
Documentation related to the test protocol and copy of the test results shall be available for inspection on board the ship.

Il presente Certificato di Tipo Approvato è rilasciato sulla base dell'approvazione originariamente rilasciata dalla Repubblica di Grecia – Ministero degli affari marittimi e delle politiche insulari, Comando generale della Guardia costiera (riferimento: Certificato n. 2323.6-5/01/18 del 19/10/2018).
This Type Approval Certificate is issued based on approval by Hellenic Republic – Ministry of Maritime Affairs and Insular Policy, Hellenic Coast Guard Headquarters (reference: Certificate no. 2323.6-5/01/19 dated 19 October 2018).

Limitazioni imposte alle condizioni operative:
Limiting conditions imposed:

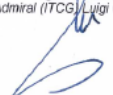
	BWTS 50-3000 (Cyclone version) BWTS FIT 75-3000 (Filter version)
Condizioni di salinità minima dell'acqua <i>Minimum water salinity condition</i>	Non applicabile <i>Not applicable</i>
Temperatura minima dell'acqua nel reattore <i>Minimum water temperature in the reactor</i>	Da -2° C a 55° C <i>From -2 deg C to 55 deg C</i>
Conduttività/salinità minima nel reattore <i>Minimum conductivity/salinity in reactor</i>	> 1050µS/cm (0.9 psu a 3° C o 1.07 psu a -2° C) <i>(0.9 psu at 3 deg C or 1.07 psu at -2 deg C)</i>

Altre restrizioni imposte:
Other restrictions imposed including the following:

L'apparecchiatura è stata progettata per funzionare alle condizioni indicate nel sopra menzionato Certificato di Tipo Approvato rilasciato dall'Amministrazione greca, che deve essere considerato parte integrante del presente Certificato e, comunque, secondo le specifiche tecniche indicate nel manuale del costruttore.
The equipment has been designed to operate according to the conditions contained in the abovementioned Type Approval Certificate, issued by the Administration of Greece and which has to be considered an integral part of the present Certificate and, in any case, pursuant to the technical requirements included in the manufacturer's manual.

Rilasciato il 15/04/2019
Issued on 15/04/2019

IL CAPO REPARTO SICUREZZA DELLA NAVIGAZIONE
Contrammiraglio (CP) Luigi GIARDINO
The Head of Navigation Safety Department
Rear Admiral (ITCG) Luigi GIARDINO



Allegato: copia dei risultati delle prove originali.
Attachment: copy of the original test results.

Pagina/Page 2 di/of 2



INTERNATIONAL BW MANAGEMENT DOCUMENT OF COMPLIANCE

DICHIARAZIONE DI CONFORMITÀ PER LA GESTIONE E CONTROLLO DEI SEDIMENTI DELLE ACQUE DI ZAVORRA DELLE NAVI

INTERNATIONAL BALLAST WATER
MANAGEMENT DOCUMENT OF COMPLIANCE
No. 84200-V062-015



rilasciato in ottemperanza alle disposizioni della
Convenzione Internazionale sulla Gestione e Controllo dei
Sedimenti e delle Acque di Zavorra delle Navi
issued under the provisions of the
International Convention for the Control and Management of
Ship Ballast Water and Sediments

RINA No. 84200

per incarico del Governo delle
under the authority of the Government of

REPUBBLICA ITALIANA
REPUBLIC OF ITALY

da
by

RINA SERVICES S.p.A.

Nome della nave Name of ship	Nominativo internazionale Distinctive number or letters	Porto d'immatricolazione Port of registry	Stazza lorda Gross tonnage
MARE NOSTRUM	ICDV	(Reg. Int.) NAPOLI	59611

Capacità d'Acqua di Zavorra (in metri cubi) Ballast Water Capacity (in cubic meters)	Data di Costruzione Date of Construction	Numero IMO ¹ IMO Number ¹
41655.9	26 February 2009	9346885

Dettagli dei Metodi di Trattamento dell'Acqua di Zavorra utilizzati
Details of Ballast Water Management Methods Used

- Metodo
Method
- Data di
Date test
- Nome S
Name of

Il principale Me
The principal Method

- in
in
- in
in
- in
in conformità alle disposizioni della Regola D-4
in accordance with regulation D-4

SI DICHIARA:
THIS IS TO CERTIFY:

- Che la nave è stata verificata in conformità alla Regola E-1 dell'Annesso della Convenzione e.
That the ship has been surveyed in accordance with regulation E-1 of the Annex to the Convention; and
- Che la visita ha dimostrato che il Trattamento dell'Acqua di Zavorra sulla nave è conforme all'Annesso della Convenzione.
That the survey shows that Ballast Water Management on the ship complies with the Annex to the Convention.

¹ In accordo con lo Schema del Numero Identificativo IMO della Nave, adottato dall'Organizzazione tramite la risoluzione A.600(15)
in accordance with the IMO Identification Number Scheme, adopted by the Organization by resolution A.600(15)

IMO No. 9346885 Nome della nave MARE NOSTRUM
Name of ship

Certificato N. 84200-V062-015 Pagina 2 / 5
Certificate No. Page

Il presente certificato è valido fino al: 26 February 2024
This Certificate is valid until:

a condizione che la nave venga sottoposta alle visite prescritte dalla Regola E-1 dell'Annesso della Convenzione.
subject to surveys in accordance with regulation E-1 of the Annex to the Convention.

Data di completamento della visita sulla quale si basa il presente
Documento di Conformità
Completion date of the survey on which this certificate is based:

27 March 2019

Rilasciato a: SHANGHAI
Issued at:

il: 24 April 2019
on:



Cao Zhiteng
RINA SERVICES S.p.A.

NOTE / NOTES

Quando la Nave approda in un porto USA il Gavone di poppa deve rimanere vuoto o zavorrato solo con acqua dolce
When Vessel calls USA ports APT must be empty or filled only with fresh water.



POWER CONSUMPTION

The POWER CONSUMPTION, for System with both Ballast Pumps in use is about **450 kW**, therefore one Auxiliary Engine is necessary only for the WBTS.

Considering that the ballasting operation will be carried out during discharge operation, the Total Power Consumption required is about **1745 kW**, three Diesel Generators (running at 580 kW each) must be kept running at the same time.

Another consideration must be done with regard to the LT Cooling FW System.

All Transformer/Rectifier Units are cooled by LT CFW System as well as the additional Diesel Generator kept running for the WBTS.

In order to avoid any problem during the discharge operation, it would be useful to increase the cooler's capacity of about 15%.



CONCLUSIONS

It is recommended to:

- 1. Choose the system 10-8 months before the installation date;**
- 2. Verify that the System is approved by one's own Flag;**
- 3. Add in the contract penalty in case of delay in the delivery of the System;**
- 4. Ask to the maker a detailed list of the items of which the system is made of, underlining which ones will be supplied by them and which ones won't;**
- 5. Check that the engineering study covers the whole project;**
- 6. Use a service engineer during the installation of the WBTS.**

