RUSSIAN MARITIME REGISTER OF SHIPPING

CIRCULAR LETTER **No. 311-05-1959c** dated 19.07.2023

Re:

amendments to the Rules for the Classification and Construction of Sea-Going Ships, 2023, ND No. 2-020101-174-E

Item(s) of supervision:

ships under construction

Entry-into-force date:
01.08.2023

~~Cancels / amends / adds Circular Letter No.~~ ~~dated~~

Number of pages: 1 + 34

Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to Part VIII "Systems and Piping"

Director General Sergey A. Kulikov

Text of CL:

We hereby inform that the Rules for the Classification and Construction of Sea-Going Ships shall be amended as specified in the Appendices to the Circular Letter.

It is necessary to do the following:

1. Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and persons in the area of the RS Branch Offices' activity.
2. Apply the provisions of the Circular Letter during review and approval of the technical documentation on ships contracted for construction or conversion on or after 01.08.2023, in the absence of a contract, during review and approval of the technical documentation on ships requested for review on or after 01.08.2023.

List of the amended and/or introduced paras/chapters/sections:

Part VIII: paras 8.7.1.1, 8.7.2, 8.7.6, Appendices 1, 1.1 and 1.2

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"Thesis" System No. 23-65167

Appendix 1 to Circular Letter
No. 311-05-1959c dated 19.07.2023

Information on amendments introduced by the Circular Letter
(for inclusion in the Revision History to the RS Publication)

Nos.	Amended paras/chapters/ sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
1	Part VIII, para 8.7.1.1	Reference has been specified regarding categorization of BWMS technologies	311-05-1959c of 19.07.2023	01.08.2023
2	Part VIII, para 8.7.2	Reference has been specified regarding categorization of BWMS technologies	311-05-1959c of 19.07.2023	01.08.2023
3	Part VIII, para 8.7.6	Reference has been specified regarding the placement of the BWMS on board the ship and the routing of pipelines	311-05-1959c of 19.07.2023	01.08.2023
4	Part VIII, new Appendices 1, 1.1 and 1.2	New Appendices 1, 1.1 and 1.2 have been introduced containing requirements for BWMS in compliance with IACS Unified Requirement (UR) M74 (Rev.2 June 2021)	311-05-1959c of 19.07.2023	01.08.2023

Appendix 2 to Circular Letter
No. 311-05-1959c dated 19.07.2023

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF SEA-GOING SHIPS, 2023,

ND No. 2-020101-174-E

PART VIII. SYSTEMS AND PIPING

8.7 BALLAST WATER TREATMENT SYSTEMS

1 **Para 8.7.1.1** is replaced by the following text:

"**.1** Ballast Water Management System (BWMS) means any system which processes ballast water such that it meets or exceeds the Ballast Water Performance Standard in Regulation D-2 of the BWM Convention. The BWMS includes ballast water equipment, all associated piping arrangements as specified by the manufacturer, control and monitoring equipment and sampling facilities. Categorization of BWMS technologies is given in Table 1 of Appendix 1.".

2 **Para 8.7.2** is replaced by the following text:

"**8.7.2** If a ship carrying ballast water has a BWMS that complies with the requirements of Regulation D-2 of the BWM Convention and tested in accordance with the Code for Approval of Ballast Water Management Systems (BWMS Code) (refer to IMO resolution MEPC.300(72)), then such a ship may be assigned the distinguishing mark **BWM (T)**.

Categorization of BWMS technologies and required stages of sea water treatment when ballasting and deballasting for each BWMS category are given in Table 1 of Appendix 1.".

3 **Para 8.7.6** is replaced by the following text:

"**8.7.6** The placement of the BWMS on board the ship and the routing of pipelines shall comply with Appendix 1. Fire detection and fire alarm systems shall comply with the requirements of 4.2.1.1, Part VI "Fire Protection", and fire extinguishing system shall comply with the requirements of 2.1.5.10.8 — 2.1.5.10.11, Part VI "Fire Protection".".

4 **New Appendices 1, 1.1** and **1.2** are introduced reading as follows:

"*APPENDIX 1*

BALLAST WATER MANAGEMENT SYSTEM

1. Application

In addition to the requirements contained in BWM Convention, the following requirements are applied to the BWMS installation.

These requirements are not applied to ship's ballast water systems including piping valves, pumps, etc. where the BWMS is not fitted.

These requirements shall be read in conjunction with 2.1.5.10, 4.2.1.1.7, 5.1.25, Tables 3.1.2.1 and 5.1.2 of Part VI "Fire Protection". Applicability of the requirements for each BWMS technology complies with Table 2.

Table 1

Categorization of BWMS technologies

BWMS's technology category (informative Appendix 1.2 shall be referred to) →		1	2	3*a*	3*b*	3c	4	5	6	7*a*	7*b*	8
Characteristics ↓		In-line UV or UV + Advanced Oxidation Technology (AOT) or UV + TiO_2 or UV + Plasma	In-line Flocculation	In-line membrane separation and de-oxygenation (injection of N_2 from a N_2 generator)	In-line de-oxygenation (injection of inert gas from inert gas generator)	In-tank de-oxygenation with inert gas generator	In-line full flow electrolysis	In-line side stream electrolysis (1)	In-line (stored) chemical injection	In-line side-stream ozone injection without gas/liquid separation tank and without discharge treatment tank	In-line side-stream ozone injection with gas/liquid separation tank and discharge water treatment tank	In-tank pasteurization and de-oxygenation with N_2 generator
Desinfection when ballasting	Making use of active substance		X			In-tank technology: No treatment when ballasting or de-ballasting	X	X	X	X	X	In-tank technology: No treatment when ballasting or de-ballasting
	Full flow of ballast water is passing through the BWMS	X	X	X	X		X				X	
	Only a small part of ballast water is passing through the BWMS to generate the active substance							X				
After-treatment when de-ballasting	Full flow of ballast water is passing through the BWMS	X									X	
	Injection of neutralizer						X	X	X	X	X	
	Not required by the Type Approval Certificate issued by the Administration		X	X								
Examples of dangerous gas as defined in 8.7.1.3 of this Part			(2)	O_2 N_2	CO_2 CO		H_2 Cl_2	H_2 Cl_2	(2)	O_2 O_3 N_2		O_2 N_2

Note: (1) In-line side stream electrolysis may also be applied in-tank in circulation mode (no treatment when ballasting or de-ballasting.
(2) To be investigated on a case by case basis based on the result of the IMO Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP/MEPC) report for basic and final approval in accordance with Procedure for Approval of Ballast Water Management Systems that Make Use of Active Substances (G9).

Taking into consideration future developments of BWMS technologies, some additional technologies may be considered in this Table 1 by identifying their characteristics in the same manner as for the above BWMS categories 1, 2, 3*a*, 3*b*, 3*c*, 4, 5, 6, 7a, 7*b* and 8.

Table 2

Applicability of the requirements for each BWMS technology

BWMS's technology category (informative Appendix 1.2 shall be referred to)→	1	2	3*a*	3*b*	3*c*	4	5	6	7*a*	7*b*	8
Requirements of Appendix 1 ↓	In-line UV or UV + Advanced Oxidation Technology (AOT) or UV + TiO_2 or UV + Plasma	In-line Flocculation	In-line membrane separation and de-oxygenation (injection of N_2 from a N_2 generator)	In-line de-oxygenation (injection of inert gas from inert gas generator)	In-tank de-oxygenation with inert gas generator	In-line full flow electrolysis	In-line side stream electrolysis	In-line (stored) chemical injection	In-line side-stream ozone injection without gas/liquid separation tank and without discharge treatment tank	In-line side-stream ozone injection with gas/liquid separation tank and discharge water treatment tank	In-tank pasteurization and de-oxygenation with N_2 generator
1 and 2	x	x	x	x	x	x	x	x	x	x	x
3.1.1 — 3.1.4	x	x	x	x	x	x	x	x	x	x	x
3.1.5			x	x	x						x
3.1.6	x	x	x	x	x	x	x	x	x	x	x
3.1.7			x	x	x						x
3.1.8				x						x	
3.1.9	x	x	x	x	x	x	x	x	x	x	x
3.2.1.1				x	x				x	x	
3.2.1.2						x	x	x			
3.2.2	x	x	x	x		x	x	x	x	x	
3.2.3	x	x	x	x	x	x	x	x	x	x	x
3.2.4	x	x	x	x		x	x	x	x	x	
3.3.1.1		x	x			x	x	x	x	x	x
3.3.1.2			x	x	x				x	x	x
3.3.1.3									x	x	
3.3.1.4						x	x	x	x	x	
3.3.1.5						x	x	x			
3.3.1.6			x	x	x				x	x	x
3.3.2.1 — 3.3.2.4		x	x	x	x	x	x	x	x	x	x
3.3.2.5			x			x	x	x	x	x	x
3.3.2.6			x						x	x	x
3.3.2.7			x			x	x	x	x	x	x
3.3.3		x				x	x	x	x	x	
3.3.4						x	x	x	x	x	

2. Definitions

2.1 "Cargo area" is defined in:

for oil tankers, 9.1.4 of this Part;

for chemical tankers, 1.2.1, Part I "Classification" of the Rules for the Classification and Construction of Chemical Tankers;

for gas carriers, 1.2.1, Part I "Classification" of the Rules for the Classification and Construction of Ships Carrying Liquefied Gases in Bulk;

for offshore supply vessels – paragraph 1.2.7 of the IMO Resolution A.1122(30)

2.2 Dangerous liquid means any liquid that is identified as hazardous in the Material Safety Data Sheet or other documentation relating to this liquid.

2.3 Hazardous area means an area in which an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical apparatus. When a gas atmosphere is present, the following hazards may also be present: toxicity, asphyxiation, corrosivity and reactivity.

2.4 Non-hazardous area means an area which is not a hazardous area as defined in 2.3.

3. Installation

3.1 General requirements

3.1.1 All valves, piping fittings and flanges shall comply with the relevant requirements of Sections 2 and 3. In addition, special consideration can be given to the material used for this service with the agreement of the Register.

3.1.2 The BWMS shall be provided with by-pass or override arrangement to effectively isolate it from any essential ship system to which it is connected. For new installation or retrofit to existing ships, under normal operating conditions of ballasting and de-ballasting given in the Ballast Water Management Plan (BWMP) the adequacy of the generating plant capacity installed on the ship shall be demonstrated by an electrical load analysis.

For retrofit installation to exiting ships, a revised electrical load analysis with preferential trips of non-essential services can be accepted.

3.1.3 The BWMS shall be operated within its Treatment Rated Capacity (TRC) in accordance with the Type Approval Certificate. This may require limiting of ship’s ballast pump flowrates.

The arrangement of the bypasses or overrides of the BWMS shall be consistent with the approved Operation Maintenance and Safety Manual by the Flag Administration’s Type Approval.

In case the maximum capacity of the ballast pump(s) exceeds the maximum TRC of the BWMS specified in the Type Approval Certificate issued, there shall be a limitation on the BWMP giving a maximum allowable flow rate for operating the ballast pump(s) that shall not exceed the maximum TRC of the BWMS.

3.1.4

In general, monitoring functions of BWMS belong to system category I according to Section 7, Part XV "Automation". However, in case a by-pass valve is integrated in the valve remote control system, the by-pass valve belongs to the system category II Ballast transfer remote control system.

The BWMS’s components are required to be inspected and certified by the firm (manufacturer) as specified in Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships, including pressure vessels, piping class I or II, filters, switchboards, etc.

The arrangement of the bypasses or overrides of the BWMS shall be consistent with the approved Operation Maintenance and Safety Manual by the Flag Administration’s Type Approval.

In case the maximum capacity of the ballast pump(s) exceeds the maximum TRC of the BWMS specified in the Type Approval Certificate issued, there shall be a limitation on the BWMP giving a maximum allowable flow rate for operating the ballast pump(s) that shall not exceed the maximum TRC of the BWMS.

3.1.5 Where a vacuum or overpressure may occur in the ballast piping or in the ballast tanks due to the height difference or injection of inert gas or nitrogen (N_2), a suitable protection device shall be provided (i.e. pressure/vacuum (P/V) valves, P/V breakers, P/V breather valves or pressure safety relief valve or high/low pressure alarms).

The pressure and vacuum settings of the protection device shall not exceed the design pressure of the ballast piping (BWMS categories 3*a* and 3*b*) or ballast tank (BWMS categories 3*a*, 3*b* and 3*c*), as relevant.

For BWMS categories 3*a*, 3*b* and 3*c*, the inert gas or nitrogen product enriched air from the inert gas system and from the protection devices installed on the ballast tanks shall be discharged to a safe location*(1) and (2) on the open deck.

When the concerned ballast tanks are hazardous areas, an extension of hazardous area shall be considered at the outlet of the protection devices: according to 20.2.3.2.2, Part XI "Electrical Equipment" the areas on open deck or semi-enclosed spaces on open deck within 1,5 m of their outlets shall be categorized hazardous zone 1 and according to 20.2.3.2.3, Part XI "Electrical Equipment" an additional 1,5 m surrounding the 1,5 m hazardous zone 1 shall be categorized hazardous zone 2. Any source of ignition such as anchor windlass or opening into chain locker shall be located outside the hazardous areas.

Where products covered by IEC 60092-502:1999 are stored on-board or generated during operation of the BWMS, the requirements of this standard shall be followed in order to:

define hazardous areas and acceptable electrical equipment; and

design ventilation systems.

3.1.6 Electric and electronic components shall not be installed in a hazardous area unless they are of certified safe type for use in the area. Cable penetrations of decks and bulkheads shall be sealed when a pressure difference between the areas shall be maintained.

3.1.7 Inert gas systems installed for de-oxygenation BWMS (categories 3*a*, 3*b*, 3*c* and 8) shall be designed in accordance with the requirements in 9.16 of this Part.

3.1.7.1 In general, when applying requirements in 9.16 of this Part to inert-gas based BWMS, the following modifications shall be considered:

the terms "cargo tank" and "cargo piping" shall be replaced by "ballast water tank" or "ballast water piping" as relevant;

the term "cargo control room" shall be replaced by "BWMS control station" as relevant;

requirements for slop tanks on combination carriers shall be disregarded.

When applying requirements in 9.16.12.10 of this Part, the acceptable oxygen content shall be specified by the manufacturer, 5 % oxygen content need not necessarily be applied.

3.1.7.2 When applying the requirements in 9.16.12.10 of this Part, the terms "cargo tanks" and "cargo piping" shall be understood as "ballast tanks" and "ballast piping" respectively. For de-oxygenation BWMS (categories 3*a*, 3*b*, 3*c* and 8), the requirements in 3.1.7.1 prevail.

Footnotes **safe location*(1)** and **safe location*(2)**.

Safe location needs to address the specific types of discharges separately.

Signboards or similar warnings at the discharge areas shall be provided.

Safe location*(1): inert gas or nitrogen product enriched air from:

in-line (categories 3*a* and 3*b*) and in-tank (categories 3*c* and 8) de-oxygenation BWMS: the protection devices installed on the ballast tanks, nitrogen or inert gas generators, nitrogen buffer tank (if any); or

in-line ozone injection BWMS (categories 7*a* and 7*b*): the oxygen generator;

safe locations on the open deck are:

not within 3 m of areas traversed by personnel; and

not within 6 m of air intakes for machinery (engines and boilers) and all ventilation inlets/outlets.

Safe location*(2): oxygen-enriched air from:

in-line and in-tank de-oxygenation BWMS (categories 3*a* and 8): the nitrogen generator; or

in-line ozone injection BWMS (categories 7*a* and 7*b*): the protection devices or vents from oxygen generator, compressed oxygen vessel, the ozone generator and ozone destructor devices;

safe locations on the open deck are:

outside of hazardous area;

not within 3 m of any source of ignition and from deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard;

not within 3 m of areas traversed by personnel; and

not within 6 m of air intakes for machinery (engines and boilers) and all ventilation inlets.

3.1.8 When cavitation is the BWMS treatment process (e.g. by use of pressure vacuum reactor working in combination with a vertical ballast water drop line) or part of the BWMS treatment process (e.g. by use of "smart pipe" or "special pipe" in BWMS category 7*b* or by use of "venturi pipe" in BWMS technology 3*b*) or by use other means, the design and the wall thickness or grade of materials or inside coating or surface treatment of the part of the piping where the cavitation is taking place shall be specifically considered.

3.1.9 When it is required to have an automatic shutdown of the BWMS for safety reasons, this shall be initiated by a safety system independent of the BWM control system.

3.2 Additional requirements for oil tankers

3.2.1 Hazardous area classification shall be in accordance with 20.2.3, Part XI "Electrical Equipment" of these Rules, herewith:

.1 BWMS using ozone generators (categories 7*a* and 7*b*) and de-oxygenation BWMS using inert gas generator by treated flue gas from main or auxiliary boilers or gas from an oil or gas-fired gas generator (categories 3*b* and 3*c*) shall be located outside the cargo area in accordance with paragraph 15/2.3.1.1.2 of the FSS Code.

N o t e . This requirement does not apply to inert gas generators for which paragraph 15/2.4.1 of the FSS Code and 9.16 of this Part apply;

.2 in-line full flow electrolysis BWMS (category 4), in-line side-stream electrolysis BWMS (category 5) and in-line injection BWMS using chemical which is stored onboard (category 6) can be located inside the hazardous areas with due consideration of the requirement of 3.1.4 but shall not be located inside the cargo pump room unless it is demonstrated by the BWMS manufacturer that the additional hazards that could be expected from dangerous liquids and dangerous gases stored or evolved from the BWMS (e.g. H_2 generation):

do not lead to an upgrade of the hazardous area categorization of the cargo pump room;

are not reactive with the cargo vapours expected to be present in the cargo pump room;

are not reactive with the fire-extinguishing medium provided inside the cargo pump room;

are not impacting the performance of the existing fire-fighting systems provided inside the cargo pump room; and

are not introducing additional hazards inside the cargo pump room such as toxicity hazards that would not have been prior addressed by suitable counter measures.

N o t e s : 1. In-line full flow electrolysis BWMS (category 4) can be accepted in cargo compressor rooms of liquefied gas carriers and inside cargo pump rooms of oil tankers or chemical tankers if that cargo pump room is located above the cargo tank deck.

2. For submerged cargo pumps, the room containing the hydraulic power unit or electric motors shall not be considered as the "cargo pump room".

3. Ballast pump rooms and other pump rooms not containing the cargo pumps shall not be considered as the "cargo pump room".

3.2.2 In general, two independent BWMS shall be required i.e. one for ballast tanks located within the cargo area and the other one for ballast tanks located outside cargo area. Specific arrangements where only one single in-line BWMS (categories 1, 2, 3*a*, 3*b*, 4, 5, 6, 7*a* and 7*b*) may be accepted are given in Appendix 1.1.

N o t e . When the fore peak tank is ballasted with the piping system serving the other ballast tanks within the cargo area, the ballast water of the fore peak tank shall be processed by the BWMS processing the ballast water of the other ballast tanks within the cargo area.

3.2.3 Isolation between ballast piping serving the ballast tanks inside and outside of the cargo area shall be in accordance with the following requirements.

3.2.3.1 Interconnection in between the ballast piping serving the ballast tanks located within the cargo area and the ballast piping serving the ballast tanks located outside the cargo area may be accepted if appropriate isolation arrangement is applied in accordance with Appendix 1.1.

N o t e s : 1. The means of appropriate isolation described in 3.2.3.1 is necessary for the interconnection specified in said para regardless of the diameter of the piping.

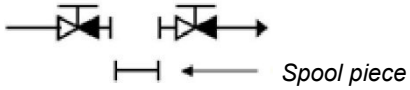
2. As indicated in Appendix 1.1, the means of appropriate isolation described in 3.2.3.1 is necessary for the interconnection specified in said para in the case of the active substance piping such as N_2 gas piping, inert gas piping, neutralizer piping, fresh water piping for filter cleaning, compressed air piping for remaining water purge and sea water piping for adjusting the salinity etc. At the discretion of the Register and for active substance piping and neutralizer piping (both up to 50 mm in diameter) only, alternative isolation arrangements, provided preferably on the open deck, offering enhanced safety and gastightness may be considered for penetration of the bulkhead separating the non-hazardous machinery space from a hazardous area (such as the cargo pump room) at as high an elevation in the machinery space as possible, preferably, just below the main deck. The arrangements shall provide suitable protection measures in addressing the pollution hazards and safety concerns due to the potential migration of hydrocarbon or flammable or toxic liquids or vapours from the hazardous areas.

3. The means of appropriate isolation described in 3.2.3.1 for the interconnection specified in said para need not be applied to the sampling lines described in 3.2.4.

The means of appropriate isolation shall be one of the following:

.1 two non-return valves with positive means of closing in series with a spool piece; or

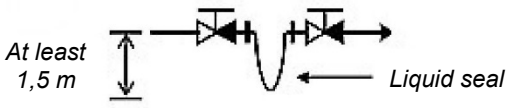
N o t e . As an alternative to positive means of closure, an additional valve having such means of closure may be provided between the non-return valve and the spool piece.



.2 two non-return valves with positive means of closing in series with a liquid seal at least 1,5 m in depth; or

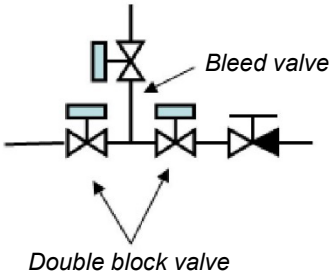
N o t e s : 1. As an alternative to positive means of closure, an additional valve having such means of closure may be provided between the non-return valve and the liquid seal.

2. For ships operating in cold weather conditions, freeze protection shall be provided in the water seal. A portable heating system can be accepted for this purpose.



.3 automatic double block and bleed valves and a non-return valve with positive means of closing.

N o t e . As an alternative to positive means of closure, an additional valve having such means of closure may be provided after the non-return valve.



3.2.3.2 The above-mentioned means of appropriate isolation shall be provided on the open deck in the cargo area.

N o t e . When the fore peak tank is ballasted with the piping system serving the other ballast tanks within the cargo area, the means of appropriate isolation described in 3.2.3.1 and 3.2.3.2 is not required in between the fore peak tank and the common ballast water piping serving the other ballast water tanks within the cargo area.

3.2.4 Sampling lines which are connected to the ballast water piping system serving the tanks in the cargo area and provided for the purpose of the following:

for any BWMS: ballast water sampling required by the G2 Guideline of the BWM Convention; or

for BWMS technologies categories 4, 5, 6, 7*a* and 7*b*: total residual oxidant (TRO) analysis in closed loop system;

shall not be led into a non-hazardous enclosed space outside the cargo area.

However, the sampling lines may lead into a non-hazardous enclosed space outside the cargo area provided the following requirements are fulfilled:

.1 the sampling facility (for BWMS monitoring/control) shall be located within a gas tight enclosure (hereinafter, referred to as a "cabinet"), and the following requirements shall be complied:

.1.1 in the cabinet, a stop valve shall be installed on each sampling line;

.1.2 gas detection equipment shall be installed in the cabinet and the valves specified in 3.2.4.1.1 shall be automatically closed upon activation of the gas detection equipment;

.1.3 audible and visual alarm signals shall be activated both locally and at the BWMS control station when the concentration of explosive gases reaches a pre-set value, which shall not be higher than 30 % of the lower flammable limit (LFL). Upon an activation of the alarm, all electrical power to the cabinet shall be automatically disconnected;

N o t e . When the electrical equipment is of a certified safety type, the automatic disconnection of power supply is not required.

.1.4 the cabinet shall be vented to a safe location in non-hazardous area on open deck and the vent shall be fitted with a flame arrester;

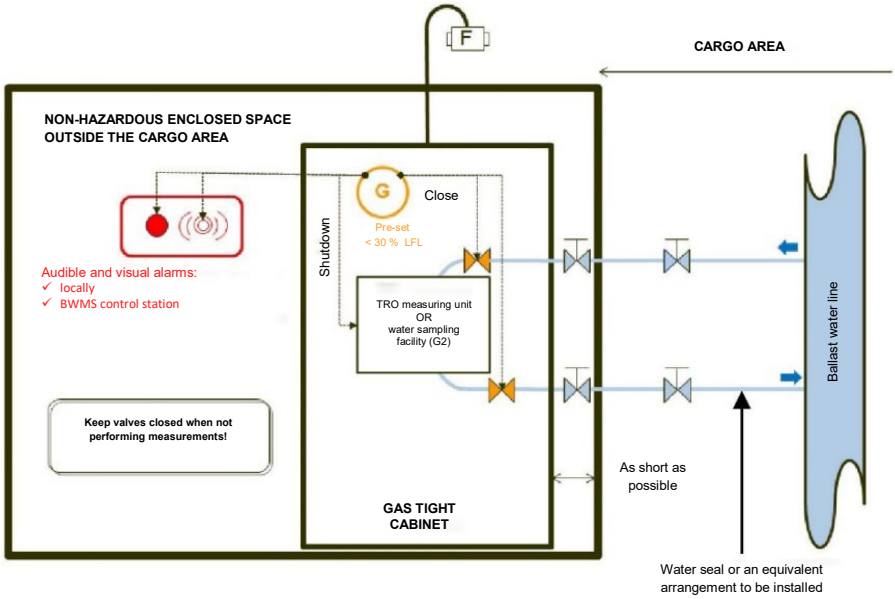
.2 the standard internal diameter of sampling pipes shall be the minimum necessary in order to achieve the functional requirements of the sampling system;

.3 the cabinet shall be installed as close as possible to the bulkhead facing the cargo area, and the sampling lines located outside the cargo area shall be routed on their shortest ways;

.4 stop valves shall be located in the non-hazardous enclosed space outside the cargo area, in both the suction and return lines close to the penetrations through the bulkhead facing the cargo area. A warning plate stating "Keep valve closed when not performing measurements" shall be posted near the valves. Furthermore, in order to prevent backflow, a water seal or equivalent arrangement shall be installed on the hazardous area side of the return pipe;

.5 a stop valve shall be installed on the cargo area for each sampling line (i.e. both the suction and return lines);

.6 the samples which are extracted from the ballast water piping system serving the tanks within the cargo area shall not be discharged to a tank located outside the cargo area and not to discharge to a piping line supplying the spaces located outside the cargo area.



3.3 Special requirements for BWMS categories 2, 3*a*, 3*b*, 3*c*, 4, 5, 6, 7*a*, 7*b* and 8 generating dangerous gas or dealing with dangerous liquids.

3.3.1 Where the operating principle of the BWMS involves the generation of a dangerous gas, the following requirements shall be satisfied:

.1 gas detection equipment shall be fitted in the spaces where dangerous gas could be present, and an audible and visual alarm shall be activated both locally and at the BWMS control station in the event of leakage.

The gas detectors shall be located as close as possible to the BWMS components where the dangerous gas may accumulate.

For flammable gases and explosive atmosphere including but not limited to H_2, the construction, testing and performance of the gas detection devices shall be in accordance with IEC 60079-29-1:2016, IEC 60079-29-2:2015, IEC 60079-29-3:2014 and/or IEC 60079-29-4:2009, as applicable.

Where other hazards are considered like toxicity, asphyxiation, corrosive and reactivity hazards, a recognized standard acceptable to the Register shall be selected with due consideration of the specific gases to be detected and due consideration of the performance of the detection device with regards to the specific atmosphere where it is used;

.2 in spaces where inert gas generator systems are fitted (BWMS categories 3*b* and 3*c*) or nitrogen generators are fitted (BWMS categories 3*a* and 8), at least two oxygen sensors shall be positioned at appropriate locations (as required by the requirements in 9.16.7.10 of this Part) to alarm when the oxygen level falls below 19 %. The alarms shall be both audible and visual and shall be activated:

inside the space;

at the entry into the space; and

inside the BWMS control station.

For BWMS categories 7*a* and 7*b*, at least two oxygen sensors shall be positioned at appropriate locations in the following spaces:

spaces where ozone generators are fitted, or

spaces where ozone destructors are fitted, or

spaces where ozone piping is routed;

to alarm when the oxygen level raises above 23 %. The alarms shall be both audible and visual and shall be activated at the following locations:

inside the space; and

at the entry into the space; and

inside the BWMS control station.

Automatic shut-down of the BWMS shall be arranged when the oxygen level raises above 25 %. Audible and visual alarms independent from those specified in 3.3.1.1 shall be activated prior to this shut-down;

.3 for BWMS categories 7*a* and 7*b*, at least one ozone sensor shall be provided at the vicinity of the discharge outlet to the open deck from the ozone destructors addressed in Footnote*(4) to alarm when the ozone concentration level raises above 0,1 ppm. The alarms shall be both audible and visual and shall be activated in the BWMS control room. In addition, at least two ozone sensors shall be positioned at appropriate location in the following spaces:

spaces where ozone generators are fitted; or

spaces where ozone destructors are fitted; or

spaces where ozone piping is routed,

to alarm when the ozone concentration level raises above 0,1 ppm. The alarms shall be both audible and visual and shall be activated at the following locations:

inside the space;

at the entry into the space; and

inside the BWMS control station.

Automatic shut-down of the BWMS shall be arranged when the ozone concentration measured from one of the two sensors inside the space raises above 0,2 ppm;

.4 inside double walled spaces or pipe ducts constructed for the purpose of 3.3.2.1 Note 1, sensors shall be provided for the detection of H_2 leakages (BWMS categories 4, 5 and 6 when relevant) or O_2 leakages (BWMS categories 7*a* and 7*b*) or O_3 leakages (BWMS categories 7*a* and 7*b*). The sensors shall activate an alarm at the high-level settings and automatic shut-down of the BWMS at the high-high level settings described in above 3.3.1.1 to 3.3.1.3.

N o t e . As an alternative to the sensor for the gas detection, monitored under-pressurization inside the double walled spaces or pipe ducts can be provided with an automatic alarm and shut-down of the BWMS in case of loss of the under-pressurization. The monitoring can be achieved either by monitoring the pressure inside the double walled spaces or pipe ducts or by monitoring the exhaust fan;

.5 for in-line full flow electrolysis BWMS (category 4), in-line side-stream electrolysis BWMS (category 5) and in-line injection BWMS using chemical which is stored onboard (category 6): the hydrogen de-gas arrangement (when provided) shall be provided with redundant ventilation fans and redundant monitoring of the ventilation system.

In addition, the ventilation fan shall be certified explosion proof and have spark arrestor to avoid ignition sources to enter the ventilation systems whereas remaining H_2 gas may be present in dangerous concentrations.

Audible and visual alarms and automatic shut-down of the BWMS shall be arranged for respectively high and high-high levels of H_2 concentration. The open end of the hydrogen by-product enriched gas relieving device shall be led to a safe location*(3) on open deck;

.6 The open end of inert gas or nitrogen gas enriched air (BWMS categories 3a, 3b, 3c and 8) or oxygen-enriched air (BWMS categories 3a, 7a, 7b and 8) shall be led to a safe location*(1) and (2) on open deck.

3.3.2 Where the piping is conveying active substances, by-products or neutralizers that are containing dangerous gas or dangerous liquids as defined respectively in 8.7.1.3 of this Part and 2.2 of this Appendix, the following requirements shall be satisfied:

N o t e s : 1. This requirement is applicable to the injection lines conveying the dangerous gas or dangerous liquids but not applicable to the ballast water lines where the dangerous gas or dangerous liquids are diluted.

2. The IMO reports issued during the basic and final approval procedures of the BWMS that make use of active substances (G9 Guidelines) can be used for assessing the hazards that can be expected from the media conveyed by the BWMS piping.

For ***(4)**, refer to footnotes to 3.3.2.3.

For **safe location*(3)**, refer to footnotes to 3.3.2.3.

For **safe location*(1)** and **safe location*(2)**, refer to footnotes to 3.1.4.

.1 irrespective of design pressure and temperature, the piping shall be either of Class I (without special safeguard) or Class II (with special safeguard) in accordance with Table 1.3.2 of this Part. The selected materials, the testing of the material, the welding, the non-destructive tests of the welding, the type of connections, the hydrostatic tests and the pressure tests after assembly on-board shall comply with the requirements of Sections 2 and 3 of this Part. Mechanical joints, where allowed, shall be selected in accordance with Table 2.4.5.11-2 of this Part.

N o t e s : 1. For piping class II with special safeguards conveying dangerous gas like hydrogen (H_2), oxygen (O_2) or ozone (O_3), the special safeguards shall be either double walled pipes or pipe duct.

2. For piping class II with special safeguards conveying dangerous liquids, other special safeguards can be considered like shielding, screening, etc.

3. Plastic pipes may be accepted after due assessment of the dangerous gas or dangerous liquids conveyed inside. When plastic pipes are accepted, the requirements of Section 3 of this Part apply.

.2 the length of pipe and the number of connections shall be minimized;

.3 inside double walled space or pipe ducts constructed as the special safeguard for the purpose of 3.3.2.1 Note 1 shall be equipped with mechanical exhaust ventilation leading to a safe location*(3) and (4) on open deck;

.4 the routing of the piping system shall be kept away from any source of heating, ignition and any other source that can react hazardously with the dangerous gas or liquid conveyed inside. The pipes shall be suitably supported and protected from mechanical damage;

.5 pipes carrying acids shall be arranged so as to avoid any projection on crew in case of a leakage;

.6 H_2 by-product enriched air vent pipes (BWMS categories 4, 5 and 6) or O_2 enriched air vent pipes (BWMS categories 3*a*, 7*a*, 7*b* and 8) or O_3 piping (BWMS categories 7*a* and 7*b*) shall not be routed through accommodation spaces, services spaces and control stations;

.7 O_2 enriched air vent pipes (BWMS categories 3*a*, 7*a*, 7*b* and 8) shall not be routed through hazardous areas unless it is arranged inside double walled pipes or pipe ducts constructed as the special safeguard for the purpose of 3.3.2.1 Note 1 and provided with suitable gas detection as described in 3.3.1.4 and mechanical exhaust ventilation as described in 3.3.2.3;

Footnotes **safe location*(3)** and **safe location*(4)**:

Safe location*(3): hydrogen by-product enriched gas from:

in-line full flow electrolysis BWMS (category 4), in-line side-stream electrolysis BWMS (category 5) and in-line injection BWMS using chemical which is stored onboard (category 6): the hydrogen de-gas arrangement (when provided); safe locations on the open deck are:

not within 5 m of any source of ignition and from deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard;

not within 3 m of areas traversed by personnel; and

not within 5 m of air intakes from non-hazardous enclosed spaces.

The areas on open deck, or semi-enclosed spaces on open deck, within 3 m of the outlets shall be categorized hazardous zone 1 plus an additional 1,5 m surrounding the 3 m hazardous zone 1 shall be categorized hazardous zone 2.

Electrical apparatus located in the above hazardous areas zone 1 and zone 2 shall be suitable for at least IIC T1 (refer to 20.3.1.4, Part XI "Electrical Equipment").

Safe location*(4): for in-line ozone injection BWMS (categories 7*a* and 7*b*), vent outlet from O_3 destructor device (ODS) can be considered as oxygen-enriched air provided that:

the ODS are duplicated; and

the manufacturer justified that the quantity of consumable (activated carbon) used by the ODS is sufficient for the considered life cycle of the BWMS; and

ozone detection is arranged in the vicinity of the discharge outlet from the vent outlet of the ODS to alarm the crew in case the ODS is not working.

If one of the above 3 conditions is not fulfilled, the safe location from ODS on open deck are:

outside of hazardous area;

not within 3 m of any source of ignition;

not within 6 m of areas traversed by personnel; and

not within 6 m of air intakes for machinery (engines and boilers) and all ventilation inlets.

.8 The routing of H_2 by-product enriched air vent pipes (BWMS categories 4, 5 and 6) or O_2 enriched air vent pipes (BWMS categories 3*a*, 7*a*, 7*b* and 8) shall be as short and as straight as possible. When necessary, horizontal portions may be arranged with a minimum slope in accordance with the manufacturer's recommendation.

3.3.3 For BWMS using chemical substances or dangerous gas which are stored on-board for either

storage or preparation of the active substances (BWMS categories 2 and 6); or storage or preparation of the neutralizers (BWMS categories 4, 5, 6, 7*a* and 7*b*); or recycling the wastes produced by the BWMS (BWMS category 2), procedures shall be in accordance with the Material Safety Data Sheet (MSDS) and IMO circular BWM.2/Circ.20 "Guidance to ensure safe handling and storage of chemicals and preparations used to treat ballast water and the development of safety procedures for risks to the ship and crew resulting from the treatment process", and the following measures shall be taken as appropriate:

.1 the materials, inside coating used for the chemical storage tanks, piping and fittings shall be resistant to such chemical substances;

.2 chemical substances (even if they are not defined as dangerous liquid in the sense of 2.2) and gas storage tanks shall be designed, constructed, tested, inspected, certified and maintained in accordance with:

for independent tanks permanently fixed onboard containing dangerous liquids (e.g. sulfuric acid H_2SO_4) or dangerous gas (e.g. oxygen O_2): the requirements of Section 6, Part X "Boilers, Heat Exchangers and Pressure Vessels" as applicable to pressure vessels;

for independent tanks permanently fixed onboard not containing dangerous liquid (e.g. sodium sulphite, sodium biosulphite or sodium thiosulfphate neutralizers) and not containing dangerous gas (e.g. nitrogen N_2): the requirements of Section 6, Part X "Boilers, Heat Exchangers and Pressure Vessels";

for portable tanks: the IMDG Code or other industry standard recognized by the Register;

.3 when the chemical substances are stored inside integral tanks, the ship's shell plating shall not form any boundary of the tank;

.4 dangerous liquids and dangerous gas storage tank air pipes shall be led to a safe location*(1) and (2) on open deck;

.5 an operation manual containing chemical injection procedures, alarm systems, measures in case of emergency, etc. shall be kept onboard;

.6 dangerous liquid storage tanks and their associated components like pumps and filters, shall be provided with spill trays or secondary containment system of sufficient volume to contain potential leakages from tank openings, gauge glasses, pumps, filters and piping fittings.

Further to the safety and/or pollution assessment of the concerned chemical substances, consideration shall be provided for segregation of the drains from such spill trays (or secondary containment system) or piping systems from engine room bilge system or from cargo pump room bilge system, as applicable. When necessary, arrangement shall be provided within the spill trays (or within the secondary containment system) for the detection of dangerous liquid or dangerous gas as defined respectively in 8.7.1.3 of this Part and 2.2 of this Appendix.

N o t e . The IMO reports issued during the basic and final approval procedures of the BWMS that make use of active substances (G9 Guidelines) can be used for this assessment.

3.3.4 A risk assessment shall be conducted in a generic manner during the design review and submitted to the Register for approval for the following BWMS categories:

BWMS category 4: in all cases;

BWMS category 5: in all cases;

BWMS category 6: when one of the MSDS indicates that the chemical substance stored on-board is either flammable, toxic, corrosive or reactive;

BWMS category 7*a* and 7*b*: in all cases;

N o t e . The IMO reports issued during the basic and final approval procedures of the BWMS that make use of active substances (G9 Guidelines) can be used as a reference for this assessment.

.1 the recommended risk assessment techniques for BWMS and other guidances are listed below but not limited to:

FMEA, FMECA, HAZID, HAZOP, etc.;

ISO/IEC 31010 — Risk assessment techniques;

IACS Recommendation No.146;

.2 the risk assessment shall ensure that the package supplied by the BWMS's manufacturer is intrinsically safe and/or provides mitigation measures to the hazards created by the BWMS which have been identified during the design review but that need to be implemented during the installation on-board.

For **safe location*(1)** and **safe location*(2)**, refer to footnotes to 3.1.4.

INSTALLATION OF ONE SINGLE BWMS ON OIL TANKERS
(N o t e . This Appendix does not cover in-tank technologies categories 3*c* and 8)

Table 1.1

In-line BWMS's categorization depending on the applied technologies

BWMS's technology category → / **Characteristics ↓**		1	2	3*a*	3*b*	4	5	6	7*a*	7*b*
		In-line UV or UV + Advanced Oxidation Technology (AOT) or UV + TiO2 or UV + Plasma	In-line flocculation	In-line membrane separation and de-oxygenation (injection of N_2 from a N_2 generator)	In-line de-oxygenation (injection of inert gas from inert gas generator)	In-line full flow electrolysis	In-line side stream electrolysis (1)	In-line (stored) chemical injection	In-line side-stream ozone injection without gas/liquid separation tank and without discharge treatment tank	In-line side-stream ozone injection with gas/liquid separation tank and discharge water treatment tank
Des-infection when ballasting	Making use of active substance		X			X	X	X	X	X
	Full flow of ballast water is passing through the BWMS	X	X	X	X	X				X
	Only a small part of ballast water is passing through the BWMS to generate the active substance						X			
After-treatment when de-ballasting	Full flow of ballast water is passing through the BWMS	X								X
	Injection of neutralizer					X	X	X	X	X
	Not required by the Type Approval Certificate issued by the Administration		X	X						
Examples of dangerous gas as defined in 8.7.1.3 of this Part			(2)	O_2 N_2	CO_2, CO	H_2, Cl_2	H_2, Cl_2	(2)	O_2, O_3, N_2	
Arrangement of one single BWMS	BWMS is located outside the cargo area	Not acceptable	Case 1.2 (3)	Case 1.3*a* (3)	Case 1.3*b*	Case 1.4 (3)	Case 1.5	Case 1.6	Case 1.7*a*	Case 1.7*b* (3)

N o t e s : (1) In-line side stream electrolysis may also be applied in-tank in circulation mode (no treatment when ballasting or de-ballasting).
(2) To be investigated on a case by case basis based on the result of the IMO (GESAMP) Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP/MEPC) report for basic and final approval in accordance with the G9 Guidelines.
(3) Only "Means of disconnection" as described in 3.2.3.1 shall be applied.

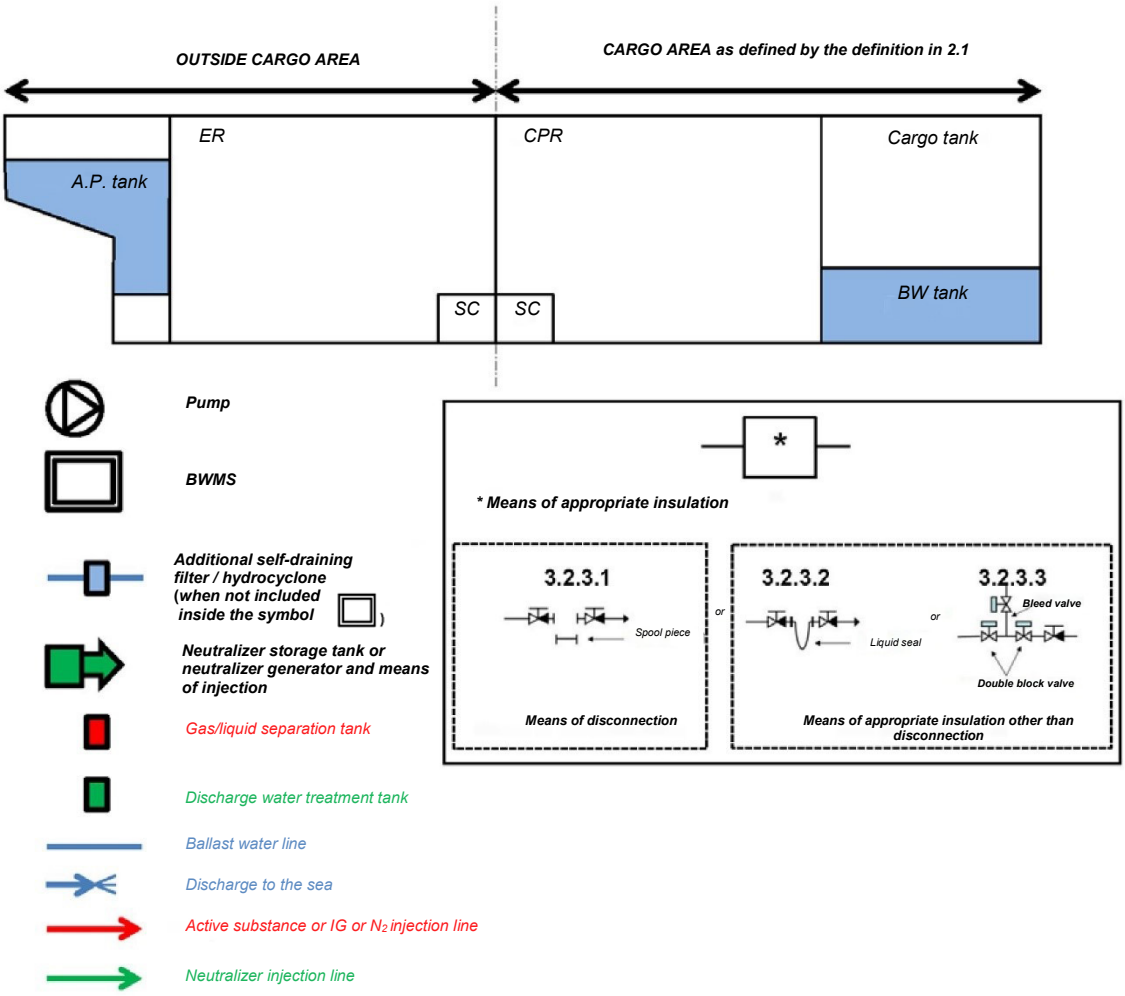


Fig. 1.1-1
S y m b o l s :
CPR — cargo pump room;
SC — sea chest;
ER — engine room

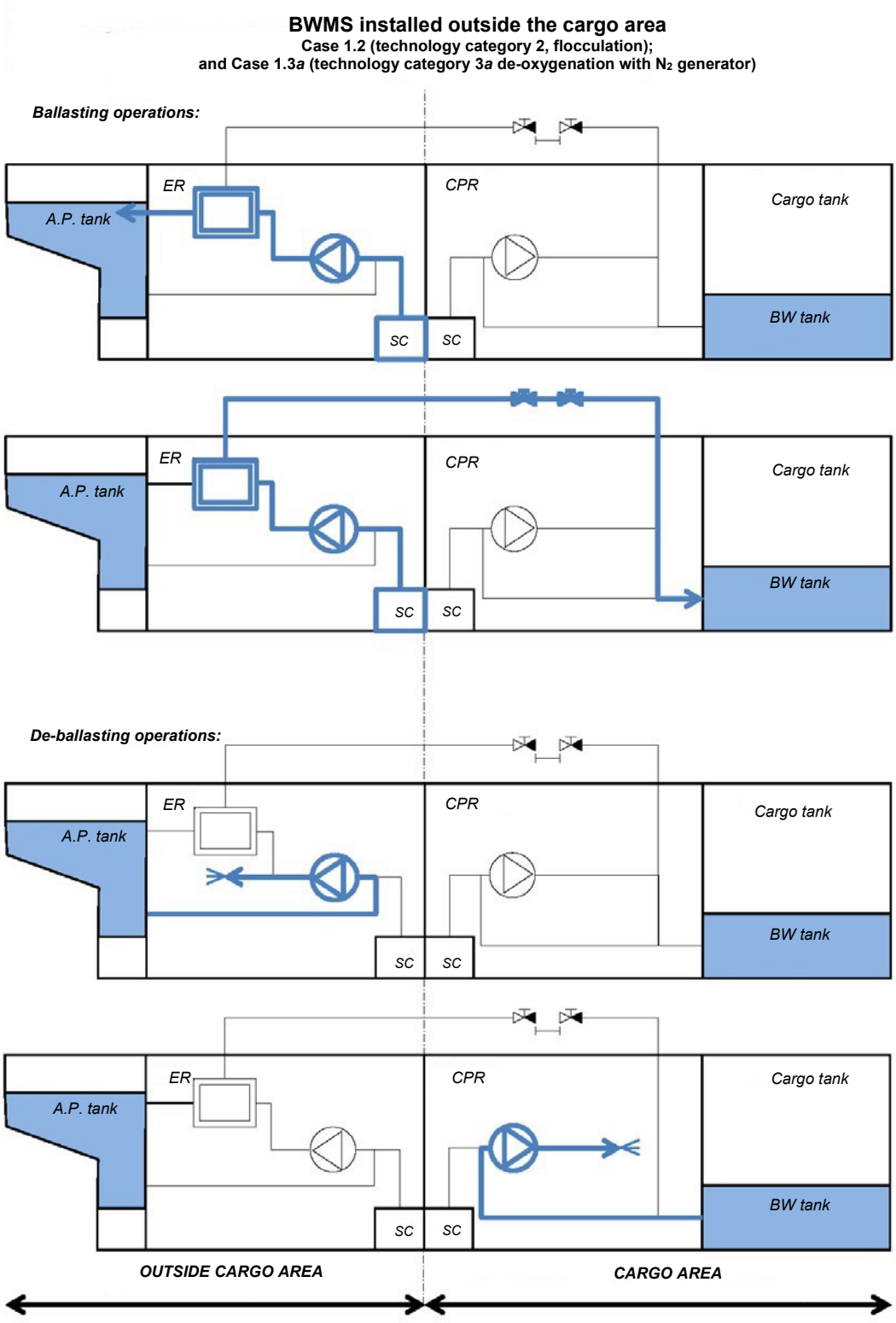


Fig. 1.1-2
S y m b o l s :
CPR — cargo pump room;
SC — sea chest;
ER — engine room

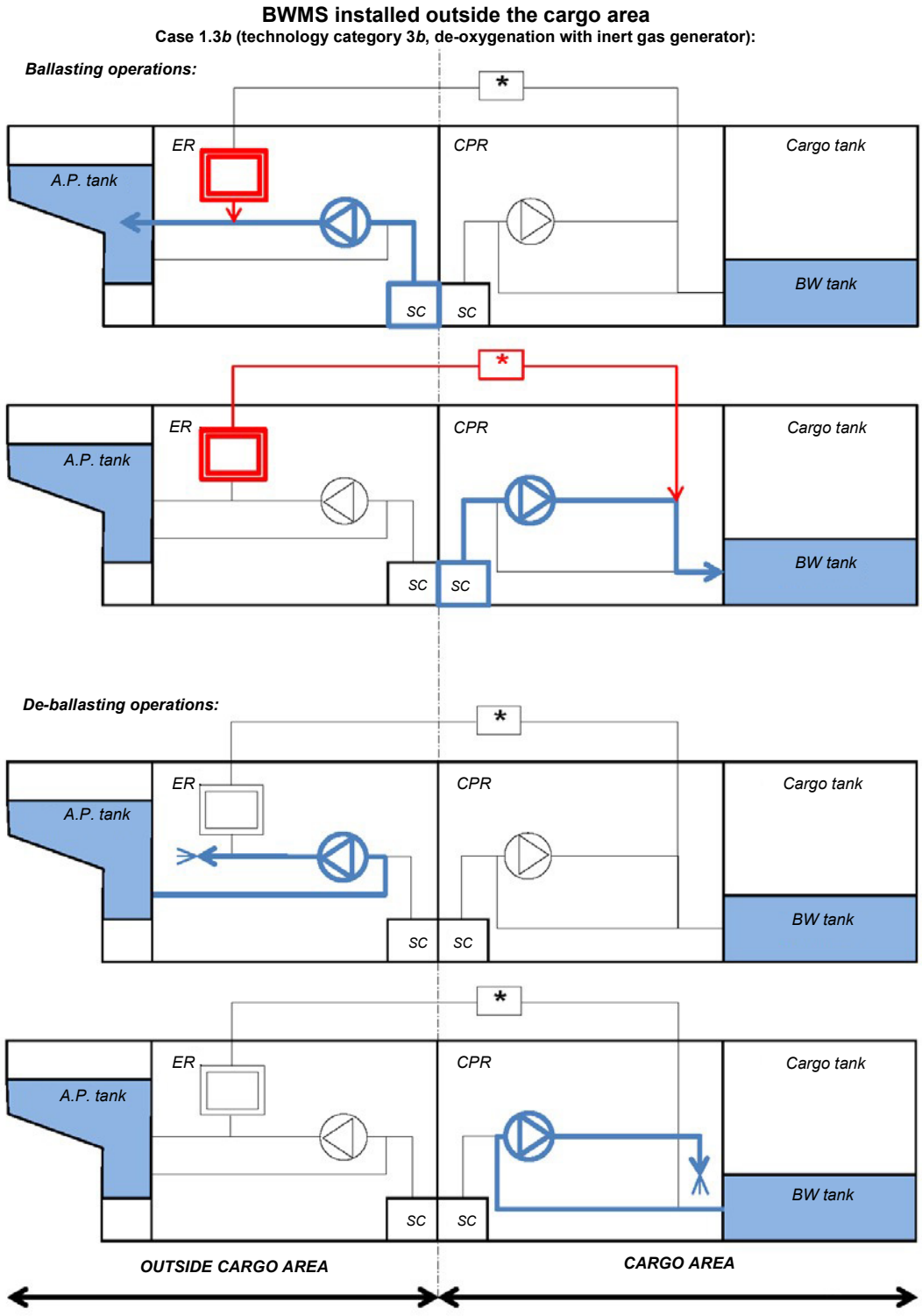


Fig. 1.1-3
S y m b o l s :
CPR — cargo pump room;
SC — sea chest;
ER — engine room

BWMS installed outside the cargo area
Case 1.4 (technology category 4, full-flow electrolysis):

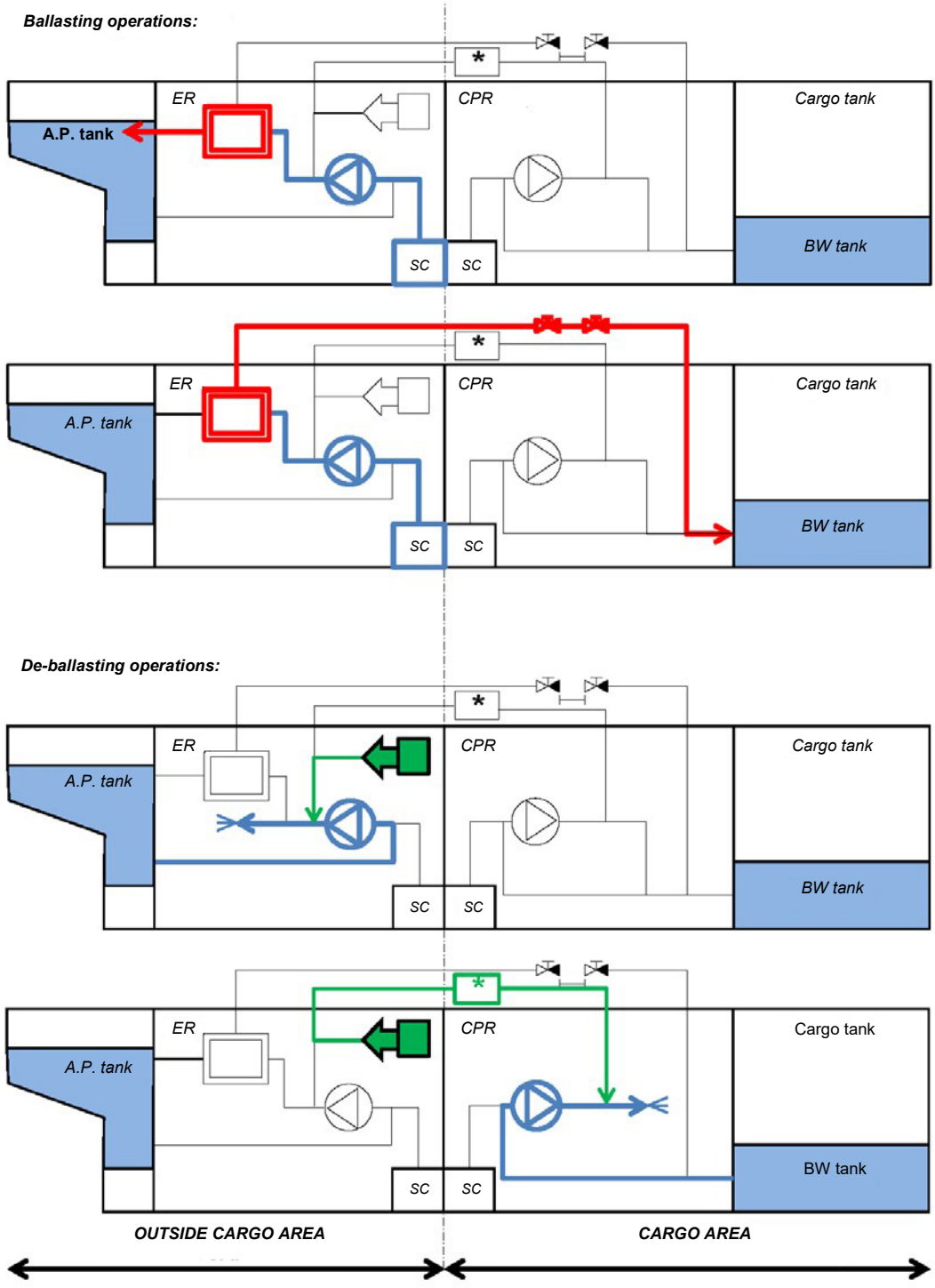


Fig. 1.1-4
S y m b o l s :
CPR — cargo pump room;
SC — sea chest;
ER — engine room

BWMS installed outside the cargo area

Case 1.5 (technology category 5, side-stream electrolysis):

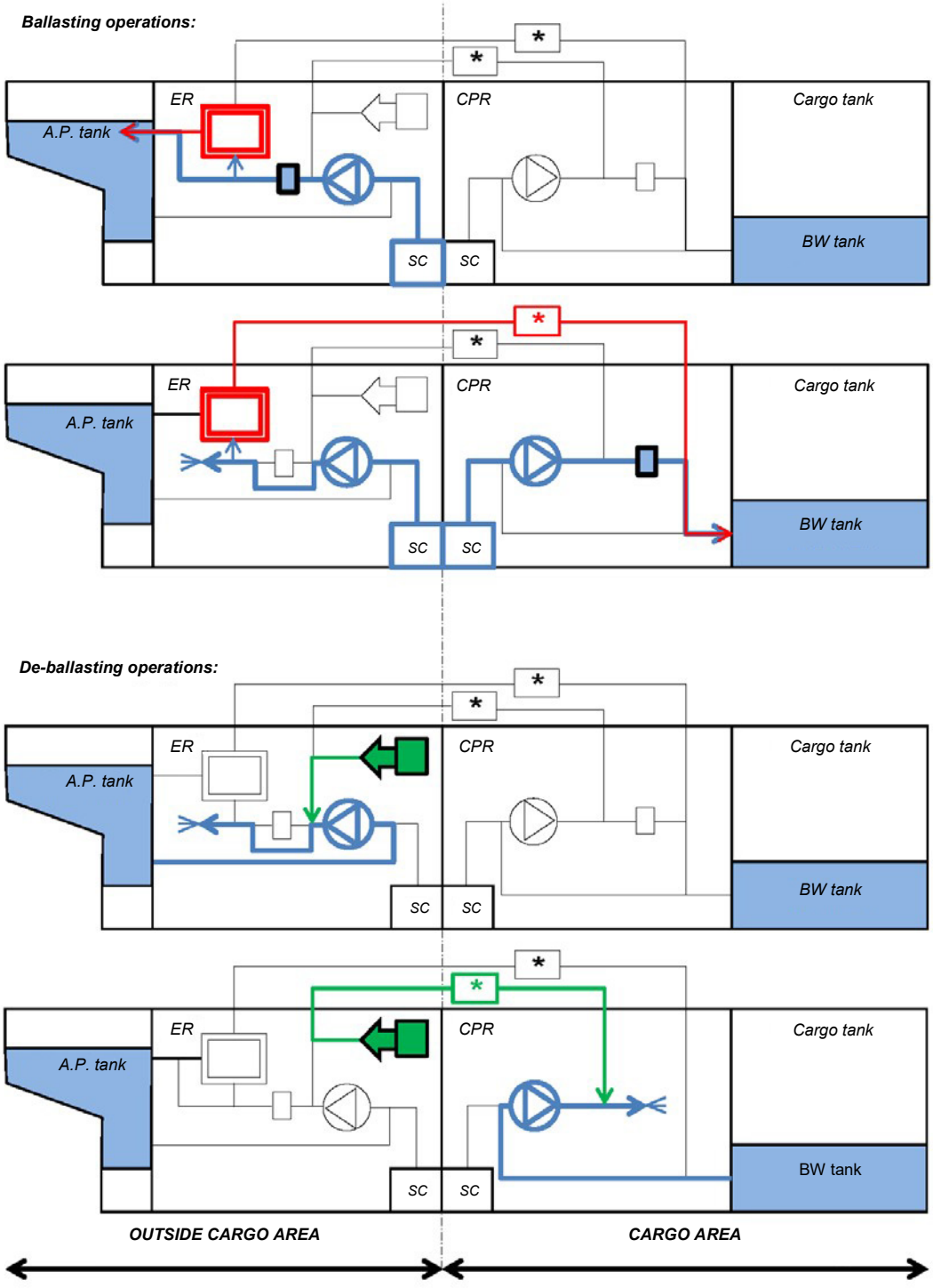


Fig. 1.1-5

S y m b o l s :

CPR — cargo pump room;

SC — sea chest;

ER — engine room

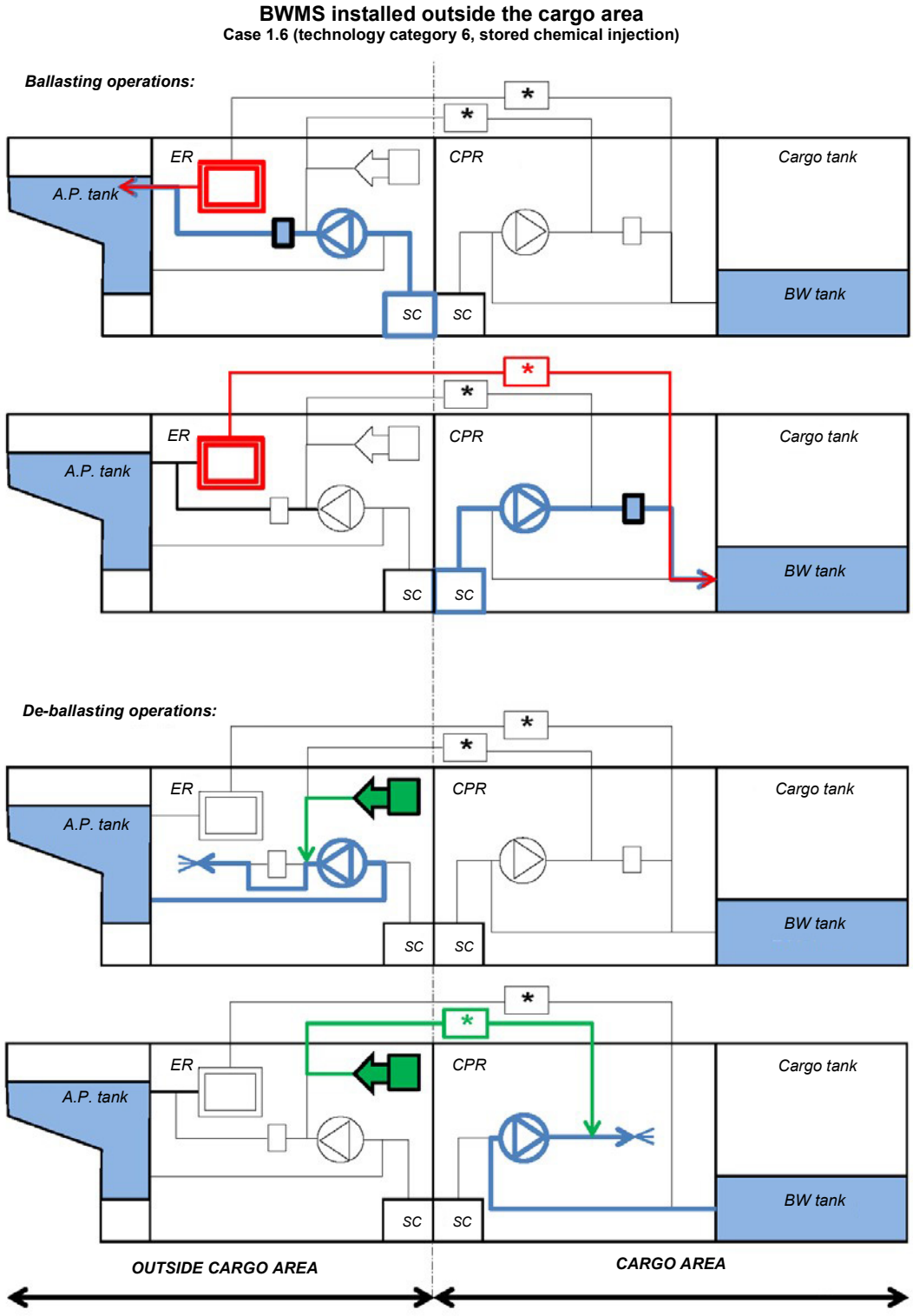


Fig. 1.1-6
S y m b o l s :
CPR — cargo pump room;
SC — sea chest;
ER — engine room

BWMS installed outside the cargo area

Case 1.7*a* (technology category 7*a*, side-stream ozone injection without gas/liquid separation tank and without discharge water treatment tank):

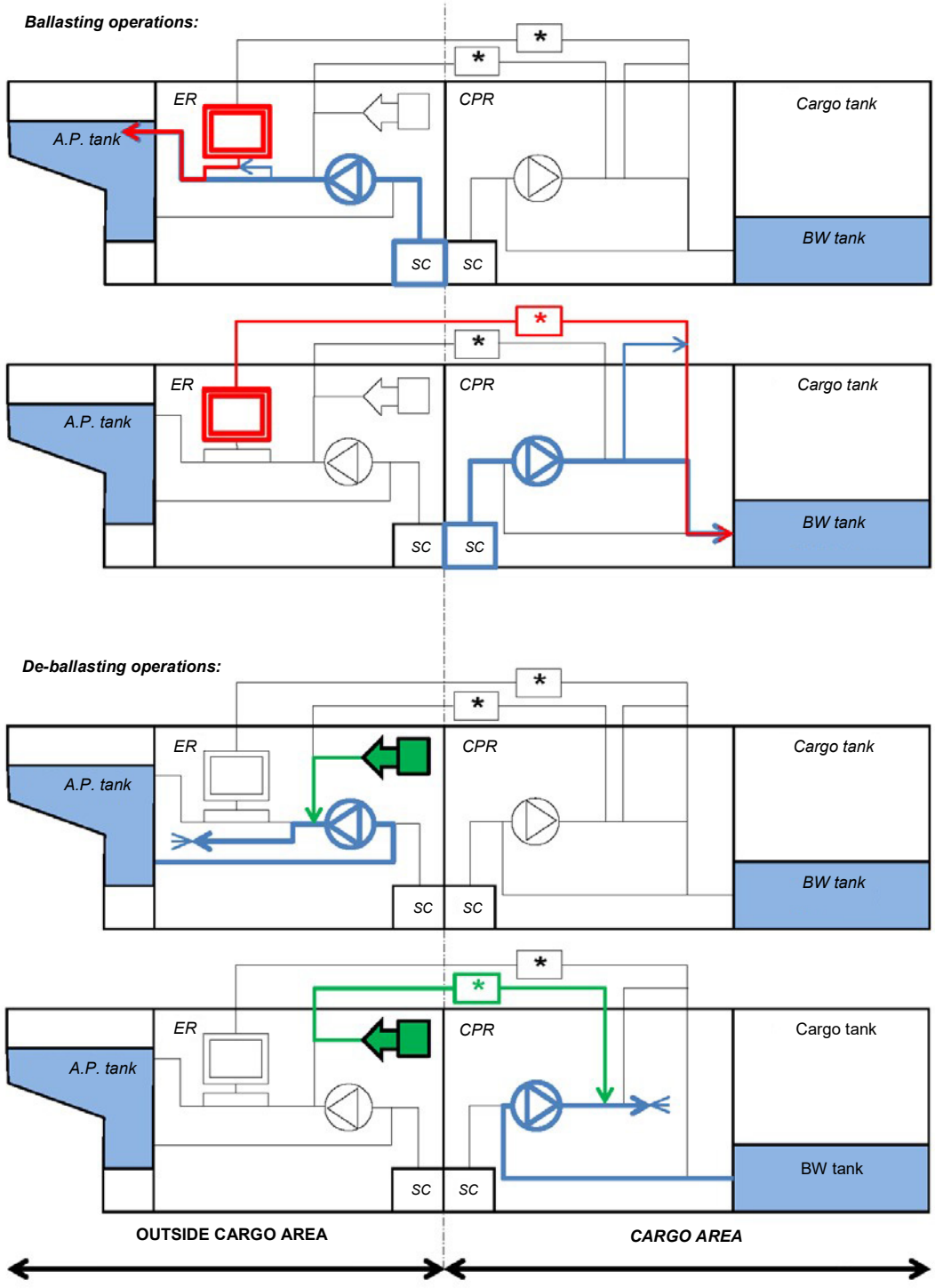


Fig. 1.1-7

S y m b o l s :

CPR — cargo pump room;

SC — sea chest;

ER — engine room

BWMS installed outside the cargo area

Case 1.7*b* (technology category 7*b*, side-stream ozone injection with gas/liquid separation tank and with discharge water treatment tank):

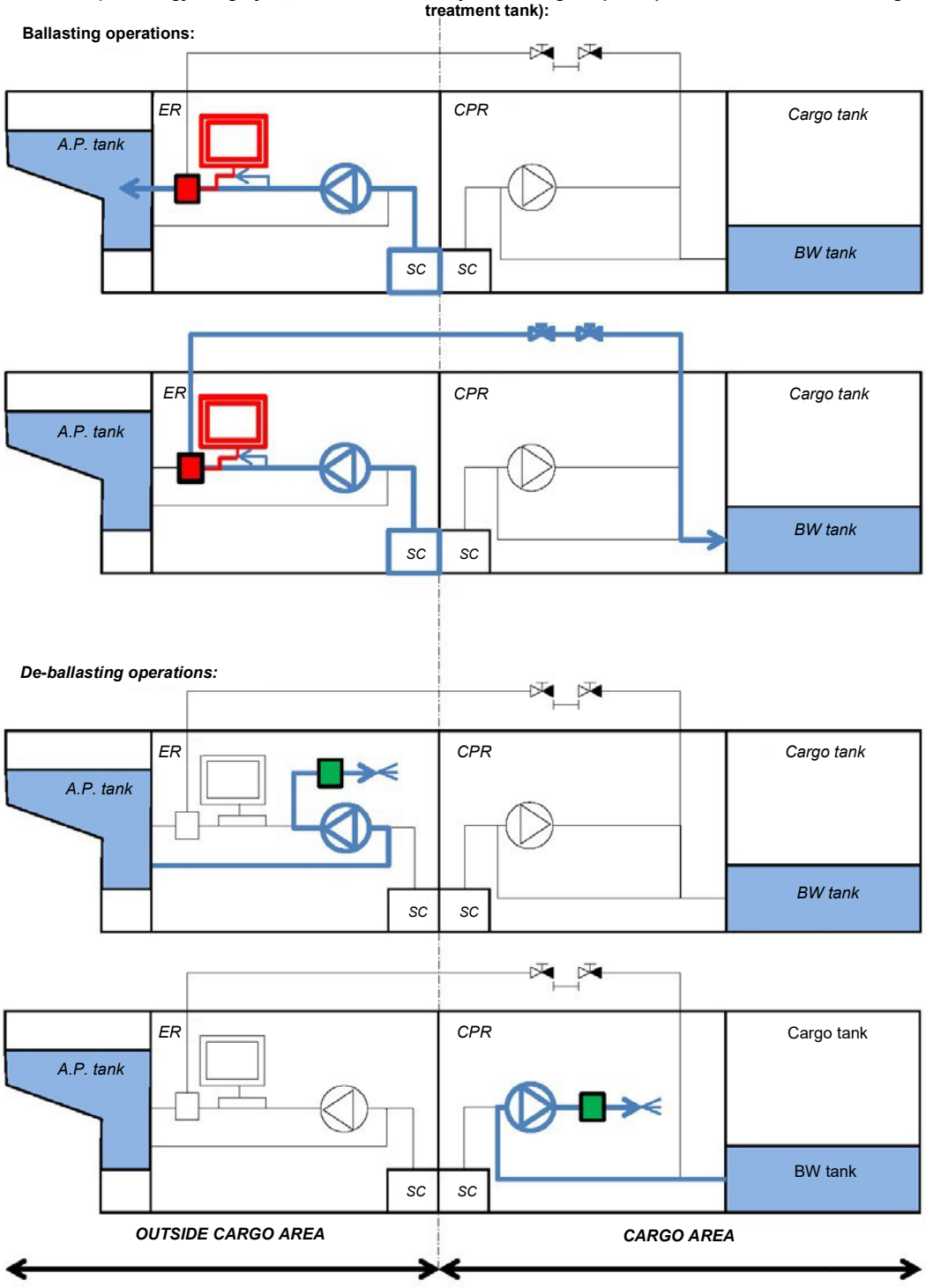


Fig. 1.1-8

S y m b o l s :

CPR — cargo pump room;

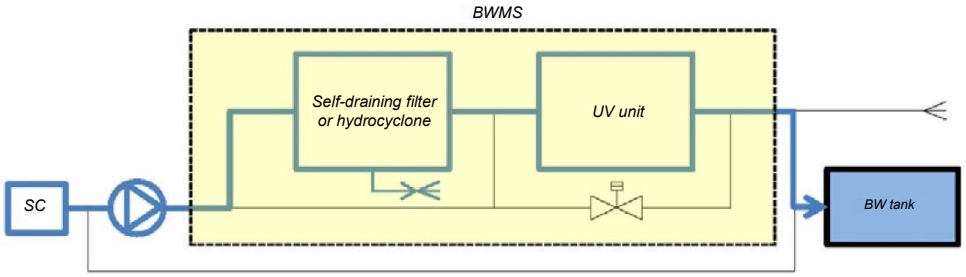
SC — sea chest;

ER — engine room

BWMS TECHNOLOGIES CATEGORIZATION

BWMS Technology Group No. 1.
In-line UV
including UV + AOT
including UV+TiO_2

Ballasting operations:



De-ballasting operation:

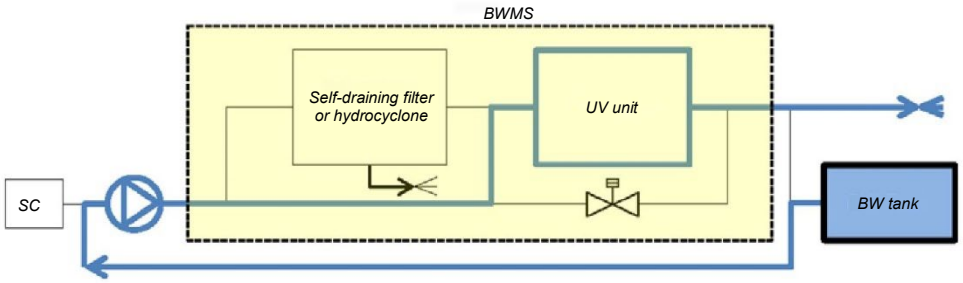
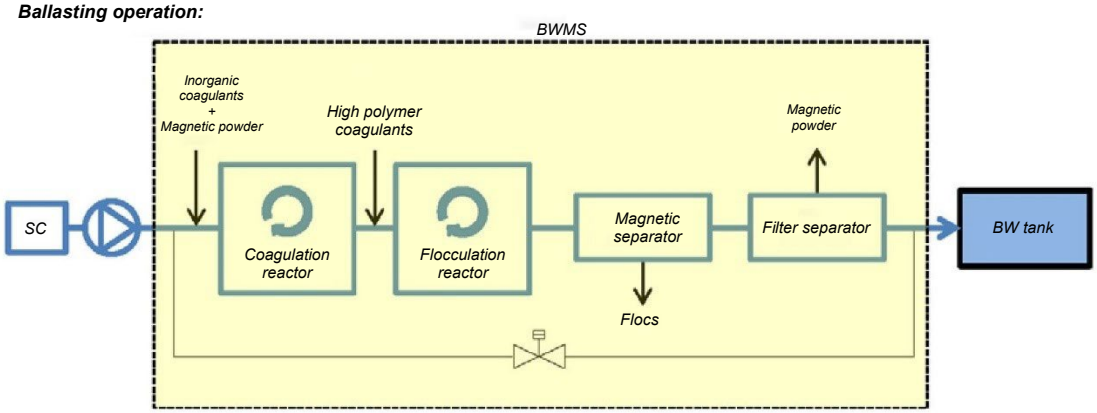


Fig. 1.2-1
S y m b o l :
SC — sea chest

BWMS Technology Group No. 2.
In-line flocculation

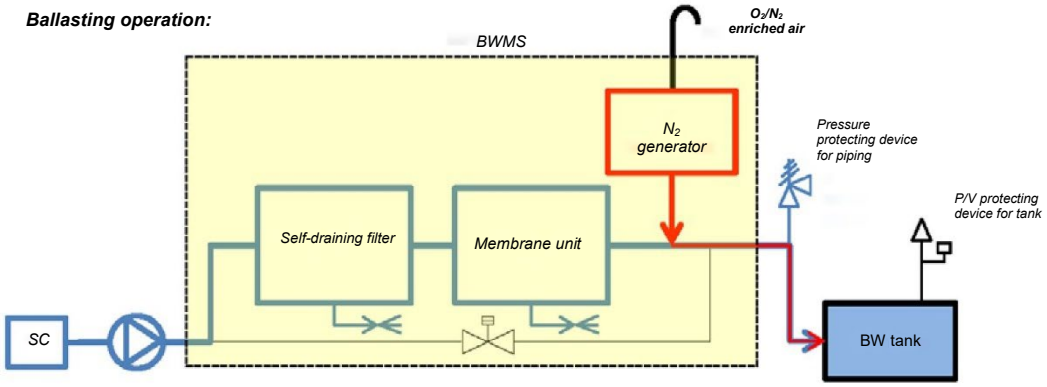
Ballasting operation:



De-ballasting operation: no requirement for after-treatment

Fig. 1.2-2
S y m b o l :
SC — sea chest

BWMS Technology Group No. 3*a*.
In-line membrane separation and de-oxygenation
(injection of N_2 from N_2 generator)

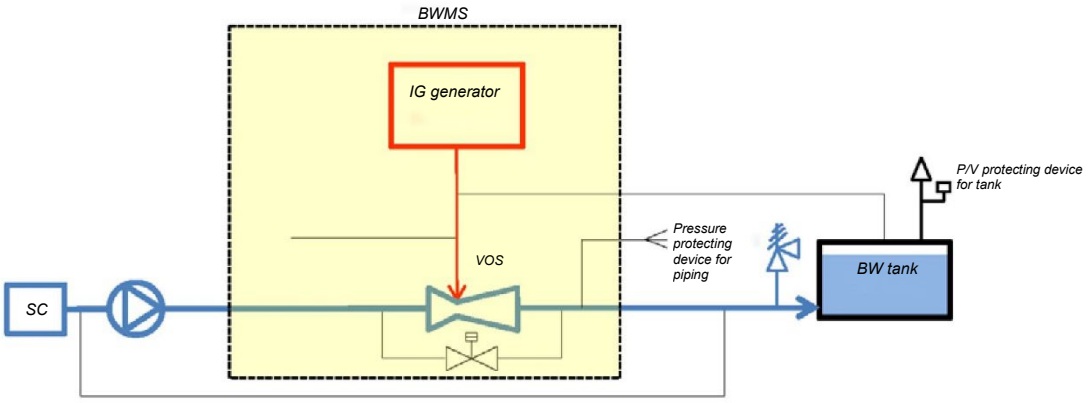


De-ballasting operation: no requirements for after-treatment

Fig. 1.2-3
S y m b o l :
SC — sea chest

BWMS Technology Group No. 3*b*.
In-line de-oxygenation
(Injection of N_2 from either an oil fired inert gas generator or inert gas from treatment of the flue gas from main or auxiliary boilers)

Ballasting operation:



De-ballasting operation:

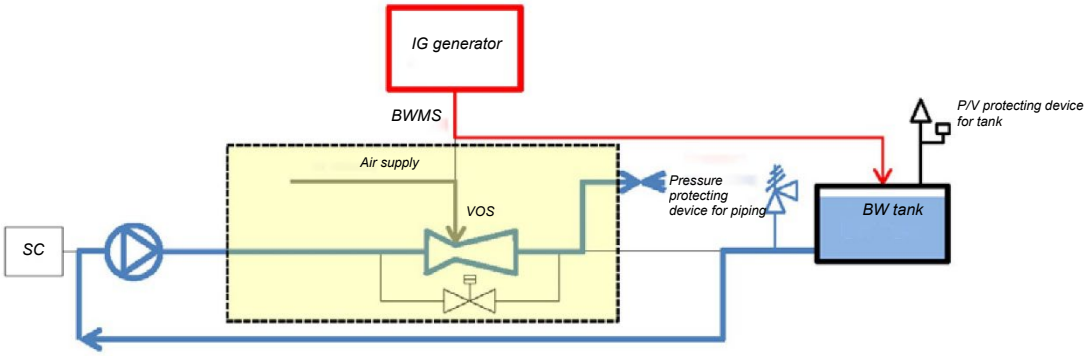


Fig. 1.2-4

S y m b o l :
SC — sea chest

VOS – venturi oxygen stripping

BWMS Technology Group No. 3*c*.
In-tank de-oxygenation with IGG

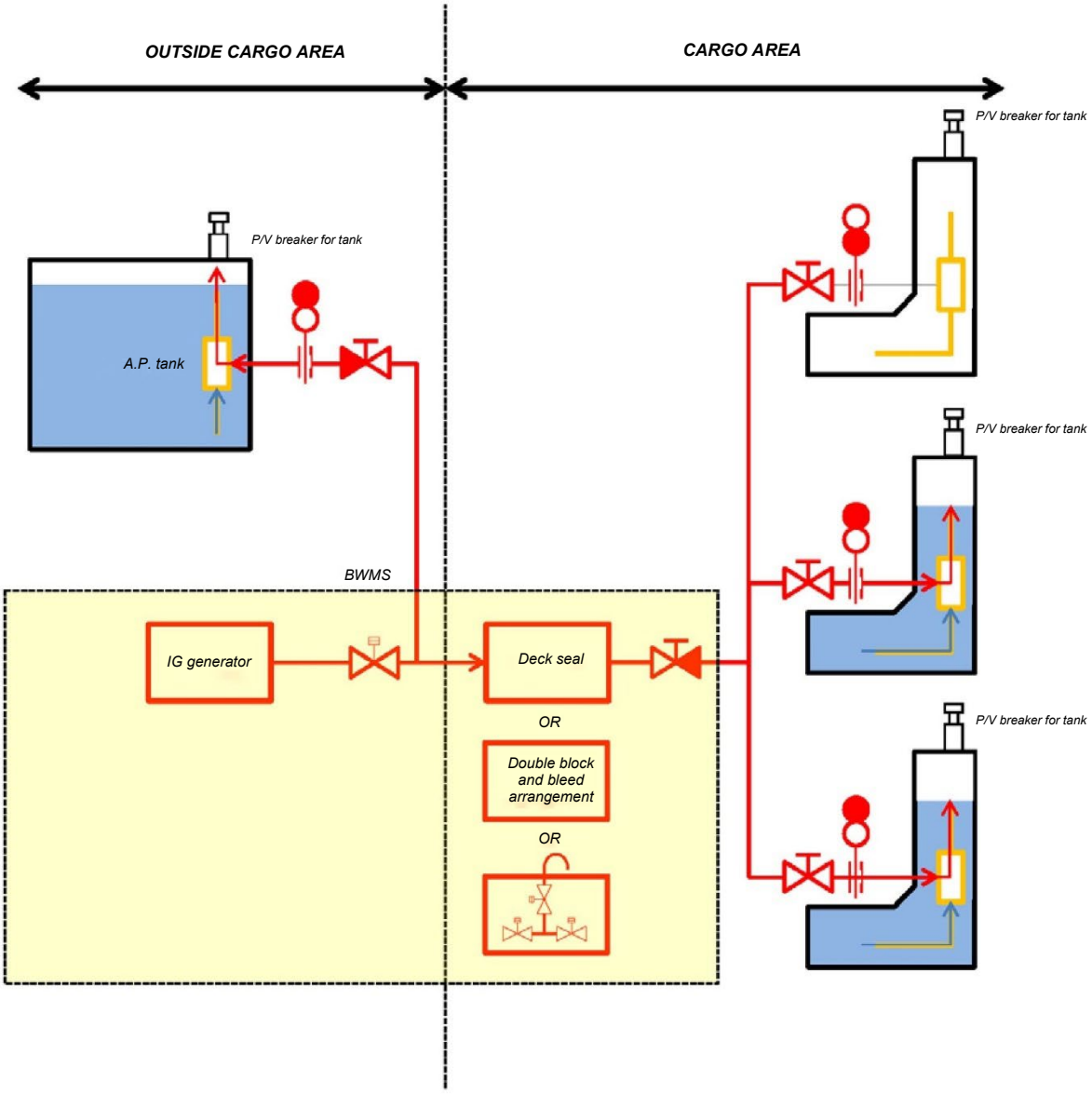
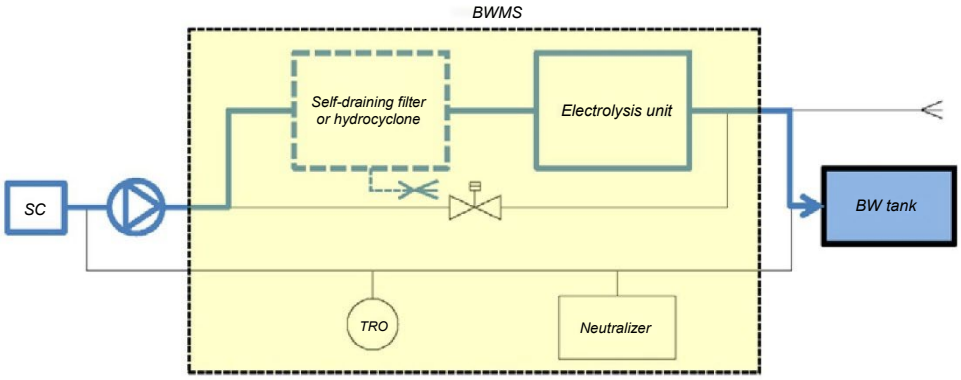


Fig. 1.2-5

BWMS Technology Group No. 4.
In-line full flow electrolysis

Ballasting operation:



De-ballasting operation:

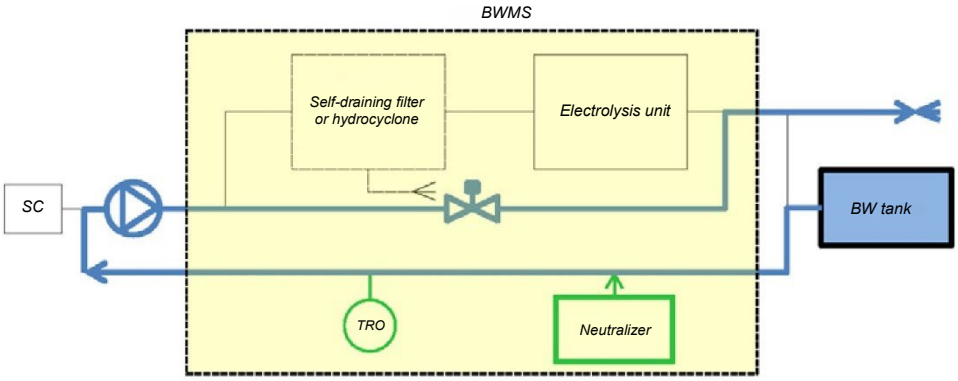
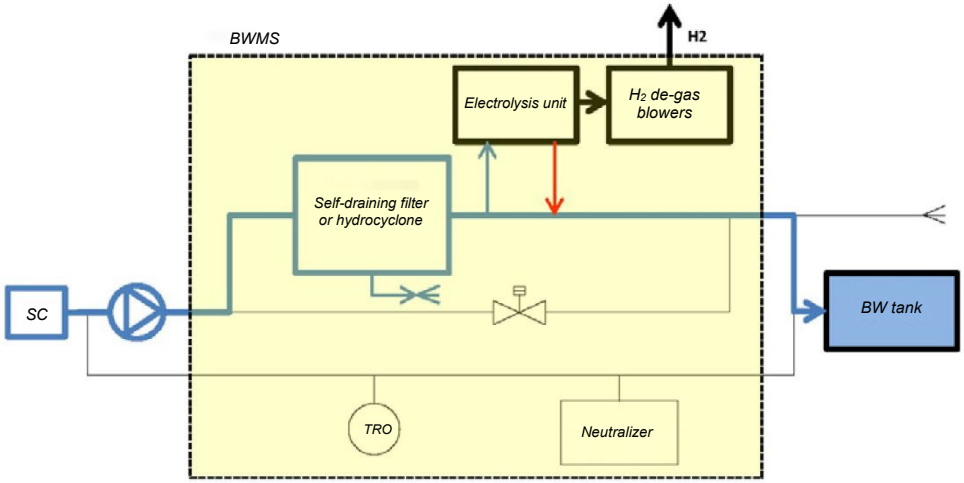


Fig. 1.2-6
S y m b o l :
SC — sea chest
TRO – total residual oxidant

BWMS Technology Group No. 5.
In-line side-stream electrolysis (electro-chlorinization)

N o t e . In-line side-stream electrolysis may also be applied in-tank in circulation mode (no treatment when ballasting or de-ballasting)

Ballasting operation:



De-ballasting operation:

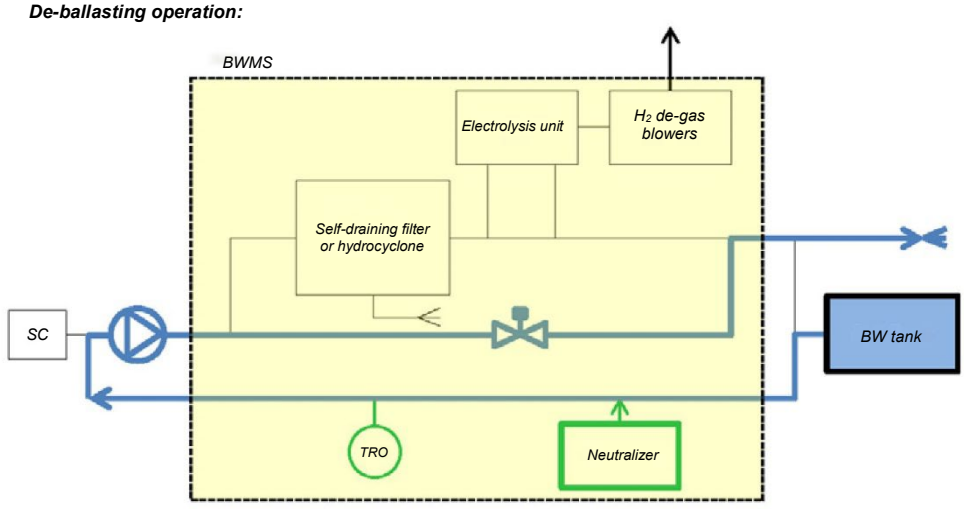
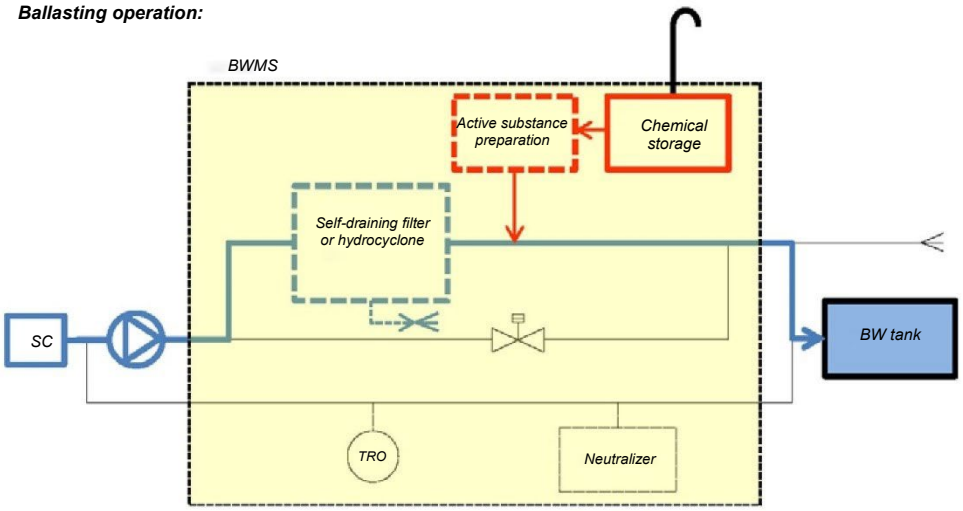


Fig. 1.2-7
S y m b o l :
SC — sea chest
TRO – total residual oxidant

BWMS Technology Group No. 6.
In-line chemical injection

Ballasting operation:



De-ballasting operation (when neutralization is required by the Type Approval Certificate):

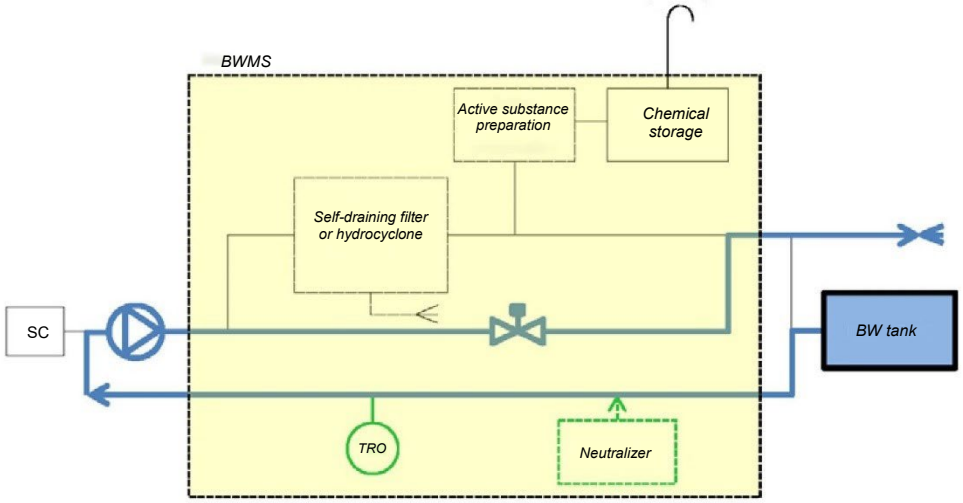


Fig. 1.2-8
S y m b o l :
SC — sea chest
TRO – total residual oxidant

BWMS Technology Group No. 7*a*.
In-line side-stream ozone injection without gas/liquid separation tank and without discharge water treatment tank

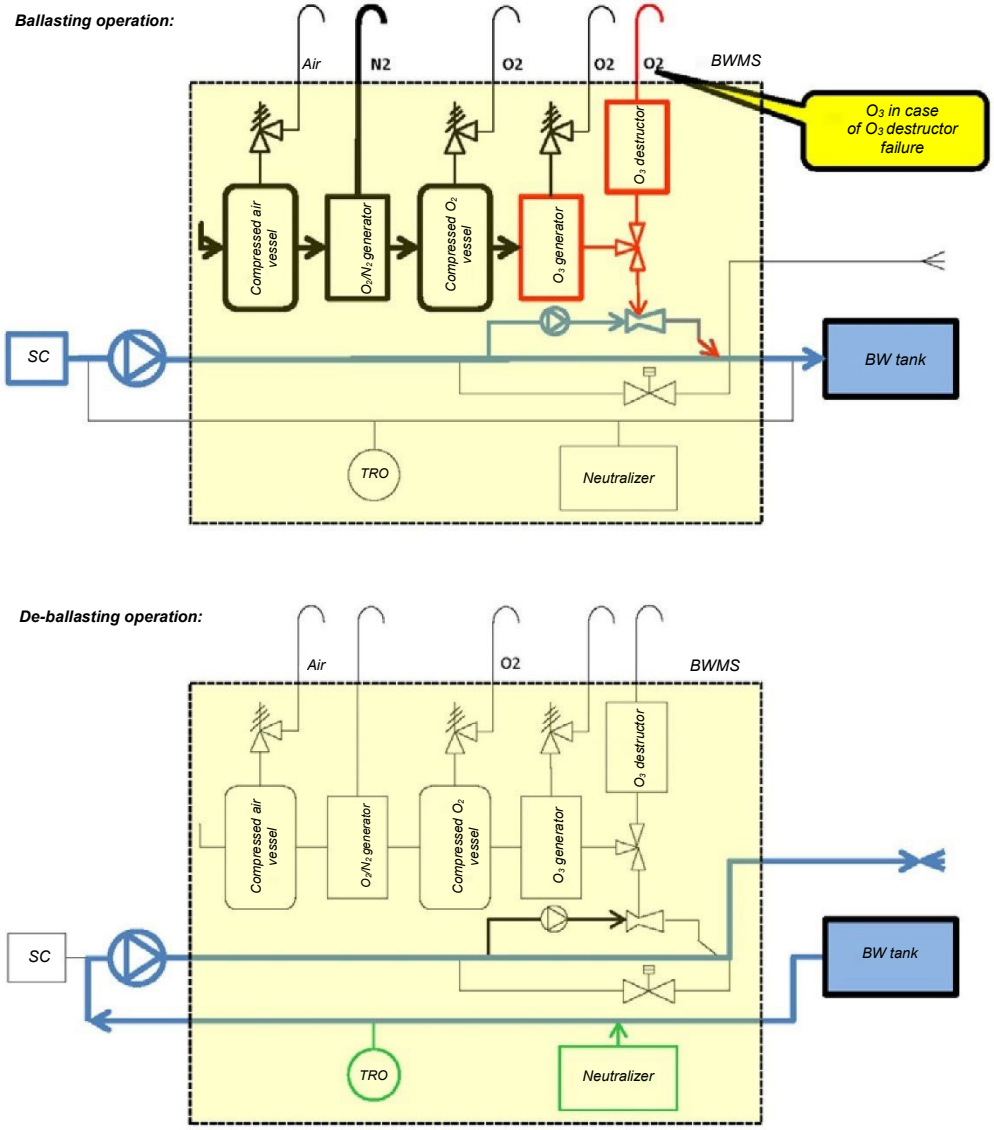


Fig. 1.2-9
S y m b o l :
SC — sea chest
TRO – total residual oxidant

BWMS Technology Group No. 7*b*.
In-line side-stream ozone injection with gas/liquid separation tank and with discharge water treatment tank

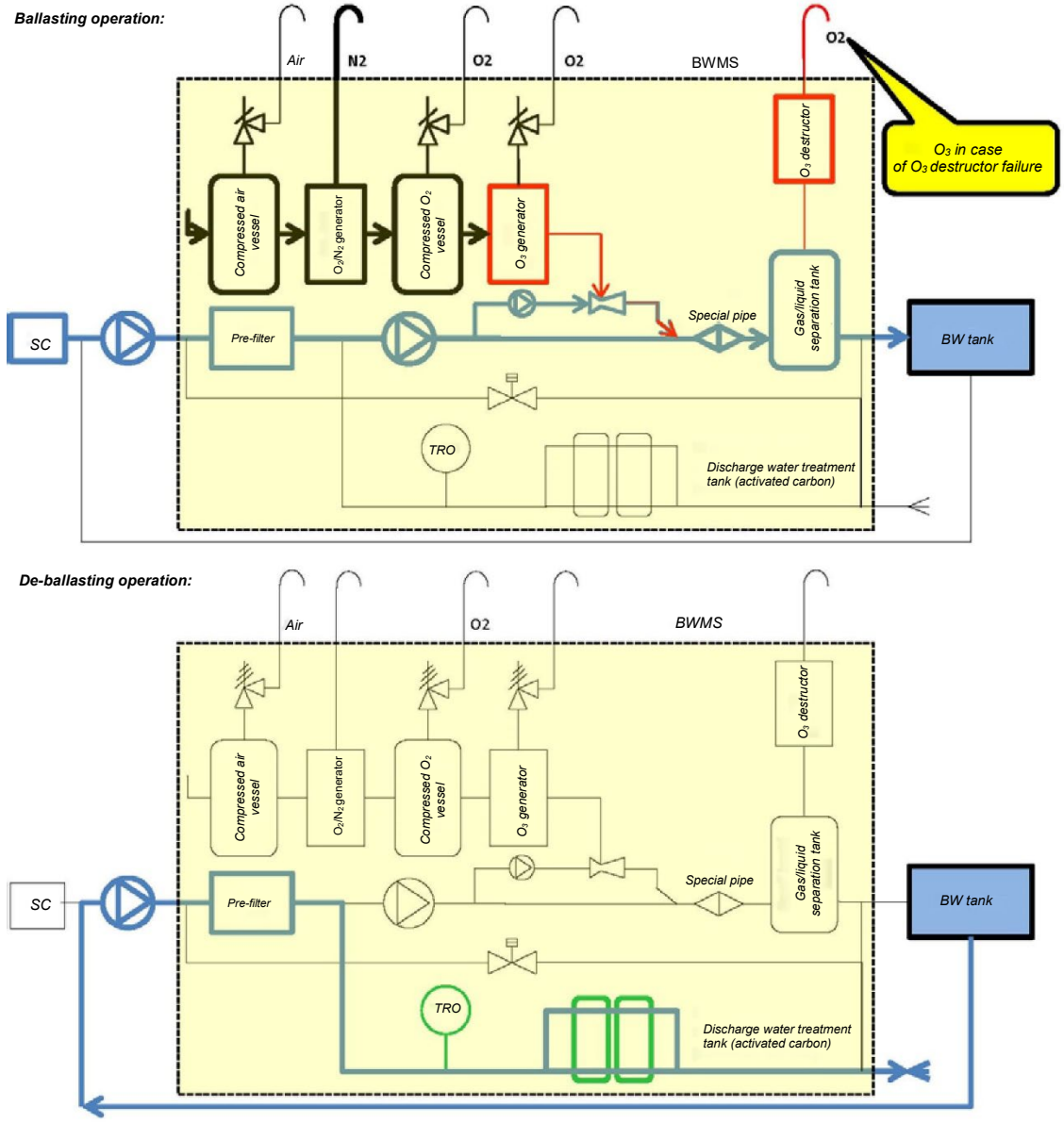


Fig. 1.2-10
S y m b o l :
SC — sea chest
TRO – total residual oxidant

BWMS Technology Group No. 8.
In-tank pasteurization + de-oxygenation with N_2 generator

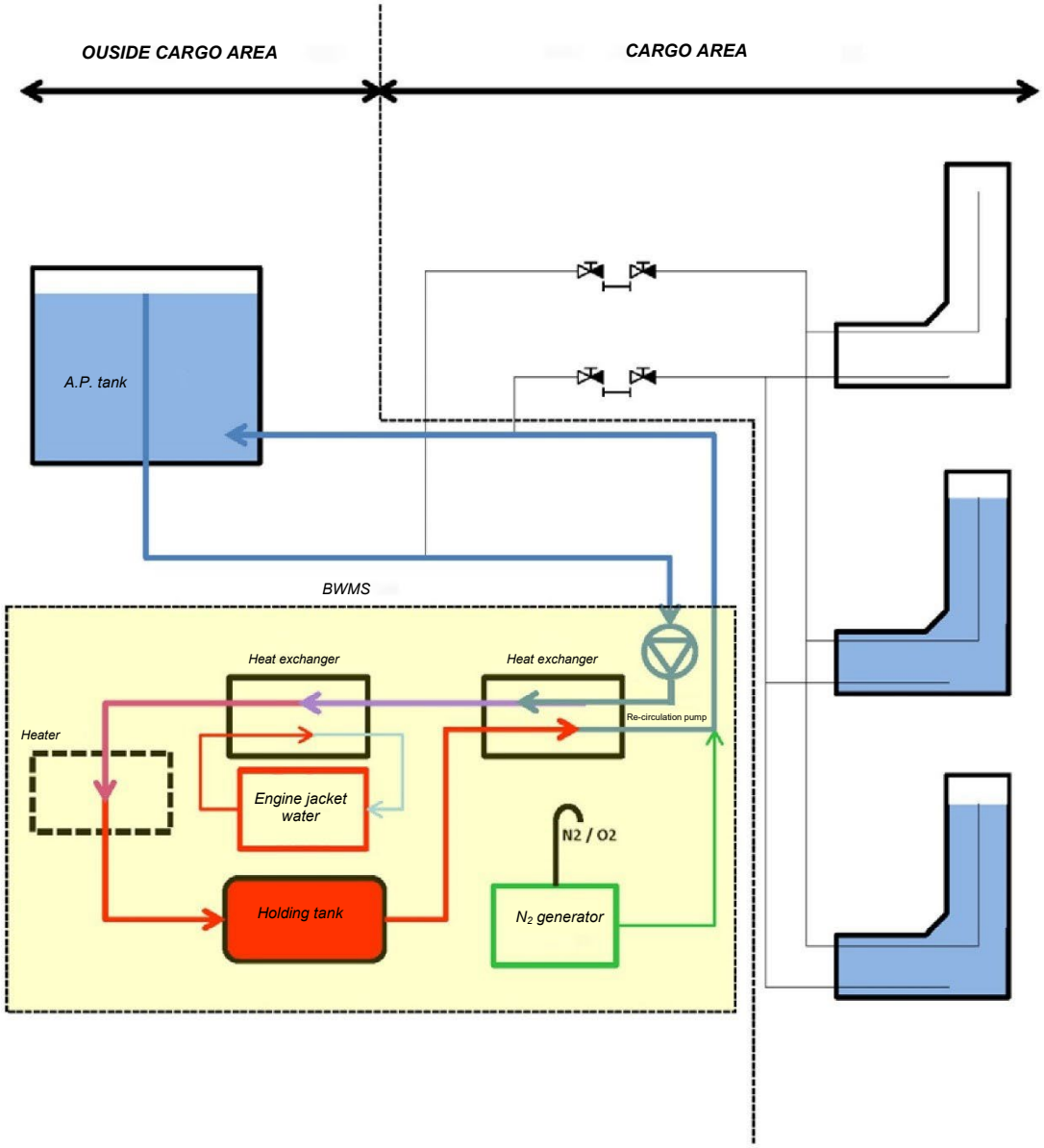


Fig. 1.2-11".