22-471

RULES FOR BALLAST WATER MANAGEMENT INSTALLATIONS

GUIDANCE FOR BALLAST WATER MANAGEMENT INSTALLATIONS

Rules for Ballast Water Management Installations

2022 AMENDMENT NO.1

Guidance for Ballast Water Management Installations

2022 AMENDMENT NO.1

Rule No.49 / Notice No.35 30 June 2022

Resolved by Technical Committee on 26 January 2022

ClassNK

NIPPON KAIJI KYOKAI

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

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RULES

2022 AMENDMENT NO.1

Rule No.49 30 June 2022

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Rule No.49 30 June 2022
AMENDMENT TO THE RULES FOR BALLAST WATER MANAGEMENT INSTALLATIONS

"Rules for ballast water management installations" has been partly amended as follows:

Amendment 1-1

Part 2 SURVEYS

Chapter 2 REGISTRATION SURVEYS

2.1 Registration Surveys during Construction

Paragraph 2.1.1 has been amended as follows.

2.1.1 General

1 At Registration Surveys during Construction, the ballast water management installations and their workmanship are to be examined in detail in order to ascertain that they meet the relevant requirements in each Part of the Rules.
2 Surveyors are to confirm that materials which contain asbestos are not being used.

2.1.2 Submission of Plans and Documents for Approval*

Sub-paragraph -2(4) has been added as follows.

2 The following documents are to be submitted to the Society for reference, in addition to the approval plans and documents specified in the preceding **-1**. The document specified in **(2)** is to be submitted before onboard testing.
((1) to (3) are omitted.)
(4) Asbestos-free declarations and supporting documents.

2.1.3 Inspections of Equipment*

Sub-paragraph -2 has been amended as follows.

2 For ships conducting the ballast water management specified in **Chapter 3, Part 3 of the Rules**, the following inspections are to be carried out:
(1) Confirmation that installations for ballast water treatment (ballast water management system, ballast pump and ballast piping, etc.) are located in their proper positions based upon approved drawings;
(2) Confirmation that the *BWMS* is in good working order (in principle, includes operation tests associated with ballasting and de-ballasting at rated capacity);
(3) Confirmation that any consumables such as active substances and preparations necessary for conducting ballast water treatment are provided on board under appropriate controls;
(4) Confirmation that the *BWMS* is the same as that listed on the certificate for type approval specified in **2.1.2-2(1)**;
(5) For *BWMS* which make use of active substances or preparations, confirmation that the type of said *BWMS* complies with **3.3-1(2), Part 3 of the Rules**;
(6) Confirmation that the recording devices for control and monitoring equipment are operable and that sufficient supply of any consumables necessary for the recording devices is provided

on board;

(7) For *BWMS* generating by-products such as sediments, dedicated installations to store such by-products are provided on board; ~~and~~

(8) The workmanship of the installation is satisfactory and, in particular, that any bulkhead penetrations or penetrations of the ballast system piping are to the relevant approved standards; ~~and~~

(9) The installation commissioning procedures have been completed~~.~~;

(10) For ships that complete their registration surveys on or after 1 June 2022, ~~the sampling and analysis of ballast water~~ commissioning testing of the ballast water management system (*BWMS*) has been completed~~.~~ by service suppliers accepted by the Administration or approved by the Society in accordance with the **Rules for Approval of Manufacturers and Service Suppliers**; and

(11) Other inspections deemed necessary by the Society.

Chapter 3 REGISTRATION MAINTENANCE SURVEYS

3.1 Annual Surveys

3.1.2 Inspections of Equipment

Sub-paragraph -3 has been added as follows.

3 For ships undergoing any installation, change, or replacement of their *BWMS*, the surveys described in **2.1.3** are to be carried out. For ships whose completion dates for such surveys are on or after 1 June 2022, the confirmation inspection required by **2.1.3-2(10)** is to be included therein.

Chapter 4 OCCASIONAL SURVEYS

Section 4.1 has been amended as follows.

4.1 ~~General~~ Occasional Surveys*

4.1.1 General

1 At Occasional Surveys, inspections are to be carried out on the relevant items of the requirements specified in **3.1.2** and **3.1.3**. In addition, Registration Surveys for such installations are to be carried out mutatis mutandis according to the degree of repairs or modifications made to the ballast water management installation and its relevant equipment. To implement the survey, in lieu of the traditional ordinary surveys where a surveyor is in attendance, the Society may approve survey methods which it considers to be appropriate.

2 For ships undergoing any installation, change, and replacement of their *BWMS*, the Occasional Surveys described in **2.1.3** are to be carried out.

3 For ships carrying out the Occasional Surveys described in **2.1.3** according to **-2** above for which the completion date is on or after 1 June 2022, the confirmation inspection required by **2.1.3-2(10)** is to be included therein.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2022.

Amendment 1-2

Part 1 GENERAL

Chapter 2 TERMINOLOGY AND ABBREVIATIONS

2.1 General

Paragraph 2.1.1 has been amended as follows.

2.1.1 Terminology (*Article* 1 of *BWM Convention* and *Regulation* A-1 of *Annex*)

For the purpose of the Rules, the following definitions apply unless otherwise stated in each part:

((1) to (12) are omitted.)

(13) "Ballast water management system" (*BWMS*) means any system which processes ballast water such that it meets or exceeds the ballast water performance standards given in **3.2, Part 3 of the Rules**. The *BWMS* includes ballast water ~~treatment~~ equipment, all associated ~~control equipment, monitoring equipment~~ piping arrangements as specified by the manufacturer, control and monitoring equipment and sampling facilities. In addition, *BWMS* does not include ship ballast water fittings (piping, valves, pumps, etc.) that are required when a *BWMS* is not fitted (i.e. where *IMO Res. MEPC.*279(70) "*2016 Guidelines for Approval of Ballast Water Management Systems (G8)*" or the *BWMS Code* is applicable).

((14) to (18) are omitted.)

~~(19) "Dangerous gas" means any gas which may develop an explosive and/or toxic atmosphere being hazardous to the crew and/or the ship, e.g. hydrogen (H_2), hydrocarbon gas, ozone (O_3), chlorine (Cl_2) and chlorine dioxide (ClO_2), etc.~~

~~(20) "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 equipment. When a gas atmosphere is present, the following hazards may also be present: toxicity, asphyxiation, corrosivity and reactivity. Hazardous area classification is to be in accordance with **4.2.3, Part H of the Rules for the Survey and Construction of Steel Ships.**~~

~~(21) "Dangerous liquid" means any liquid that is identified as hazardous in the Material Safety Data Sheet (*MSDS*) or other documentation relating to this liquid.~~

(~~22~~19) "Ballast ~~w~~Water ~~m~~Management ~~p~~Plan" means the plan referred to in **Chapter 4, Part 3 of the Rules** describing the ballast water management process and procedures implemented on board individual ships.

~~(23) "Ballast water management system" (*BWMS*) means any system which processes ballast water such that it meets or exceeds the ballast water performance standards given in **3.2, Part 3 of the Rules**. The *BWMS* includes ballast water treatment equipment, all associated control equipment, piping arrangements as specified by the manufacturer, control and monitoring equipment and sampling facilities. Also, *BWMS* does not include the ship's ballast water fittings, which may include piping, valves, pumps, etc., that would be required if the *BWMS* was not fitted. (Where *IMO Res. MEPC.*279(70) "*2016 Guidelines for Approval of Ballast Water Management Systems (G8)*" or the *BWMS Code* is applicable.)~~

(2~~4~~0) "Control and monitoring equipment" means the equipment installed for the effective operation and control of the *BWMS* and the assessment of its effective operation.

(2~~5~~1) "System Design Limitations of a *BWMS* (hereinafter referred to as "*SDL*")" means the

limitations specified in **11.1.2(16), Part 2 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

(26~~5~~2) "*BWMS Code*" means the "Code for Approval of Ballast Water Management Systems", adopted by ~~the~~ Resolution *MEPC.*300(72), as may be amended by the *IMO*, provided that such amendments are adopted and brought into force in accordance with Article 19 of the *BWM* Convention relating to amendment procedures applicable to the annex.

Part 4 has been added as follows.

Part 4 REQUIREMNETS FOR BALLAST WATER MANAGEMENT SYSTEM INSALLATION

Chapter 1 GENERAL

1.1 General

1.1.1 Application

This part applies to ships subject to **3.3, Chapter 3**.

1.1.2 Other

Compliance with additional requirements may be required when deemed necessary by the Society.

Chapter 2 ARRAGEMENT, PIPING, ELECTRICAL INSTALLATIONS, ETC.

2.1 General

2.1.1 Terminology

The following definitions apply throughout this chapter.

(1) "Ballast water management system" (*BWMS*) means the definition given in **2.1.1(13), Part 1**. The categorisation of *BWMS* technology is as given in **Table 2.1.1-1**. The meaning of "category" as specified in this chapter is the *BWMS* technology category given in **Table 2.1.1-1**. In addition, the applicability of requirements to *BWMS* technology is as given in **Table 2.1.1-2**, and supplemental *BWMS* technology information is given in **Fig. 2.1.1-1**.

(2) "Cargo area of tankers" means the following:

(a) For tankers, the areas defined in **1.2.1 and 3.2.6, Part R of the Rules for the Survey and Construction of Steel Ships**.

(b) For chemical tankers, the area defined in **1.3.1(4), Part S of the Rules for the Survey and Construction of Steel Ships**.

(c) For gas carriers, the area defined in **1.1.5(6), Part N of the Rules for the Survey and Construction of Steel Ships**.

(d) For offshore support vessels, the area defined in paragraph 1.3.1 of *IMO* Resolution *A*.673(16) (as amended by Resolution *MSC*.236(82)) or paragraph 1.2.7 of the *IMO* Resolution *A*.1122(30), as applicable.

(3) "Dangerous gas" means any gas which may develop an atmosphere that is hazardous to the ship or its crew due to concerns related to flammability, explosivity, toxicity, asphyxia, corrosivity or reactivity (e.g. hydrogen (H_2), hydrocarbon gas, oxygen (O_2), carbon dioxide (CO_2), carbon monoxide (CO), ozone (O_3), chlorine (Cl_2) and chlorine dioxide (ClO_2), etc.) and for which due consideration of the hazard is required,

(4) "Dangerous liquid" means any liquid that is identified as hazardous in the Material Safety Data Sheet (*MSDS*) or other documentation relating to the liquid.

(5) "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 apparatuses. When such a gas atmosphere is present, the following hazards may also be present: toxicity, asphyxia, corrosivity and reactivity. Hazardous area classification is to be in accordance with **4.2.3, Part H of the Rules for the Survey and Construction of Steel Ships**.

(6) "Non-hazardous area" means an area which is not a hazardous area as defined in **(5)** above.

Table 2.1.1-1 *BWMS* Technology Categorisation

BWMS technology category →		1	2	3a	3b	3c	4	5	6	7a	7b	8
Characteristics ↓		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 N2 from N2 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 (2)	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 pasteurisation and de-oxygenation with N2 generator
Des-infection 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 neutraliser						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 **2.1.1(3)**			(1)	O_2 N_2	CO_2 CO		H_2 Cl_2	H_2 Cl_2	(1)	O_2 O_3 N_2		O_2 N_2

Notes

1 To be investigated on a case-by-case basis based on the result of the *IMO (GESAMP) MEPC* report for basic and final approval.

2 In-line side-stream electrolysis may also be applied in-tank in the circulation mode (no treatment when ballasting or de-ballasting).

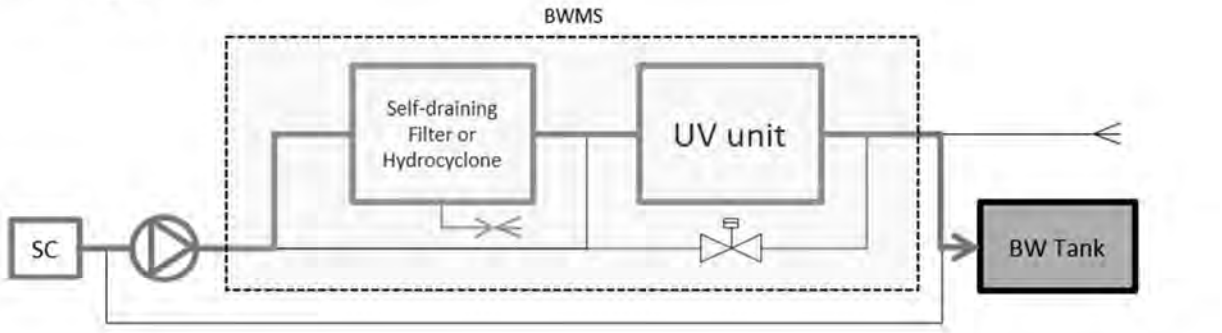
Table 2.1.1-2 Applicability of the Requirements for Each *BWMS* Technology

BWMS technology category →	1	2	3a	3b	3c	4	5	6	7a	7b	8
Requirements ↓	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 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 pasteurisation and de-oxygenation with N_2 generator
2.2.1	x	x	x	x	x	x	x	x	x	x	x
2.2.2			x	x	x						x
2.2.3-1 and -2.				x	x				x	x	
2.2.3-1 and -3 to -6						x	x	x			
2.2.3-7 and -8	x	x	x	x		x	x	x	x	x	
2.2.3-9 to -14	x	x	x	x	x	x	x	x	x	x	x
2.2.3-15 to 2.2.3-17	x	x	x	x		x	x	x	x	x	
2.2.4-1(1)		x	x			x	x	x	x	x	x
2.2.4-1(2)			x	x	x				x	x	x
2.2.4-1(3)									x	x	
2.2.4-1(4)						x	x	x	x	x	
2.2.4-1(5)						x	x	x			
2.2.4-1(6)			x	x	x				x	x	x
2.2.4-2(1) to (7)		x	x	x	x	x	x	x	x	x	x
2.2.4-2(8)			x			x	x	x	x	x	x
2.2.4-2(9) and (11)			x			x	x	x	x	x	x
2.2.4-2(10)			x						x	x	x
2.2.4-3		x				x	x	x	x	x	
2.2.4-4						x	x	x	x	x	
2.2.5				x						x	

Fig.2.1.1-1 Supplemental *BWMS* Technology Information

Fig. 2.1.1-1(1) *BWMS* Technology Group 1:
In-line UV, UV + AOT, UV+TiO_2 or UV+Plasma

Ballasting operation:



De-ballasting operation:

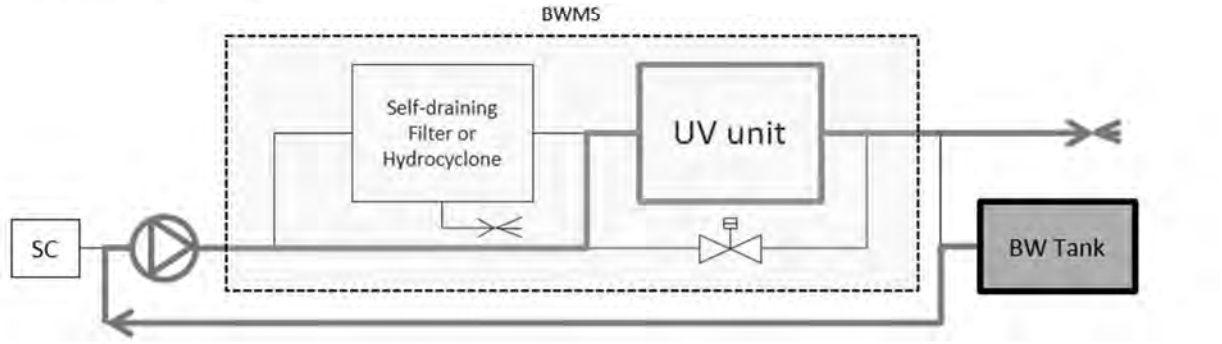


Fig. 2.1.1-1(2) *BWMS* Technology Group. 2:
In-line Flocculation

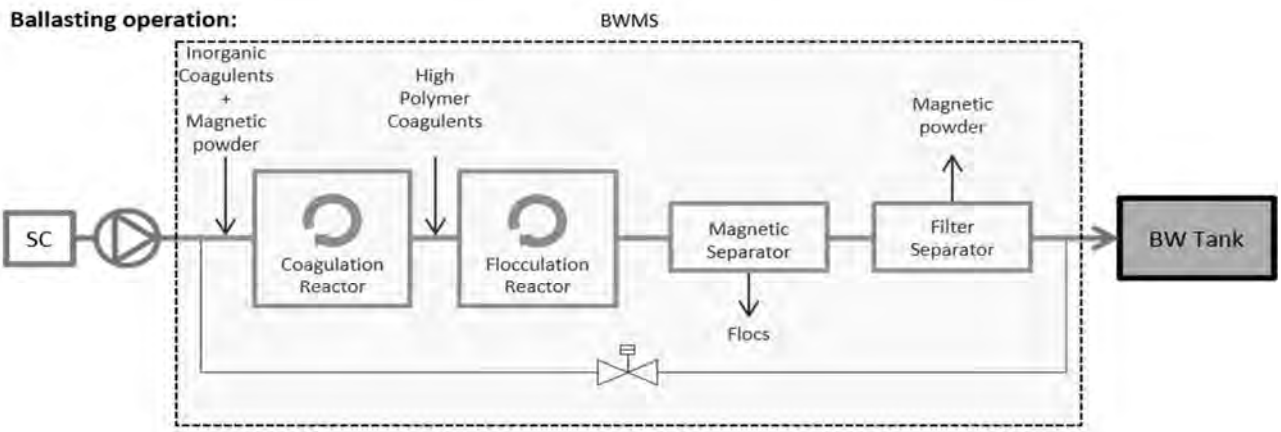


Fig. 2.1.1-1(3) *BWMS* Technology Group 3a:
In-line Membrane Separation and De-oxygenation (Injection of N_2 from N_2 Generator)

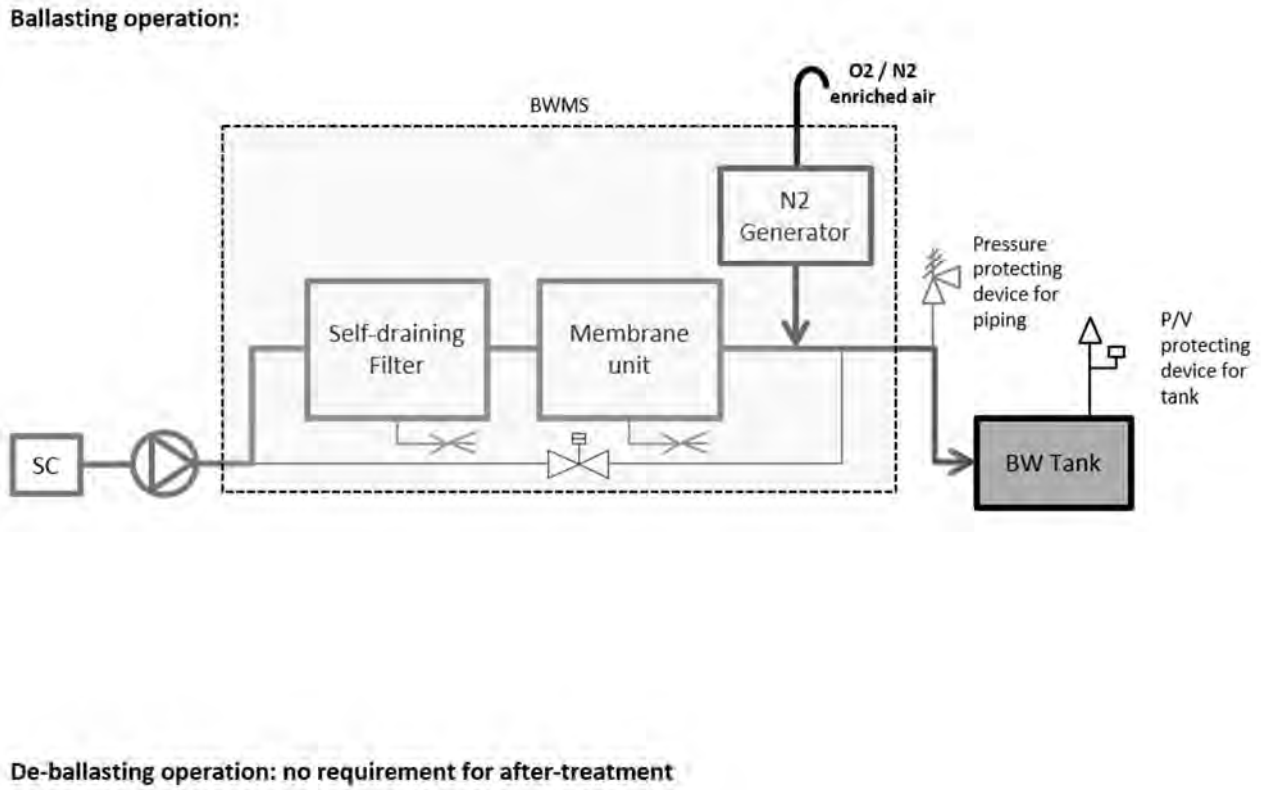


Fig. 2.1.1-1(4) *BWMS* Technology Group 3b:
In-line De-oxygenation (Injection of Inert Gas from either an Oil-fired Inert Gas Generator or Inert Gas from Treatment of the Flue Gas from Main or Auxiliary Boilers)

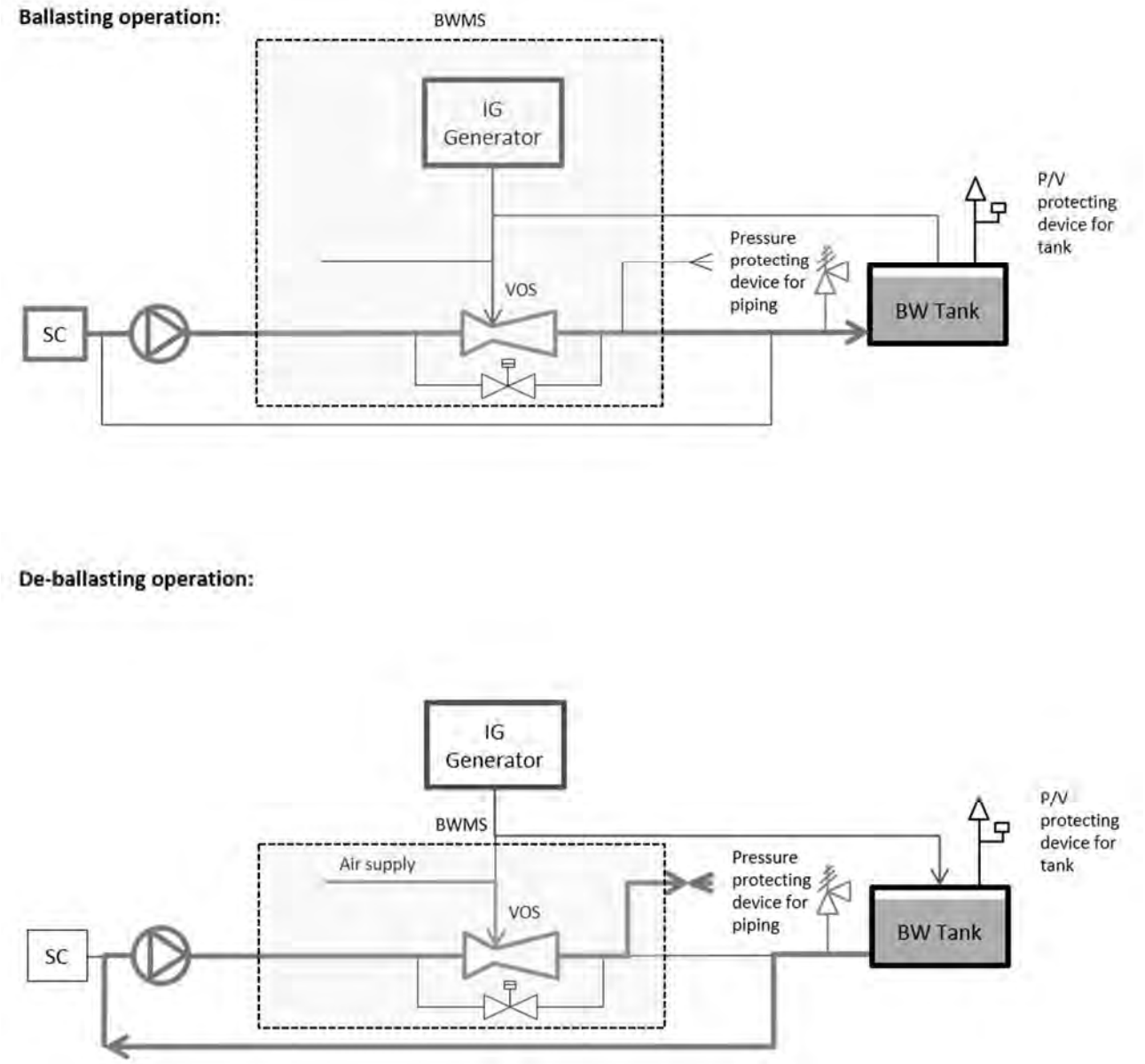


Fig. 2.1.1-1(5) *BWMS* Technology Group 3c:
In-tank De-oxygenation with IGG

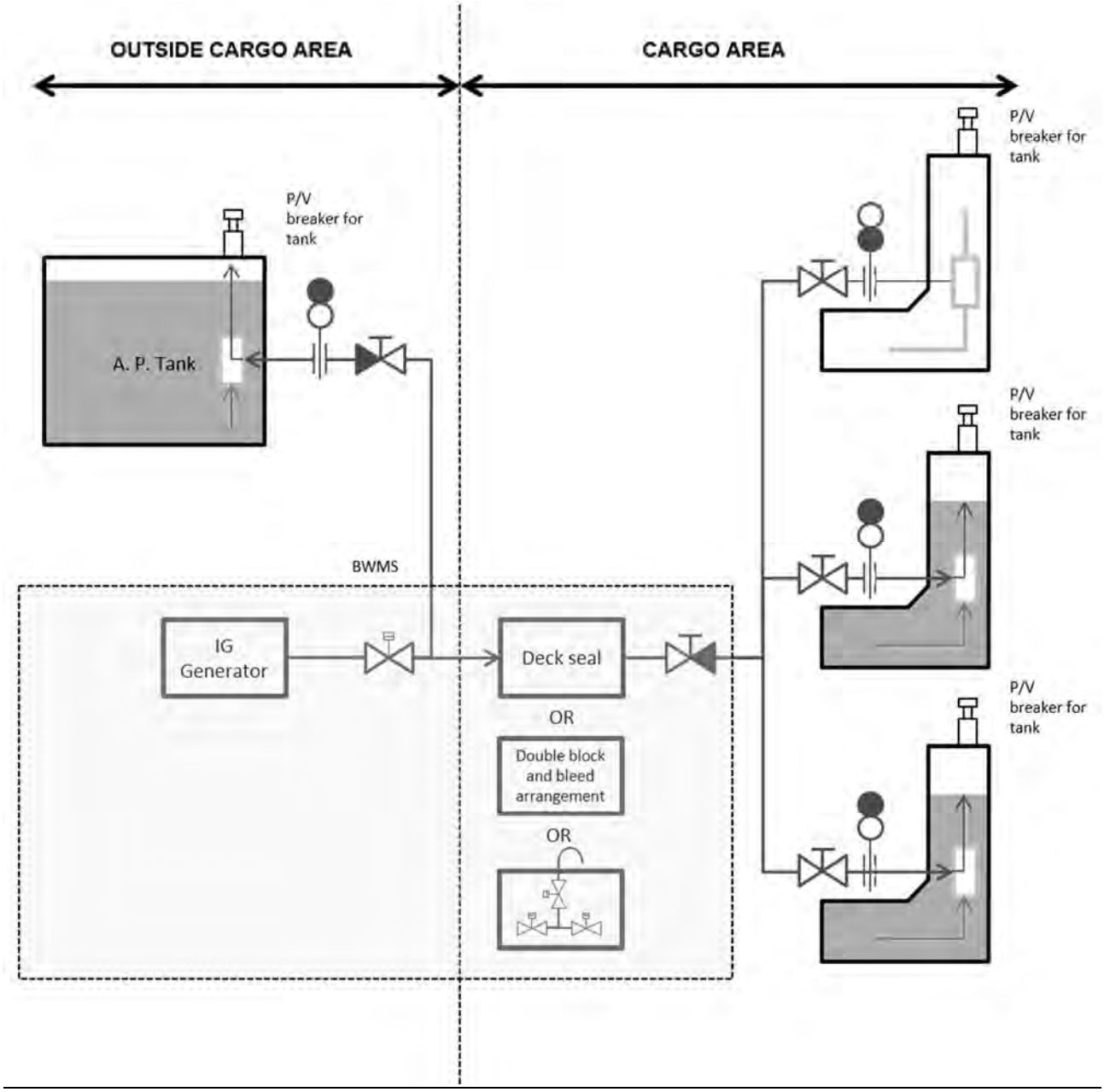
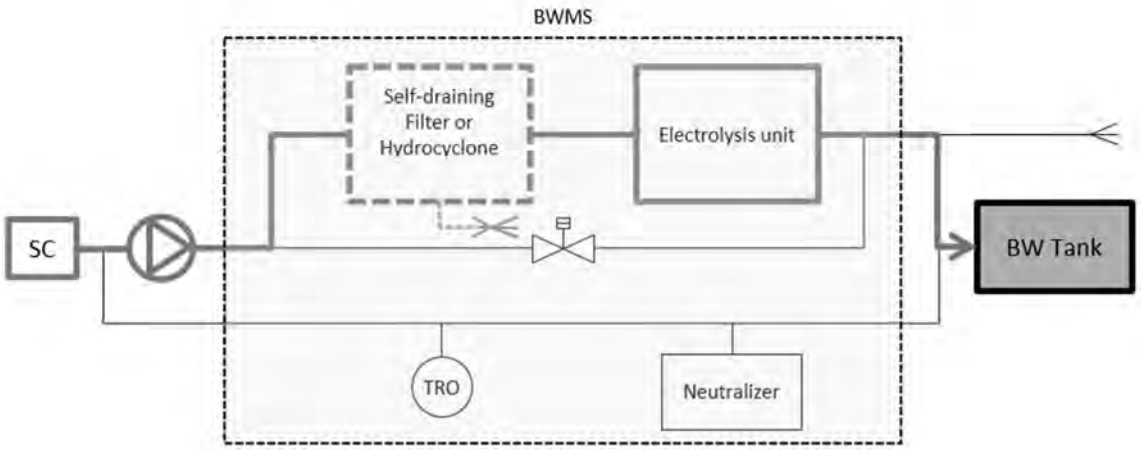


Fig. 2.1.1-1(6) *BWMS* Technology Group 4:
In-tank De-oxygenation with IGG

Ballasting operation:



De-ballasting operation:

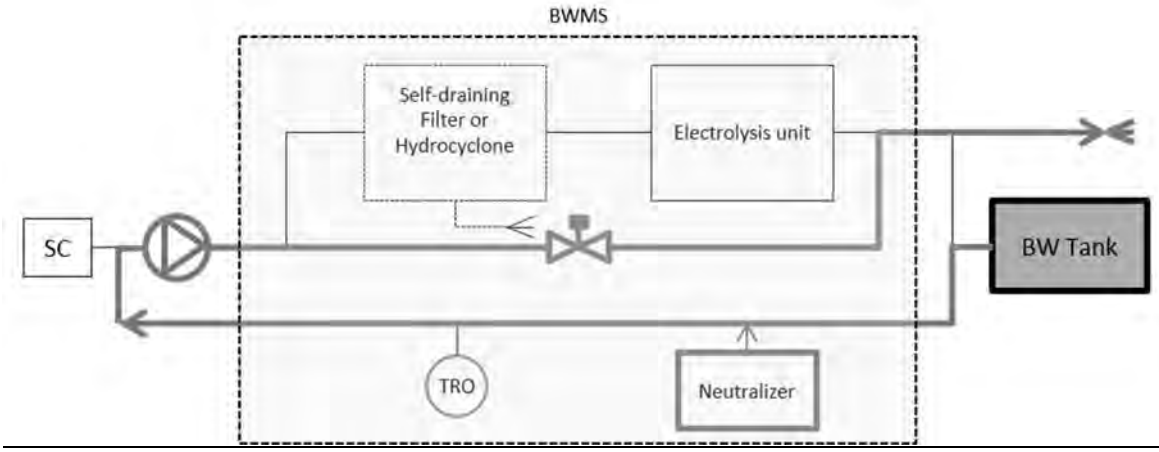


Fig. 2.1.1-1(7) *BWMS* Technology Group 5:
In-line Side-stream Electrolysis (Electro-chlorinisation)

Note: In-line side-stream electrolysis may also be applied in-tank in the circulation mode (no treatment when ballasting or de-ballasting)

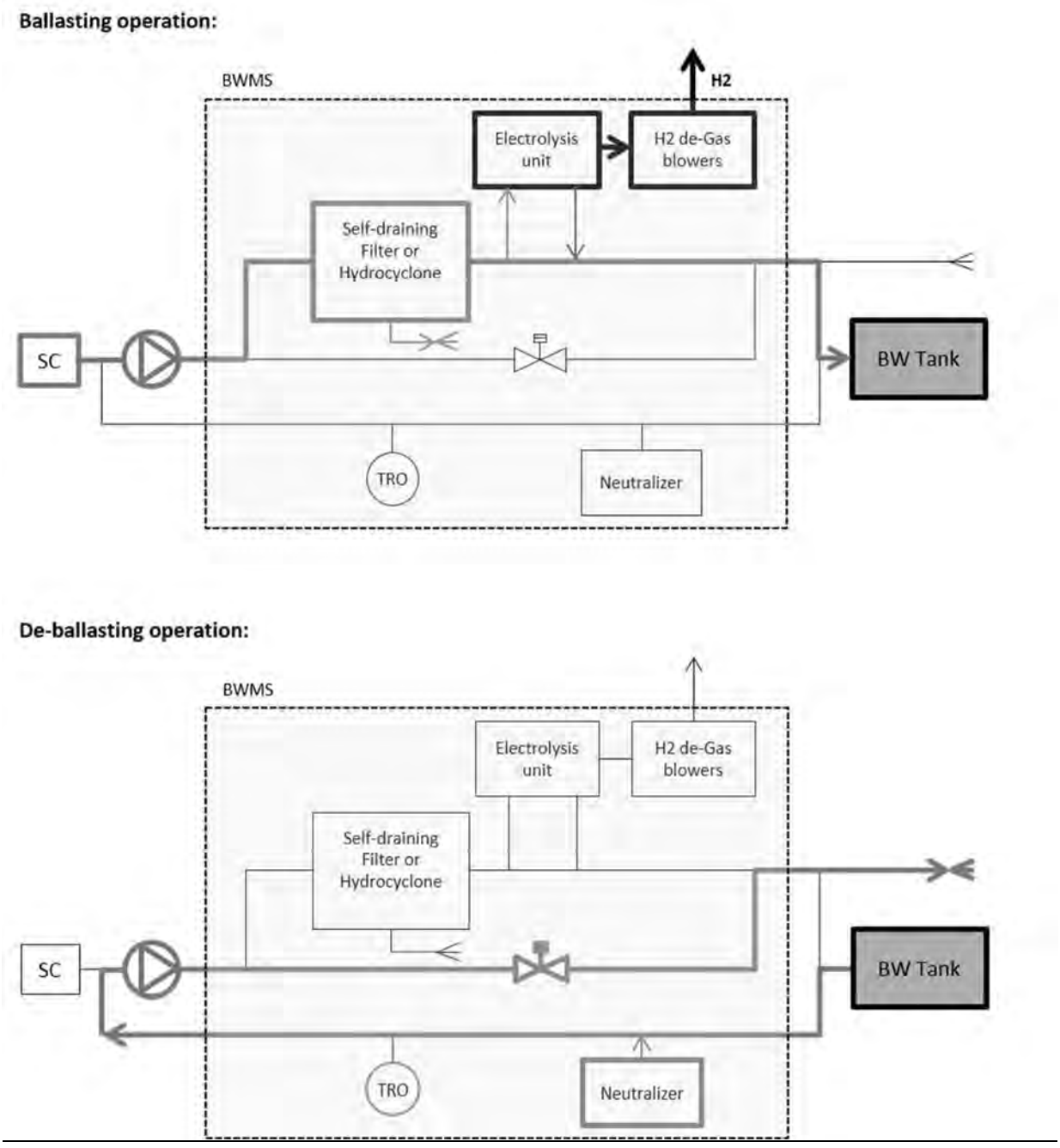


Fig. 2.1.1-1(8) *BWMS* Technology Group 6:
In-line Chemical Injection

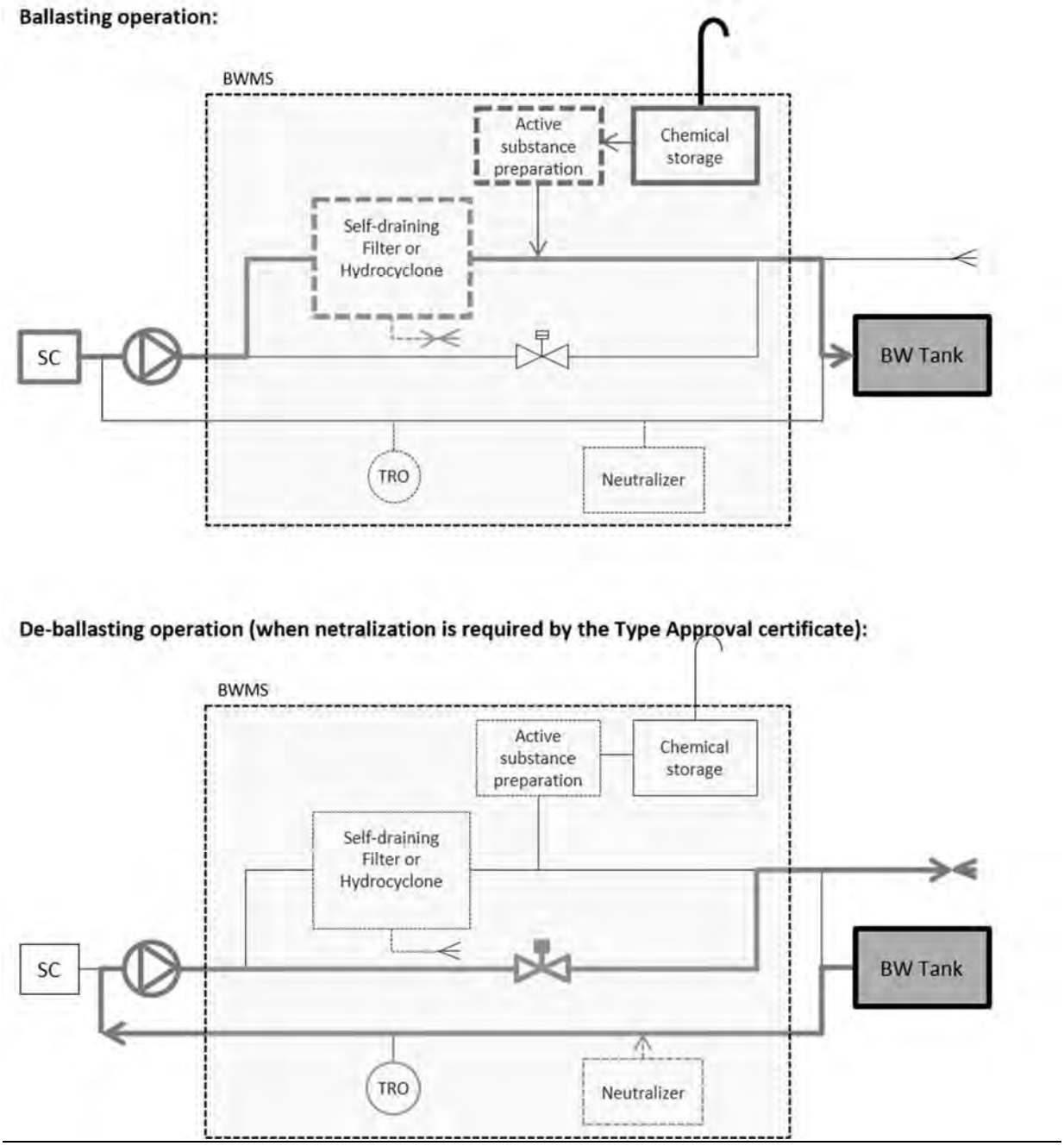


Fig. 2.1.1-1(9) *BWMS* Technology Group 7a:
In-line Side-stream Ozone Injection
without Gas/Liquid Separation Tank and Discharge Water Treatment Tank

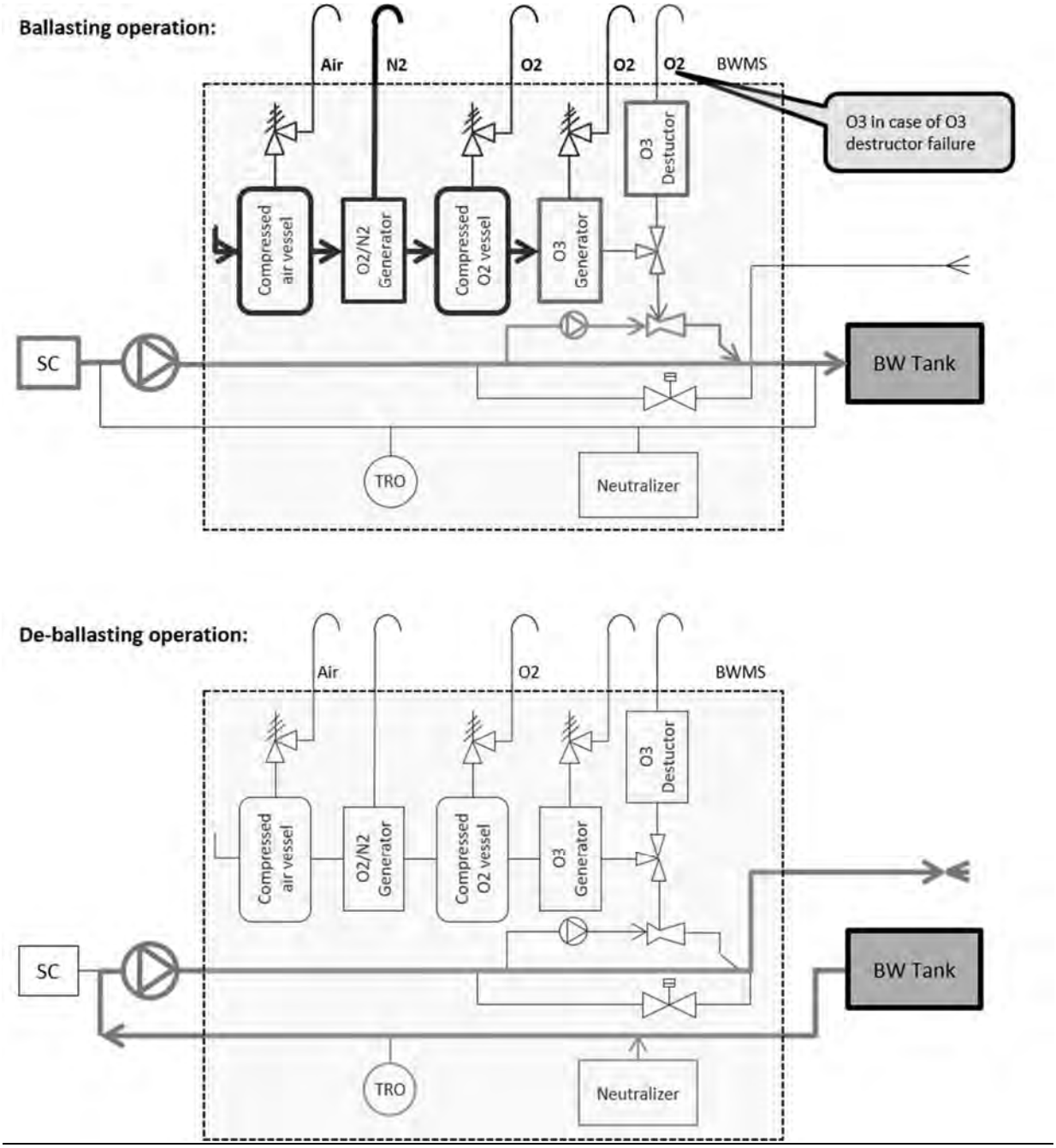


Fig. 2.1.1-1(10) *BWMS* Technology Group 7b:
In-line Side-stream Ozone Injection
with Gas/Liquid Separation Tank and Discharge Water Treatment Tank

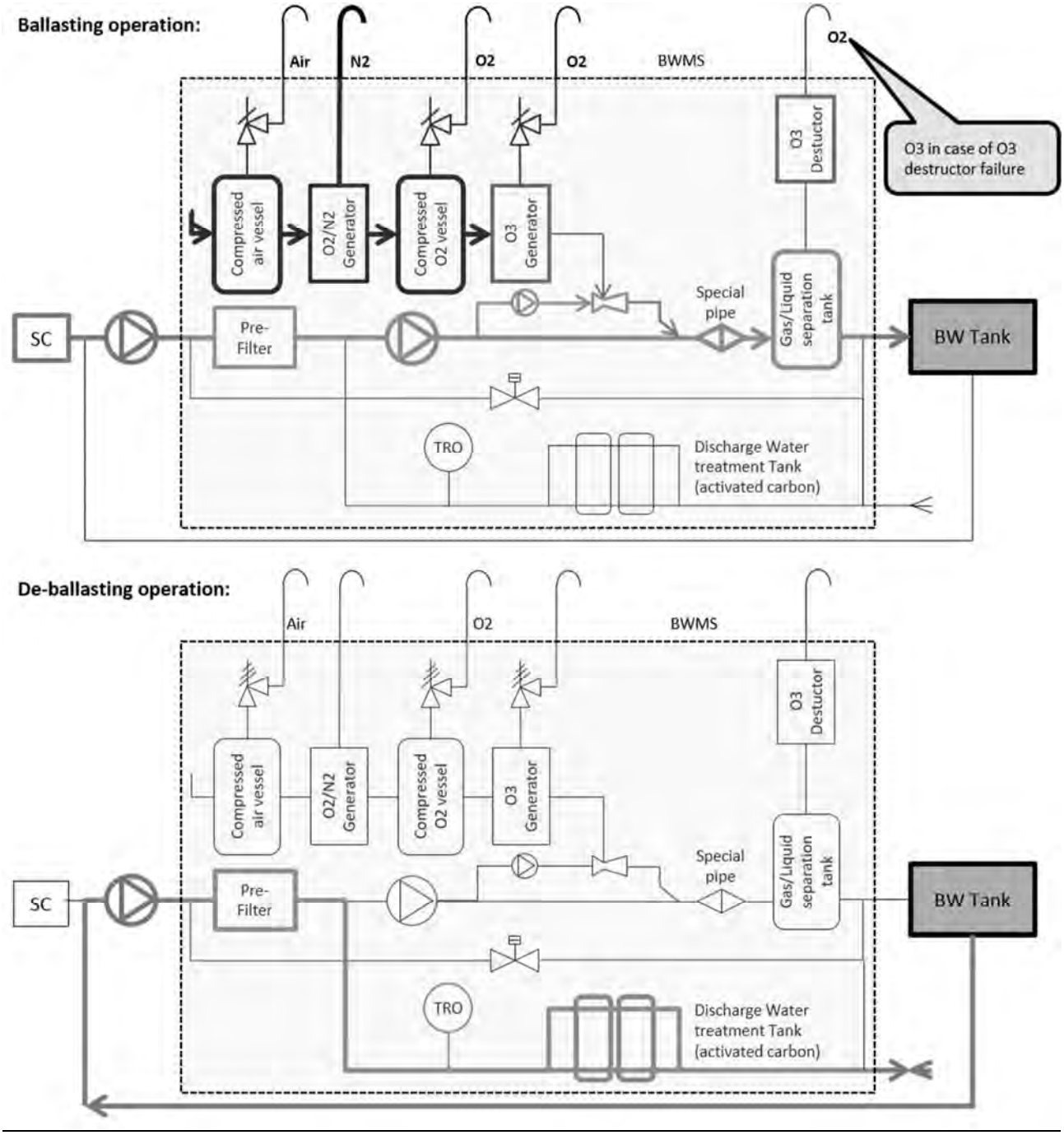
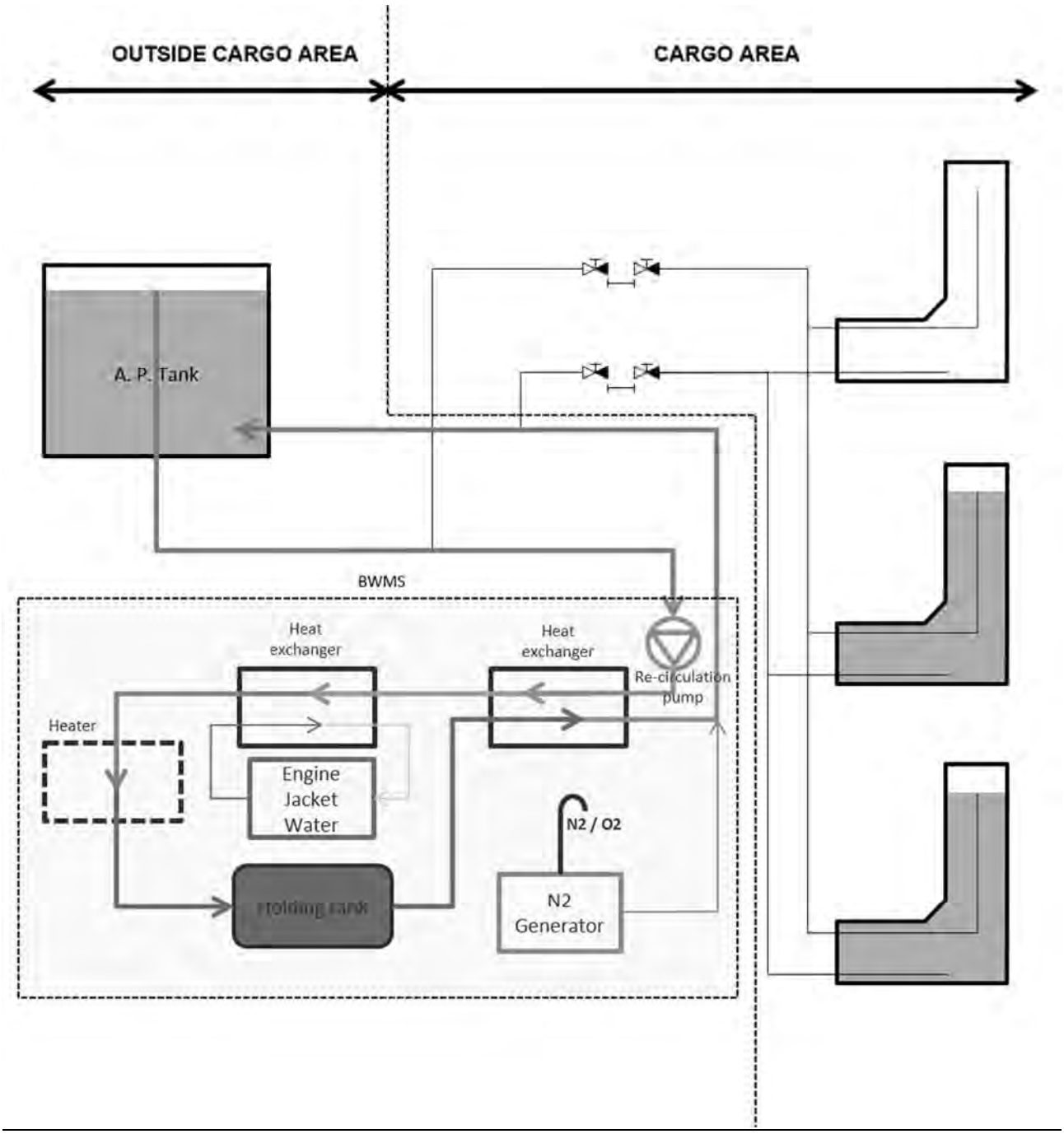


Fig. 2.1.1-1(11) *BWMS* Technology Group 8:
In-tank Pasteurization + De-oxygenation with N2 Generator



2.2 Installation

2.2.1 General Requirements

1 Valves, piping fittings and flanges are to comply with the relevant requirements of the **Rules for the Survey and Construction of Steel Ships**.

2 *BWMS* are to be provided with by-pass or override arrangements to effectively isolate them from essential ship systems to which they are connected.

3 For new installation or retrofit installation on existing ships, generating plant capacity sufficiency is to be verified by electrical load analysis under the normal operating conditions of ballasting and de-ballasting given in the Ballast Water Management Plan.

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

5 *BWMS* are to be operated in accordance with the requirements specified in their Type Approval Certificates. *BWMS* are to be operated within their Treatment Rated Capacity (*TRC*) as per their Type Approval Certificate. This may require the limiting of ship ballast pump flowrates in some cases.

6 Arrangements of *BWMS* bypasses or overrides are to be consistent with type-approved operations, maintenance and safety manuals.

7 In cases where maximum ballast pump capacity exceeds the maximum *BWMS* Treatment Rated Capacity (*TRC*) specified on Type Approval Certificates, the limitations specified in Ballast Water Management Plans for ballast pump operation maximum allowable flow rates are not to exceed the maximum *BWMS TRC*.

8 *BWMS* are subject to design reviews by the Society to verify the compliance of their *BWMS* manufacturer packages with relevant requirements in the Rules. *BWMS* manufacturers *BWMS* may apply such design reviews as part of the type approval process.

9 In general, *BWMS* monitoring functions of *BWMS* belong to system category I when applying **Annex D18.1.1, the Guidance for the Survey and Construction of Steel Ships**. However, in cases where by-pass valves are integrated into valve remote control systems, such by-pass valves belong to the system category II for ballast transfer remote control systems.

10 *BWMS* components (including pressure vessels, group I or II piping, filters, switchboards, etc.) are required to be inspected and certified by the Society at manufacturers.

11 Electrical installations are not to be installed in hazardous areas unless they are of certified safe types for use in such areas. Cable penetrations of decks and bulkheads are to be sealed when pressure differences between such areas are to be maintained.

12 *BWMS* automatic shut-downs required for safety reasons are to be initiated by safety systems independent of *BWMS* control systems.

13 The wording “discharging safe location” in this chapter means the following **(1)** to **(8)**.

(1) Inert gas or nitrogen-product-enriched air from “protection devices for ballast tanks, nitrogen gas generators, inert gas generators and nitrogen buffer tanks (i.e. *BWMS* categories 3a, 3b, 3c and 8)” or “oxygen generators (i.e. *BWMS* categories 7a and 7b)” is to be discharged at safe locations on open decks that satisfy the following **(a)** and **(b)**.
   (a) Locations not within 3 *m* of areas traversed by personnel.
   (b) Locations not within 6 *m* of machinery (engines and boilers) air intakes and ventilation inlets or outlets.

(2) Oxygen-enriched air from “nitrogen generator (i.e. *BWMS* categories 3a and 8)” or “ protection devices or vents for oxygen generators, compressed oxygen vessels, the ozone generators and ozone destructor devices (i.e. *BWMS* categories 7a and 7b)” is to be discharged at safe locations on open decks that satisfy the following **(a)** to **(d)**.
   (a) Locations outside of hazardous areas.
   (b) Locations not within 3 *m* of ignition sources as well as deck machinery (e.g. anchor

windlasses, chain locker openings, etc.) and other equipment which may constitute an ignition hazard.

(c) Locations not within 3 *m* of areas traversed by personnel.

(d) Locations not within 6 *m* of machinery (engines and boilers), and ventilation inlets or outlets.

(3) The discharging safe locations described in **(1)** and **(2)** above are to satisfy the following **(a)** and **(b)**.

(a) The specific type of discharge is indicated.

(b) Signboards or similar warnings are provided.

(4) Hydrogen by-product enriched gas from "hydrogen de-gassing arrangements (i.e. *BWMS* categories 4, 5 and 6)" is to be discharged to safe locations on open decks that satisfy the following **(a)** to **(c)**.

(a) Locations not within 5 *m* of ignition sources as well as deck machinery (e.g. anchor windlasses, chain locker openings, etc.) and other equipment which may constitute an ignition hazard.

(b) Locations not within 3 *m* of areas traversed by personnel.

(c) Locations not within 5 *m* of air intakes from non-hazardous enclosed spaces.

(5) Areas within 3 *m* of the outlets for the hydrogen by-product enriched gas referred to in **(4)** above are to be categorised as hazardous areas zone 1. In addition, an additional 1.5 *m* surrounding said 3 *m* hazardous area zone 1 is to be categorised as hazardous areas zone 2.

(6) Electrical apparatuses located in the hazardous areas zone 1 and zone 2 referred to in **(5)** above are to be suitable for at least *IICT*1.

(7) Air from O_3 destructor device (ODS) (i.e. *BWMS* categories 7a and 7b) vent outlets may be considered as oxygen-enriched air when it satisfies the following **(a)** to **(c)**. This means the discharging safe locations for such air are to be as given in **(2)** above.

(a) ODS redundancy is provided

(b) Manufacturers have justified that the quantities of consumables (activated carbon) used by the ODS are sufficient for the *BWMS* life cycle.

(c) Zone detection systems are arranged in the vicinities of the discharge outlet for ODS vent outlets and such systems alarm the crew in the case of ODS failure.

(8) If one of conditions described in **(7)(a)** to **(c)** above is not fulfilled, the discharging safe locations for ODS on open decks are to satisfy the following **(a)** to **(d)**.

(a) They are to be outside of hazardous areas.

(b) They are to be not within 3 *m* of ignition sources.

(c) They are not to be within 6 *m* of areas traversed by personnel.

(d) They are not to be within 6 *m* of machinery (engines and boilers) air intakes, and ventilation inlets or outlets

2.2.2 Requirements for *BWMS* Categories 3a, 3b, 3c and 8

1 Where a vacuum or overpressure may occur in ballast piping due to height differences, injections of inert gas or injections of nitrogen (N_2), suitable protection devices (e.g. P/V valves, P/V breakers, P/V breather valves, pressure safety relief valves or high/low pressure alarms) are to be provided. The pressure and vacuum settings of such devices are to not exceed ballast piping (i.e. *BWMS* categories 3a and 3b) or ballast tank (i.e. *BWMS* categories 3a, 3b and 3c) design pressures.

2 For *BWMS* categories 3a, 3b and 3c, the inert gas or nitrogen-product-enriched air from inert gas systems and from protection devices provided for ballast tanks (e.g. P/V valves, P/V breakers or P/V breather valves) is to be discharged to the safe locations on open decks specified in **2.1.2-13(1)** and **(2)**.

3 When ballast tanks are in hazardous areas, open deck areas or semi-enclosed spaces on open decks within 1.5 *m* of protection device outlets are to be categorised as hazardous area zone 1, and

an additional 1.5 *m* surrounding said 1.5 *m* hazardous area zone 1 is to be categorised as hazardous area zone 2. Furthermore, ignition sources (e.g. anchor windlasses, chain locker openings, etc.) are to be located outside such hazardous areas.

4 Hazardous areas, acceptable electrical equipment and ventilation system designs are to satisfy relevant requirements in **Part H of the Rules for the Survey and Construction of Steel Ships**.

5 Inert gas based *BWMS* are to satisfy the following requirements described in **Chapter 35, Part R of the Rules for the Survey and Construction of Steel Ships**.

(1) **35.2.1(2)**, **35.2.1(3)**, **35.2.2-1(3)**, **35.2.2-1(4)**, **35.2.2-2(1)**, **35.2.2-2(2)**, **35.2.2-2(3)**, **35.2.2-2(6)**, **35.2.2-4(1)**, **35.2.2-4(2)**, **35.2.2-4(3)**, **35.2.2-4(4)**, **35.2.2-4(5)** (except **35.2.2-4(5)(a)iii)** and **35.2.2-4(5)(c)**), **35.2.3(1)(a)ii)**, **35.2.3(1)(b)**, **35.2.3(1)(d)ii)**, **35.2.3(1)(e)**, **35.2.3(1)(f)**, **35.2.3(2)** (except **35.2.3(2)(b)i)**), **35.2.4(1)(a)**, **35.2.4(1)(b)**, **35.2.4(1)(g)**, **35.2.4(1)(h)**, **35.2.4(1)(i)**, **35.2.4(1)(j)** and **35.2.4(2)**.

(2) In addition to **(1)** above, inert gas systems installed for in-tank de-oxygenation *BWMS* (i.e. category 8) are to satisfy **35.2.2-3(1)** and **35.2.2-3(2)** (except **35.2.2-3(2)(f)**, **35.2.2-3(2)(g)** and **35.2.2-3(2)(j)**).

6 In general, when applying **Chapter 35, Part R of the Rules for the Survey and Construction of Steel Ships** to inert gas based *BWMS*, relevant requirements may be correspondingly applied as follows.

(1) The terms “cargo tank” and “cargo piping” are to be replaced by “ballast water tank” or “ballast water piping”.

(2) The term “cargo control room” is to be replaced by “*BWMS* control station”.

(3) Requirements for slop tanks on combination carriers are to be disregarded.

(4) When applying **35.2.2-4(5)(a)i), Part R of the Rules for the Survey and Construction of Steel Ships**, the acceptable oxygen content is to be specified by the manufacturer regardless of the requirement.

2.2.3 Requirements for Tankers

1 Hazardous area classification is to be in accordance with **Part H of the Rules for the Survey and Construction of Steel Ships**.

2 *BWMS* categories 3b, 3c, 7a and 7b are to be located outside cargo areas in accordance with **35.2.3(1)(a)ii), Part R of the Rules for the Survey and Construction of Steel Ships**.

3 *BWMS* categories 4, 5 and 6 may be located inside hazardous areas with due consideration given to **2.2.1-11**. However, *BWMS* are not to be located inside cargo pump rooms unless it is demonstrated the implementation of measures recommended by *BWMS* manufacturers with respect to the additional hazards that may be expected from dangerous liquids and dangerous gases stored or generated in such rooms does not lead to the following **(1)** to **(5)**.

(1) An upgrading of the hazardous area categorisation of the cargo pump room.

(2) A reaction with the cargo vapours expected to be present in the cargo pump room.

(3) A reaction with the fire-extinguishing medium provided inside the cargo pump room.

(4) An impacting of the performance of existing fire-fighting systems provided inside the cargo pump room

(5) An introducing of additional hazards (e.g. toxicity hazards) inside the cargo pump room not present prior to the implementation of such measures.

4 *BWMS* category 4 may be acceptable in cargo compressor rooms of liquefied gas carriers and inside cargo pump rooms of oil tankers or chemical tankers when such rooms are located above cargo tank decks.

5 For submerged cargo pumps, rooms containing hydraulic power units or electric motors are not considered to be “cargo pump rooms”.

6 Ballast pump rooms and other pump rooms not containing cargo pumps are not considered to be “cargo pump rooms”.

7 In general, two independent *BWMS* are required (e.g. one for ballast tanks located within cargo areas and one for ballast tanks located outside cargo areas). Specific arrangements where only one in-line *BWMS* may be accepted are given in **Table 2.2.3-1** and **Fig. 2.2.3-3**.

8 When fore peak tanks are ballasted with piping systems serving other ballast tanks within cargo areas in accordance with **D14.3.2, the Guidance for the Survey and Construction of Steel Ships**, the fore peak tank ballast water is to be processed by the same *BWMS* processing the ballast water of the other ballast tanks within the cargo area.

9 Isolation between ballast piping serving ballast tanks inside and outside of cargo areas is to be in accordance with the following **(1)** and **(2)**.

(1) Interconnections between ballast piping serving ballast tanks located within cargo areas and ballast piping serving ballast tanks located outside cargo areas may be accepted when appropriate isolation arrangements are provided in accordance with **Table 2.2.3-1** and **Fig. 2.2.3-3**.

(2) The appropriate isolation arrangements described in **(1)** above are necessary for such interconnections regardless of piping diameters.

10 The appropriate isolation arrangements described in **-9** above are to be one of following **(1)** to **(3)**. For *BWMS* categories 2, 3a, 4 and 9, only the following **(1)** is acceptable.

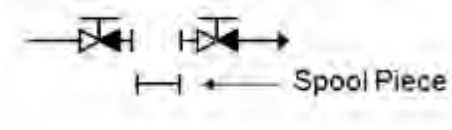
(1) Two non-return valves with positive means of closing in series with spool pieces (**Fig. 2.2.3-1(1)**). As an alternative to such positive means of closing, additional valves having such means of closing may be provided between non-return valves and spool pieces.

(2) Two non-return valves with positive means of closing in series with liquid seals at least 1.5 *m* in depth (**Fig. 2.2.3-1(2)**). As an alternative to such positive means of closing, additional valves having such means of closing may be provided between non-return valves and liquid seals. For ships operating in cold weather conditions, freeze protection is to be provided for water seals (portable heating systems may be accepted for this purpose).

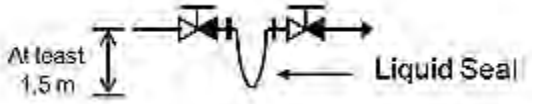
(3) Automatic double block and bleed valves and non-return valves with positive means of closing (**Fig. 2.2.3-1(3)**). As an alternative to such positive means of closing, additional valves having such means of closing may be provided after non-return valves.

Fig.2.2.3-1 Means of appropriate isolation

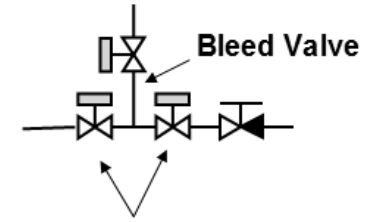
(1)



(2)



(3)



11 The appropriate isolation arrangements described in **-9** and **-10** above are to be provided on open decks in cargo areas.

12 When fore peak tanks are ballasted with piping systems serving other ballast tanks within cargo areas in accordance with **D14.3.2, the Guidance for the Survey and Construction of Steel Ships**, the appropriate isolation arrangements described in **-9** and **-10** above are not required between fore peak tanks and common ballast water piping serving the other ballast tanks within the cargo area.

13 As indicated in **Table 2.2.3-1** and **Fig. 2.2.3-3**, the appropriate isolation arrangements described in **-9** and **-10** above are necessary for interconnections in *BWMS* piping such as N_2 gas piping, inert gas piping, neutraliser piping, freshwater piping for filter cleaning, compressed air piping for remaining water purge and sea water piping for adjusting the salinity, etc.

14 Notwithstanding **-13** above, alternative means of isolation may be considered by the Society for the active substance piping and neutraliser piping with diameters not exceeding 50.8 *mm*.

15 Sampling lines connected to the ballast water piping systems serving tanks in cargo areas are to satisfied the following **-16** for the purpose of the following **(1)** and **(2)**.

(1) For any *BWMS* : ballast water sampling required by the G2 Guideline of the BWM Convention (2004)

(2) For *BWMS* technology categories 4, 5, 6, 7a and 7b: total residual oxidant (TRO) analysis in a closed loop system.

16 The “sampling lines” described in **-15** above are to satisfy the following **(1)** and **(2)**.

(1) Such lines are not to be led into non-hazardous enclosed spaces outside cargo areas.

(2) The appropriate isolation arrangements described in **-10** to **-14** above for interconnections need not be applied to such lines.

17 Notwithstanding **-16(1)** above, sampling lines may be led into non-hazardous enclosed spaces outside cargo areas provided they satisfy the following **(1)** to **(6)**. An example arrangement of sampling lines led into non-hazardous enclosed spaces outside cargo areas is provided in **Fig. 2.2.3-2**.

(1) Sampling facilities for *BWMS* monitoring and control are to be located within gas tight enclosures (hereinafter referred to as "cabinet") and to satisfy the following **(a)** to **(d)**.
   (a) Stop valves are to be provided for each sampling line in the cabinet.
   (b) Gas detection equipment is to be installed in the cabinet and the valves specified in **(a)** above are to automatically close upon activation of this gas detection equipment.
   (c) Audible and visual alarm signals are to be activated both locally and at the *BWMS* control station when the concentration of explosive gases reaches a pre-set value, which is not to be higher than 30 % of the lower flammable limit (LFL). Upon alarm activation, electrical power to the cabinet is to be automatically disconnected. Notwithstanding this requirement, automatic disconnection of power supply is not required when the electrical equipment is of a certified safety type.
   (d) Cabinets are to be vented to safe locations in non-hazardous areas on open decks and vents are to be fitted with flame arresters.

(2) Standard internal diameters of sampling pipes are to be the minimum necessary in order to achieve the functional requirements of the sampling system.

(3) Cabinets are to be installed as close as possible to bulkheads facing cargo areas, and sampling lines located outside cargo areas are to be as short as possible.

(4) Stop valves are to be located in non-hazardous enclosed spaces outside cargo areas for both suction and return lines close to penetrations through bulkheads facing cargo areas. Warning plates stating "Keep valve closed when not performing measurements" are to be posted near the valves. Furthermore, in order to prevent backflow, water seals or equivalent arrangements are to be installed on the hazardous area sides of return pipes.

(5) Stop valves are to be installed in cargo areas for each sampling line (i.e. both the suction and return lines).

(6) Samples which are extracted from ballast water piping systems serving tanks within cargo areas are not to be discharged to tank located outside cargo areas and are not to be discharged to piping lines supplying spaces located outside cargo areas.

Fig.2.2.3-2 Example Arrangement of Sampling Lines Led into Non-Hazardous Enclosed Spaces outside Cargo Areas

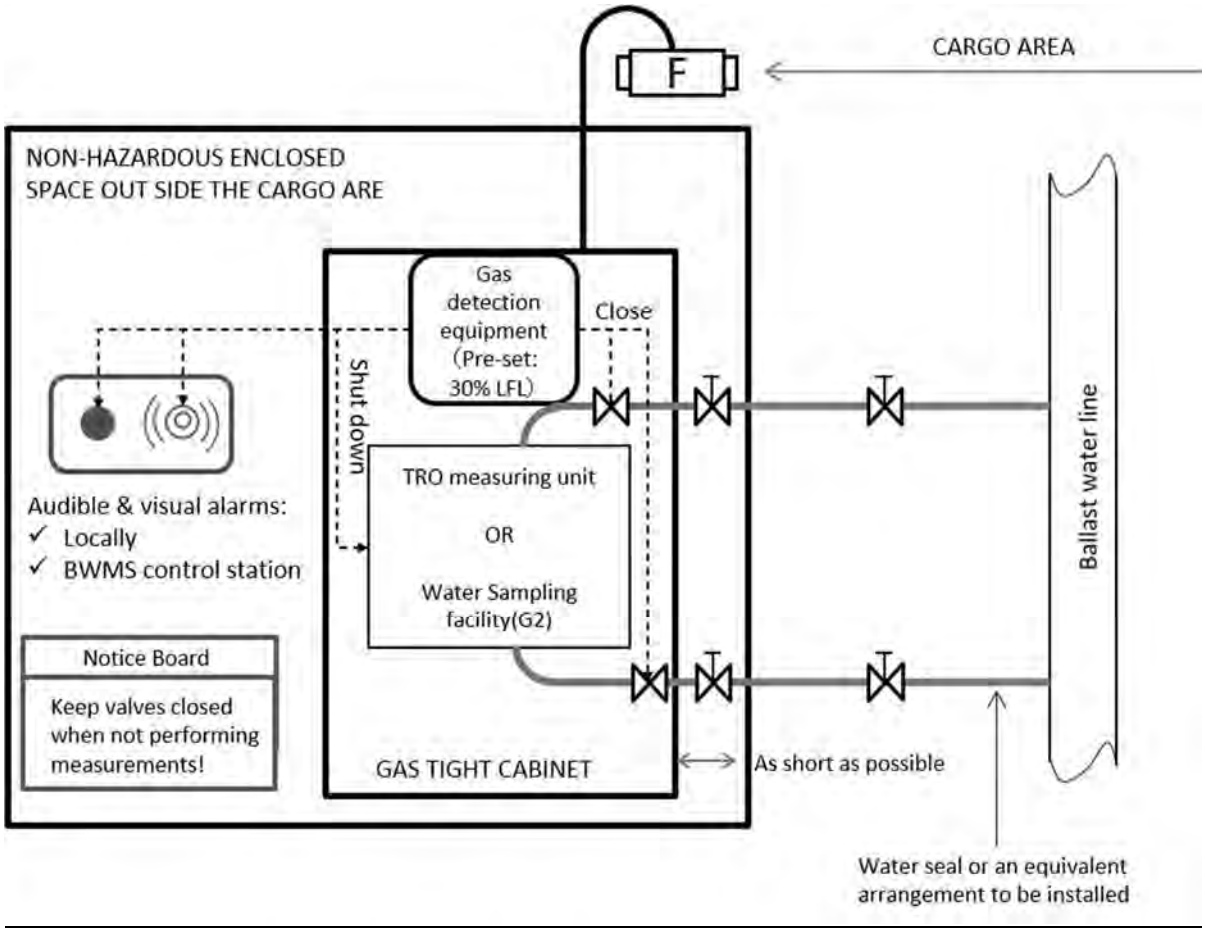


Table 2.2.3-1 In-line *BWMS* technology categorization
(Does not cover categories 3c and 8)

BWMS technology category → / Characteristics ↓		1	2	3a	3b	4	5	6	7a	7b
		In-line UV, UV with advanced oxidation technology (AOT), UV with TiO2 or UV with plasma	In-line flocculation	In-line membrane separation and de-oxygenation (injection of N2 from N2 generator)	In-line de-oxygenation (injection of inert gas from inert gas generator)	In-line full-flow electrolysis	In-line side-stream electrolysis (3)	In-line (stored) chemical injection	In-line side-stream ozone injection without gas/liquid separation tank and discharge water treatment tank	In-line side-stream ozone injection with gas/liquid separation tank and discharge water treatment tank
Disinfection 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 neutraliser					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 **2.1.1(3)**			(1)	O_2 N_2	CO_2, CO	H_2, Cl_2	H_2, Cl_2	(1)	O_2, O_3, N_2	
Arrangement of one *BWMS*	*BWMS* is located outside cargo area	NA	**Fig. 2.2.3 -3(2)** (2)	**Fig. 2.2.3 -3(2)** (2)	**Fig. 2.2.3 -3(3)**	**Fig. 2.2.3 -3(4)** (2)	**Fig. 2.2.3 -3(5)**	**Fig. 2.2.3 -3(6)**	**Fig. 2.2.3 -3(7)**	**Fig. 2.2.3 -3(8)** (2)

Notes

1 To be investigated on a case-by-case basis based on the result of the *IMO (GESAMP) MEPC* report for basic and final approval in accordance with the G9 Guideline.

2 Isolation arrangements between ballast piping serving ballast tanks located within cargo areas and ballast piping serving ballast tanks located outside cargo areas are only subject to **2.2.3-10(1)**.

Fig. 2.2.3-3 Arrangements with only one in-line *BWMS*

Fig. 2.2.3-3(1) Explanation of symbols used in figure

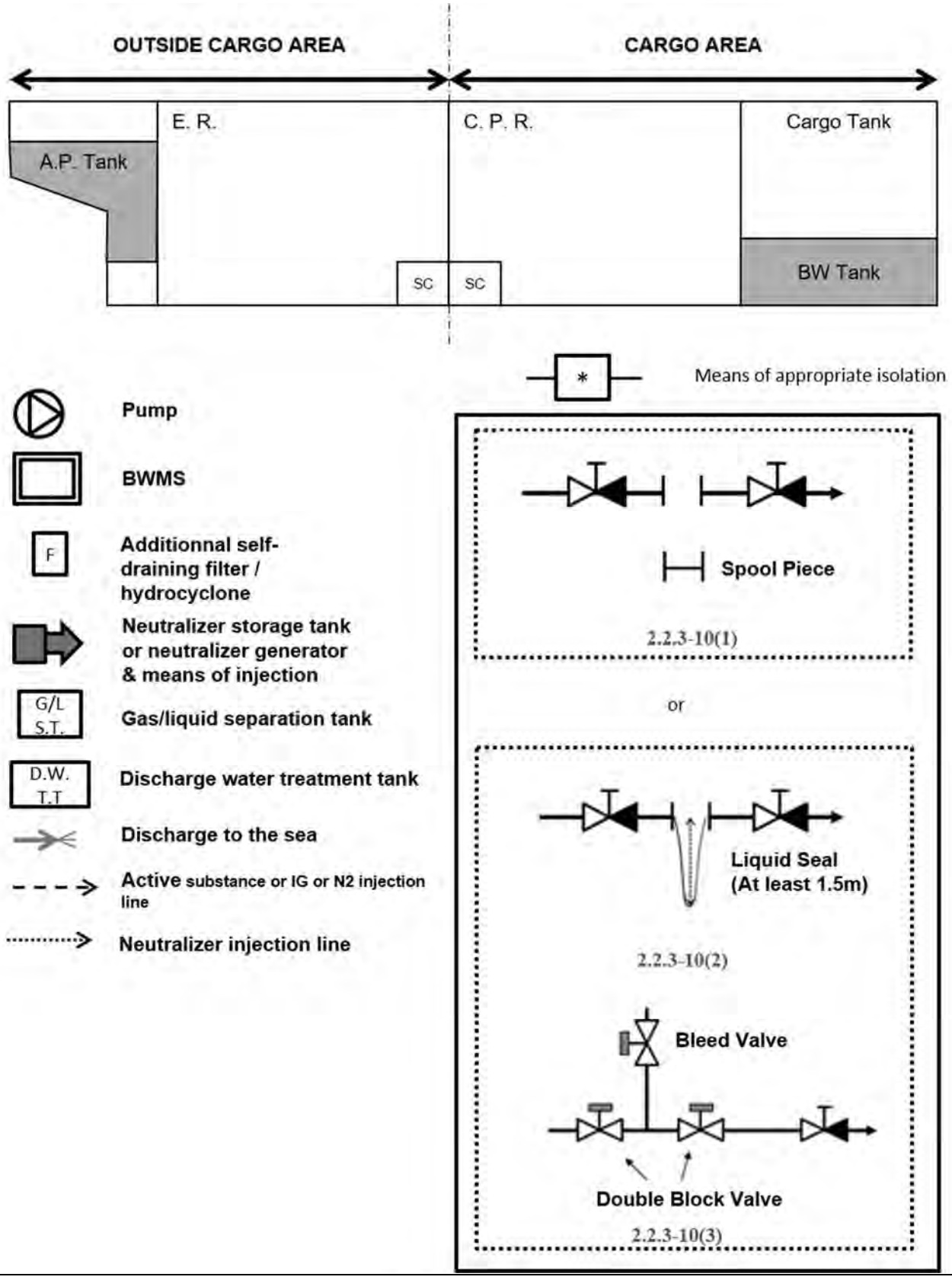


Fig. 2.2.3-3(2) *BWMS* installation (categories 2 and 3a)

Category 2: In-line flocculation
Category 3a: In-line membrane separation and de-oxygenation (injection of N_2 from N_2 generator)

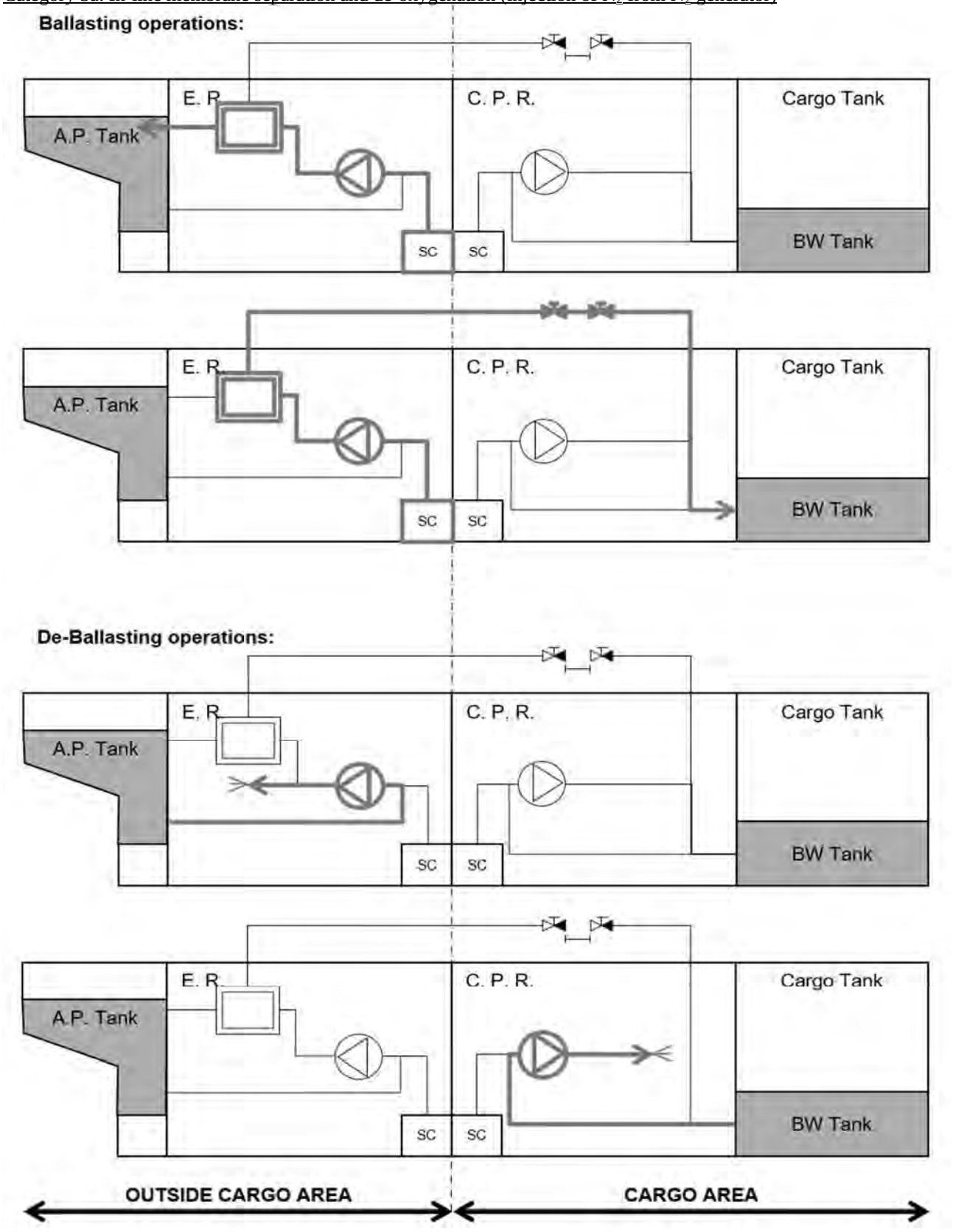


Fig. 2.2.3-3(3) *BWMS* installation (category 3b)

Category 3b: In-line de-oxygenation (injection of inert gas from inert gas generator)

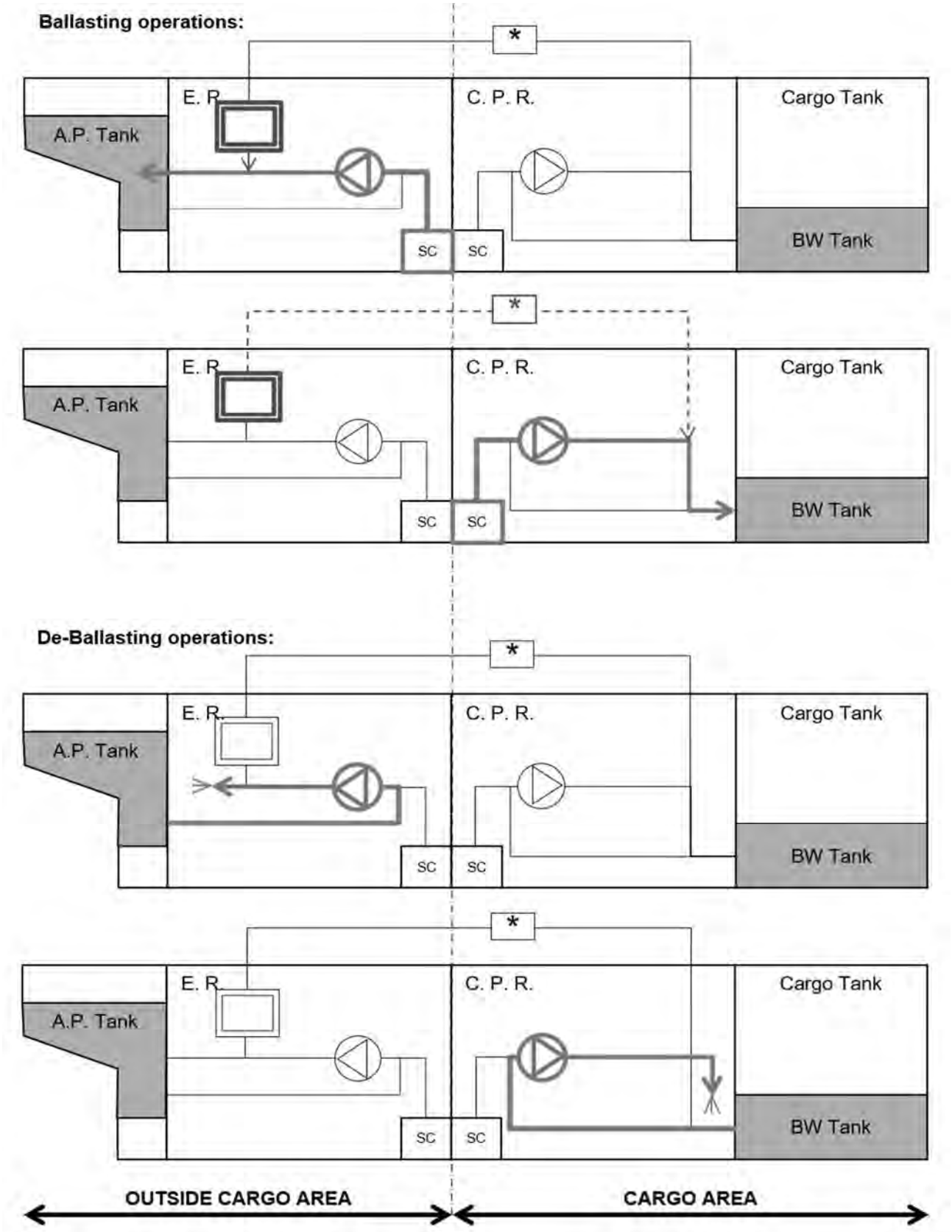


Fig. 2.2.3-3(4) *BWMS* installation (category 4)

Category 4: In-line full-flow electrolysis

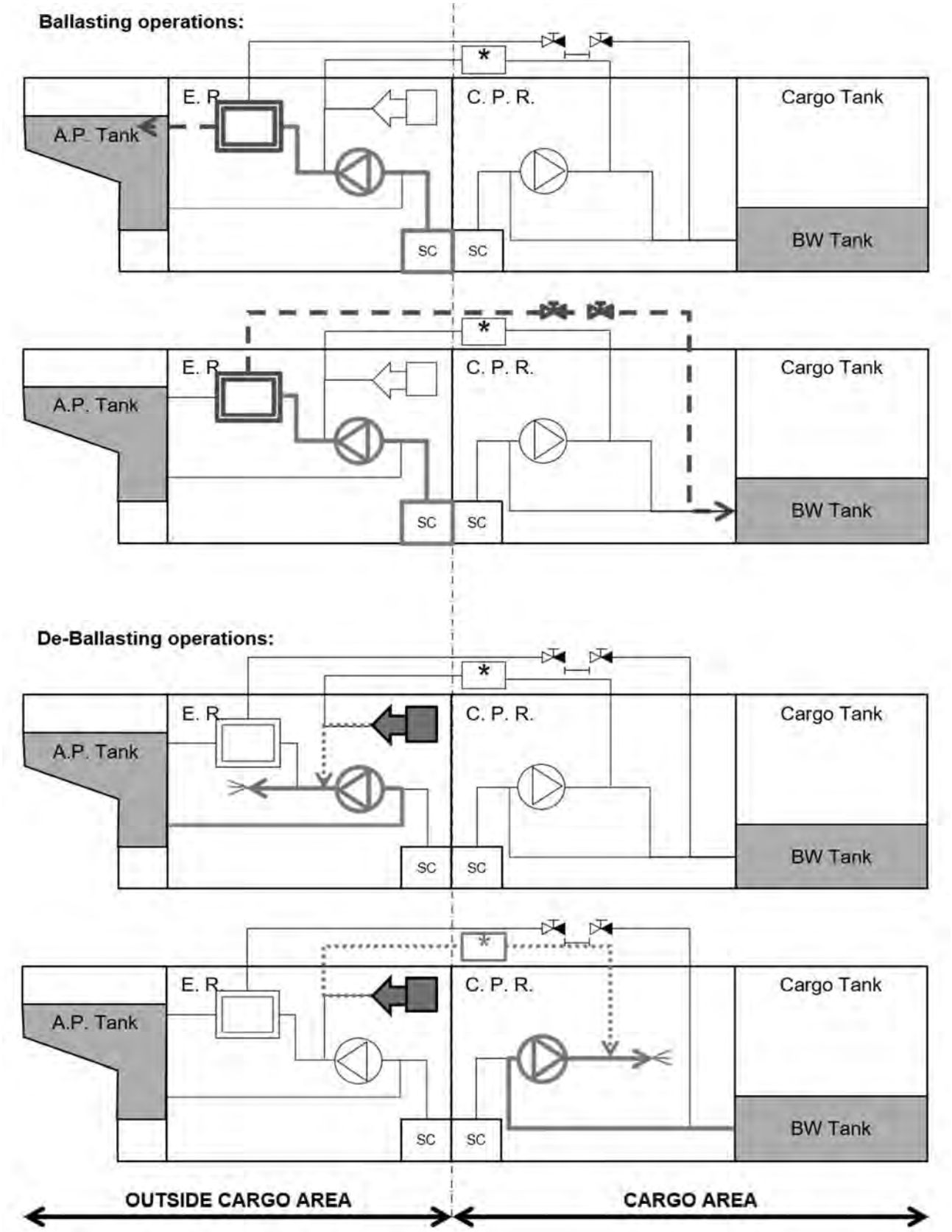


Fig. 2.2.3-3(5) *BWMS* installation (category 5)

Category 5: In-line side-stream electrolysis

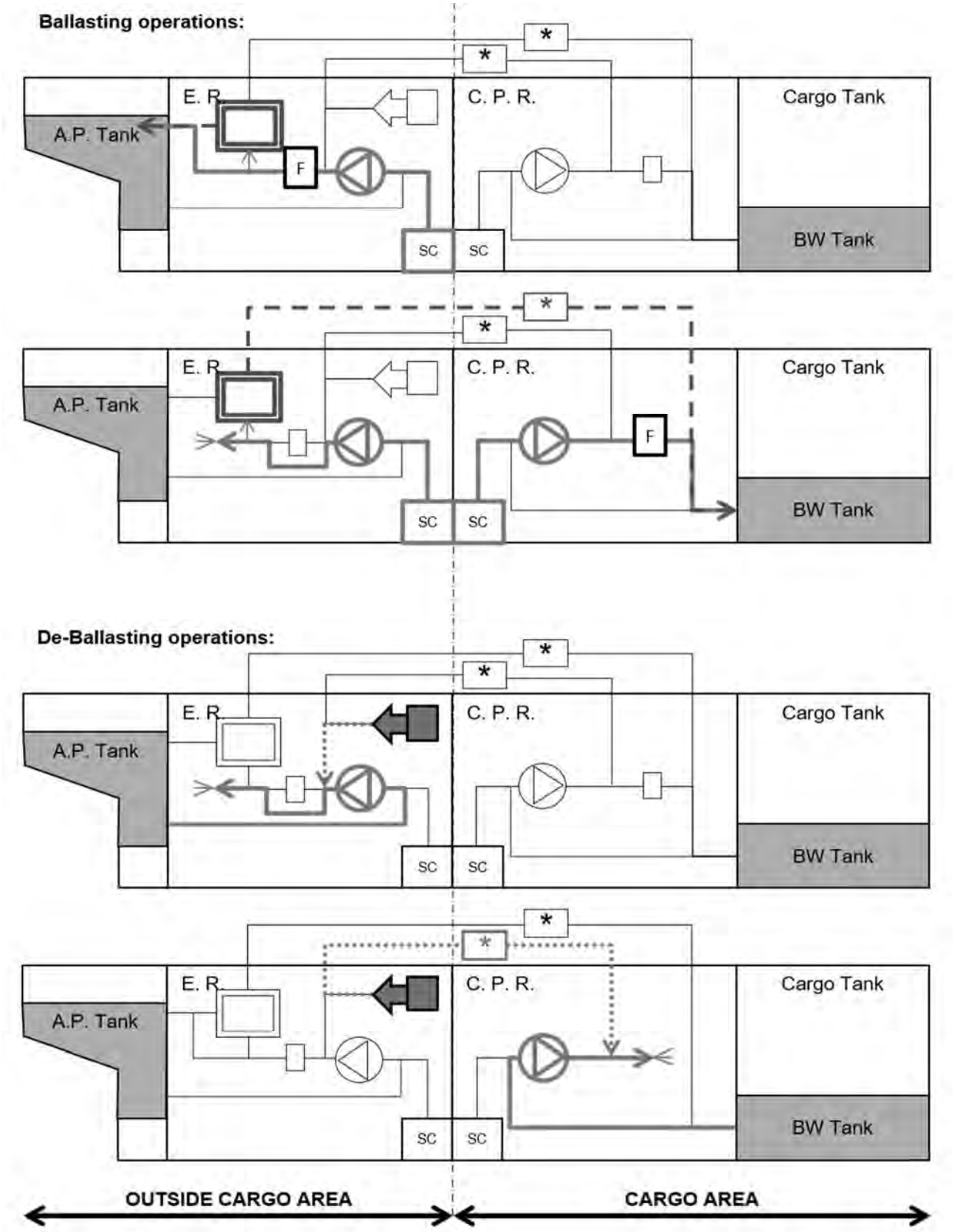


Fig. 2.2.3-3(6) *BWMS* installation (category 6)

Category 6: In-line (stored) chemical injection

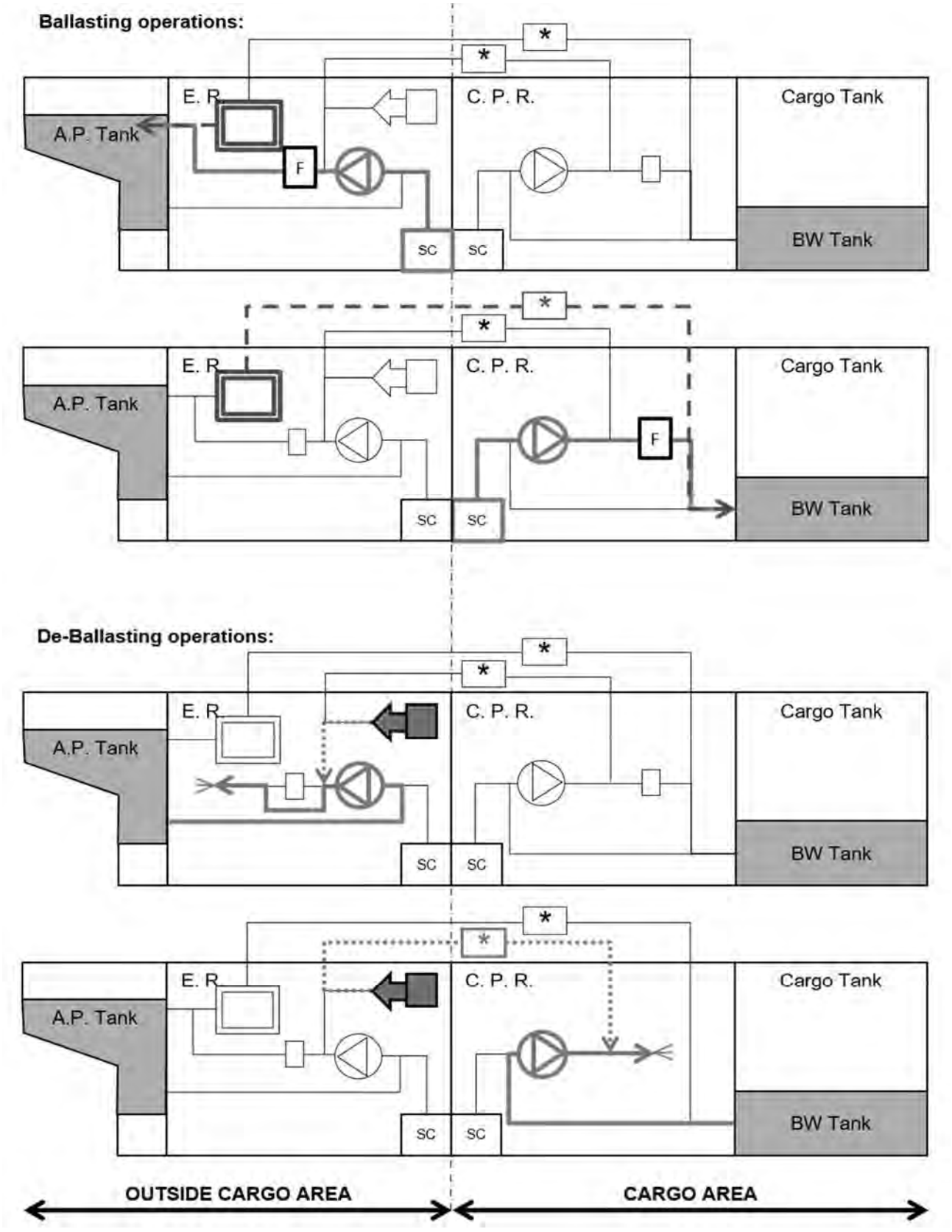


Fig. 2.2.3-3(7) *BWMS* installation (category 7a)

Category 7a: In-line side-stream ozone injection without gas/liquid separation tank and without discharge water treatment tank

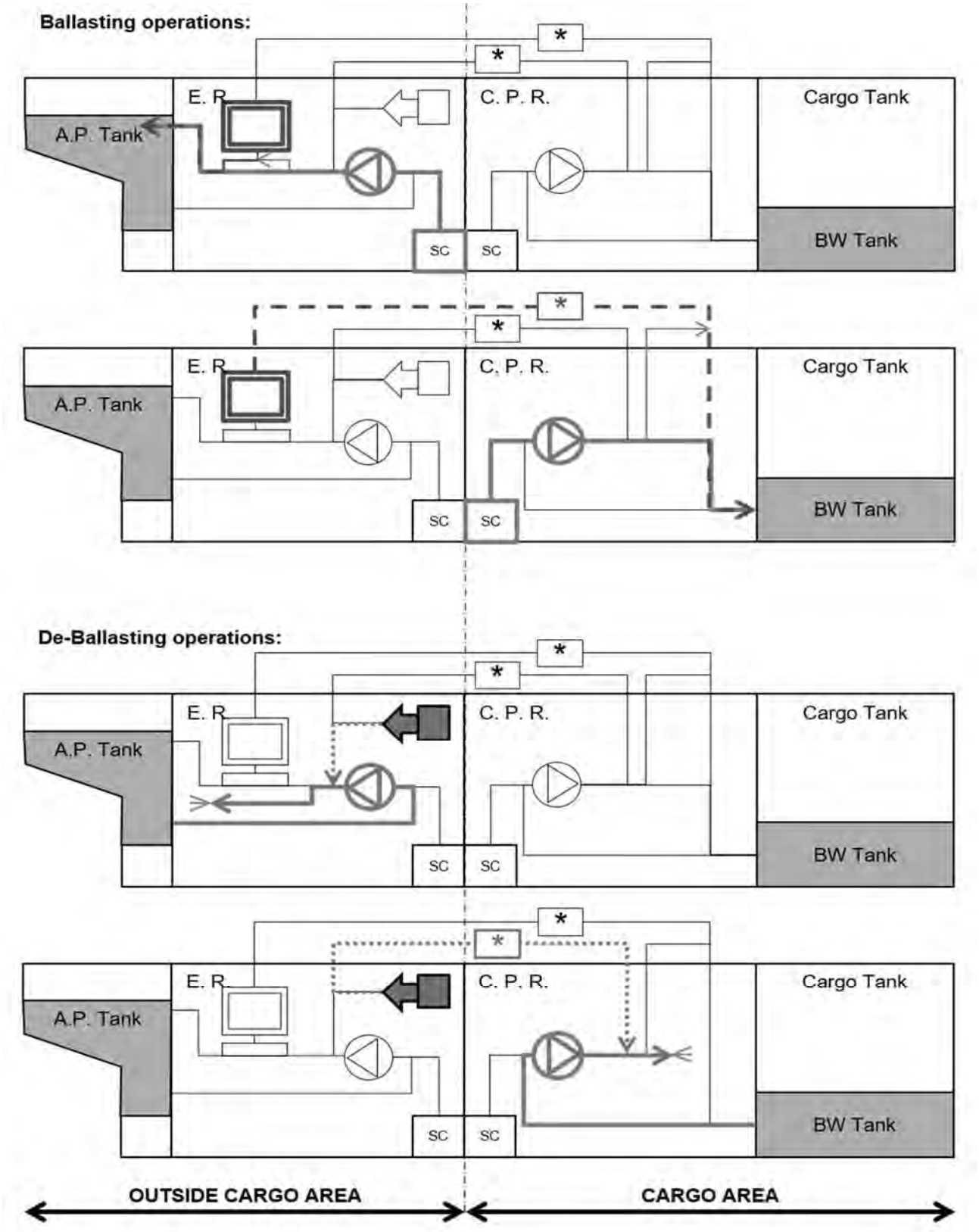
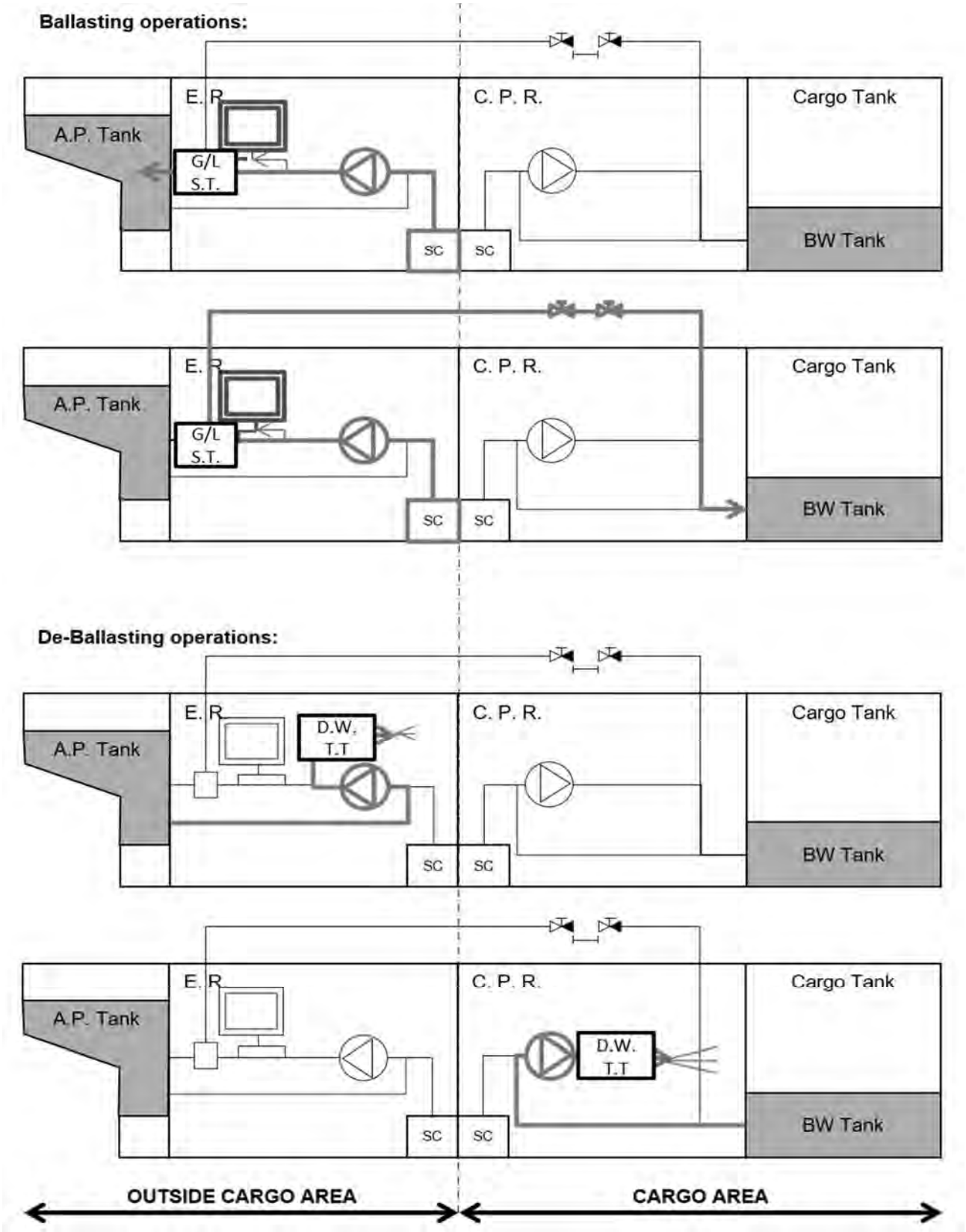


Fig. 3.3.2-3(8) *BWMS* installation (category 7b)

Category 7b: In-line side-stream ozone injection with gas/liquid separation tank and discharge water treatment tank



2.2.4 Special Requirements for *BWMS* categories 2, 3a, 3b, 3c, 4, 5, 6, 7a, 7b and 8

1 Where the *BWMS* operating principle involves generation of dangerous gas, the following **(1)** to **(6)** are to be satisfied.

(1) Gas detection equipment

(a) Gas detection equipment is to be fitted in spaces where dangerous gas may be present.

(b) Audible and visual alarms are to be activated both locally and at *BWMS* control stations in the event of leakage.

(c) Gas detectors are to be located as close as possible to *BWMS* components where dangerous gas may accumulate.

(d) For flammable gases and explosive atmospheres including but not limited to H_2, the construction, testing and performance of gas detection devices are to 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.

(e) Where other hazards (e.g. toxicity, asphyxia, corrosivity and reactivity) are considered, recognized standards acceptable to the Society are to be selected with due consideration of the specific gases to be detected and due consideration of detection device performance with regards to the specific atmosphere where such devices are intended to be used.

(2) Oxygen sensors

(a) In spaces where inert gas generator systems are fitted (i.e. *BWMS* categories 3b and 3c) or nitrogen generators are fitted (i.e. *BWMS* categories 3a and 8), at least two oxygen sensors to be positioned at appropriate locations (as required by **35.2.2-4(5)(d), Part R of the Rules for the Survey and Construction of Steel Ships**) to alarms when oxygen levels fall below 19 %. Such audible and visual alarms are to be activated at the following **i)** to **iii)** locations.

i) Inside the space

ii) At the entrance to the space

iii) Inside the *BWMS* control station

(b) For *BWMS* categories 7a and 7b, at least two oxygen sensors are to be positioned at appropriate locations in one of the following **i)** to **iii)** spaces.

i) Spaces where ozone generators are fitted

ii) Spaces where ozone destructors are fitted

iii) Spaces where ozone piping is routed

(c) Audible and visual alarms are to be activated at the following **i)** to **iii)** locations when the oxygen levels of the sensors described in **(b)** above rise above 23 %.

i) Inside the space

ii) At the entrance to the space

iii) Inside the *BWMS* control station

(d) Automatic *BWMS* shut-down is to be arranged so as to activate when the oxygen levels described in **(b)** above rise above 25 %. Audible and visual alarms independent from the alarms described in **(c)** above are to be activated prior to this shut-down.

(3) Ozone sensors

(a) For *BWMS* categories 7a and 7b, at least one ozone sensor is to be provided in the vicinity of discharge outlets to open decks from the ozone destructors specified in **2.21-13(7)** and **(8)** to alarms when ozone concentration levels rise above 0.1 *ppm*. In such cases, audible and visual alarms are to be activated in *BWMS* control rooms.

(b) In addition to the ozone sensors described in **(1)** above, at least two ozone sensors are to be positioned at appropriate spaces in the following **i)** to **iii)** spaces.

i) Spaces where ozone generators are fitted

ii) Spaces where ozone destructors are fitted
iii) Spaces where ozone piping is routed

(c) Audible and visual alarms are to be activated at the following **i)** to **iii)** locations when the ozone concentration levels of the ozone sensors described in **(b)** above rises above 0.1 *ppm*.
i) Inside the space
ii) At the entrance to the space
iii) Inside the *BWMS* control station

(d) Automatic *BWMS* shut-down is to be arranged so as to activate when the ozone concentration measured from one of the two sensors described in **(b)** above inside the space rises above 0.2 *ppm*.

(4) Leakage detection

(a) Sensors are to be provided for the detection of H_2 leakages (i.e. *BWMS* categories 4, 5 and 6) or O_2 leakages (i.e. *BWMS* categories 7a and 7b) or O_3 leakages (i.e. *BWMS* categories 7a and 7b) within double-walled spaces or pipe ducts when constructed in accordance with **2.2.4-2(2)**.

(b) The sensors described in **(a)** above are to activate alarms and automatic *BWMS* shut-down at the high-high level settings described in **(1)** to **(3)** above.

(c) As an alternative to sensors for gas detection described in **(a)** above, monitored under-pressurisation within double-walled spaces or pipe ducts may be provided with automatic alarms and *BWMS* shut-down in the case of the loss of under-pressurisation. Such monitoring may be achieved either by monitoring the pressure within double-walled spaces or pipe ducts, or by monitoring exhaust fans.

(5) Measures for hydrogen (i.e. *BWMS* categories 4, 5 and 6)

(a) Redundant ventilation fans and monitoring of ventilation systems are to be provided when hydrogen de-gassing arrangements are provided.

(b) Ventilation fans are to be certified as explosion proof and have spark arrestors to avoid ignition sources from developing within ventilation systems in which remaining H_2 gas may be present in dangerous concentrations.

(c) Audible and visual alarms and automatic *BWMS* shut-down are to be arranged so as to activate when respectively high and high-high levels of H_2 concentrations are detected.

(d) Open ends of the hydrogen by-product enriched gas relieving devices are to be led to the safe locations on open decks described in **2.2.1-13(4)**.

(6) Open ends of inert gas or nitrogen gas enriched air (i.e. *BWMS* categories 3a, 3b, 3c and 8) or oxygen-enriched air (i.e. *BWMS* categories 3a, 7a, 7b and 8) are to be led to the safe locations on open decks described in **2.2.1-13(1)** and **(2)**.

2 Where piping conveys active substances, by-products or neutralisers that contain dangerous gases or dangerous liquids, the following **(1)** to **(11)** are to be satisfied. This applies to injection lines conveying dangerous gases or dangerous liquids but does not apply to ballast water lines where dangerous gases or dangerous liquids are diluted.

(1) Notwithstanding design pressure and temperature, such piping is to be either of Class I (without special safeguards) or Class II (with special safeguards) as required by **Chapter 12, Part D of the Rules for the Survey and Construction of Steel Ships**. In addition, material selection, material testing, welding, non-destructive welding tests, connection types, mechanical joints (in cases where allowed), hydrostatic tests and pressure tests after onboard assembly are to be as required by **Part D of the Rules for the Survey and Construction of Steel Ships**.

(2) For Class II piping conveying dangerous gases (e.g. hydrogen (H_2), oxygen (O_2) or ozone (O_3)), the special safeguards described in **(1)** above are to be either double-walled pipes or

pipe ducts.

(3) For Class II piping conveying dangerous liquids, the special safeguards described in **(1)** above are to be measures deemed acceptable by the Society.

(4) Notwithstanding **(1)** above, plastic pipes may be accepted after due assessment of the dangerous gases or dangerous liquids conveyed inside. When plastic pipes are accepted, such pipes are subject to **Annex D12.1.6-2, the Guidance for the Survey and Construction of Steel Ships**.

(5) Pipe length and number of connections are to be minimised.

(6) The insides of double-walled spaces or pipe ducts constructed as the special safeguards for the purpose of **(2)** above are to be equipped with mechanical exhaust ventilation leading to the safe locations on open decks described in **2.2.1-13(4)**, **(7)** or **(8)** above.

(7) Piping system routing is to be kept away from heating sources, ignition sources and other sources that may react hazardously with the dangerous gases or liquids conveyed inside. Pipes are to be suitably supported and protected from mechanical damage.

(8) Pipes carrying acids are to be arranged so as to avoid spillage onto the crew in the case of leakage.

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

(10) O_2 enriched air vent pipes (i.e. *BWMS* categories 3a, 7a, 7b and 8) are not to be routed through hazardous areas unless they are arranged as follows.

(a) Within double-walled pipes or pipe ducts as described in **(2)** above

(b) Provided with gas detection as described in **2.2.4-1(4)**

(c) Provided with mechanical exhaust ventilation as described in **(6)** above

(11) The routing of H_2 by-product enriched air vent pipes (i.e. *BWMS* categories 4, 5 and 6) and O_2 enriched air vent pipes (*BWMS* categories 3a, 7a, 7b and 8) is to be as short and as straight as possible. When necessary, horizontal portions may be arranged with a minimum slope in accordance with manufacturer recommendations.

3 When *BWMS* categories 2, 4, 5, 6, 7a and 7b are installed on board, the following measures **(1)** to **(8)** are to be implemented.

(1) Procedures for chemical substances or dangerous gases are to be in accordance with the Material Safety Data Sheet (*MSDS*) and *BWM*.2/*Circ*.20.

(2) Materials, coatings used for the chemical storage tank interiors, piping and fittings are to be resistant to such chemical substances.

(3) Chemical substances (even when not defined as a “dangerous liquid” in **2.1.1(3)**) and gas storage tanks are to satisfy the following **(a)** to **(c)**.

(a) Independent tanks containing dangerous liquids (e.g. sulfuric acid (H_2SO_4)) or dangerous gases (e.g. oxygen (O_2)) that are permanently fixed on board are to satisfy **Chapter 10, Part D of the Rules for the Survey and Construction of Steel Ships**

(b) Independent tanks not containing dangerous liquids (e.g. sodium sulphite, sodium biosulphite or sodium thiosulfphate neutralisers)and not containing dangerous gases (e.g. nitrogen (N_2)) that are not permanently fixed on board are to satisfy standards recognized by the Society

(c) Portable tanks are to satisfy the IMDG Code or standards recognized by the Society

(4) When chemical substances are stored in integral tanks, ship shell plating is not to form any boundary of the tank.

(5) Dangerous liquid and dangerous gas storage tank air pipes are to be led to discharging safe locations as described in **2.2.1-13(1)** and **(2)**.

(6) Operation manuals containing chemical injection procedures, alarm systems, measures in case

of emergency, etc. are to be maintained on board.

(7) Dangerous liquid storage tanks and their associated components (e.g. pumps and filters) are to be provided with spill trays or secondary containment systems of sufficient volume to contain potential leakages from tank openings, gauge glasses, pumps, filters and piping fittings.

(8) In addition to **(7)** above, for safety or pollution assessments of the concerned chemical substances, consideration is to be given the segregation of drains from such spill trays (or secondary containment systems), or piping systems from engine room bilge systems, or from cargo pump room bilge systems, as applicable. When necessary, arrangements are to be provided within spill trays (or within secondary containment systems) for the detection of dangerous liquids or dangerous gases.

4 In principle, risk assessments are to be conducted and submitted to the Society for *BWMS* categories 4, 5, 7a and 7b as well as for *BWMS* category 6 when a Material Safety Data Sheets (*MSDS*) indicates that the chemical substance stored on board is either flammable, toxic, corrosive or reactive. Such risk assessments are to satisfy the following **(1)** and **(2)**.

(1) Risk assessment techniques are to follow standards recognized by the Society.

(2) Risk assessments are to satisfy the following **(a)** to **(c)**.

(a) Intrinsically safe or mitigation measures for the hazards created by the *BWMS* which have been identified by manufacturers.

(b) Intrinsically safe or mitigation measures for the hazards created by the *BWMS* which have been identified during design review.

(c) The intrinsically safe and mitigation measures described in **(a)** and **(b)** above are to be implemented during *BWMS* installation.

2.2.5 Other Requirements

When cavitation is used for the entire *BWMS* treatment process (for example, the use of pressure vacuum reactors working in combination with vertical ballast water drop lines), part of the *BWMS* treatment process (for example, the use of “smart pipes” or “special pipes” in *BWMS* category 7b or the use of “venturi pipes” in *BWMS* technology 3b), or through the use other means, the design and wall thickness or grade of materials for the inside coating or surface treatment of the parts of piping where cavitation is taking place are to be specifically considered.

Chapter 3 FIRE SAFETY MEASURES

3.1 General

3.1.1 Terminology

The following definitions apply throughout this chapter.

(1) "Airlock" means a space enclosed by gastight steel bulkheads with two gastight doors spaced not more than 2.5 *m* apart. Such doors are to be self-closing without holding back arrangements. Air locks are to have mechanical ventilation and are not to be used for other purposes. Audible and visual alarm systems to give warnings on both sides of the air lock are to be provided to indicate when more than one door is moved from its closed position. Air lock spaces are to be monitored for dangerous gases as defined **2.1.1(3)**.

(2) "Ballast water management system" (*BWMS*) means the same as defined in **2.1.1(1)**.

(3) "Ballast water management room" (*BWMR*) means any space containing equipment belonging to the *BWMS*. Spaces containing remote controls for *BWMS* or spaces dedicated to the storage of liquid or solid chemicals for *BWMS* need not be considered a *BWMR*.

3.1.2 *BWMS* Storing, Introducing or Generating Chemicals

1 In general, *BWMS* storing, introducing or generating chemicals refer to the following **(1)** to **(3)**.

(1) In-line flocculation (i.e. *BWMS* category 2)

(2) Chemical injection (i.e. *BWMS* category 6)

(3) Neutraliser injection (i.e. *BWMS* categories 4, 5, 6 and 7)

2 *BWMS* that do not store, use or generate toxic or flammable chemicals may be specially considered as detailed in **Table 3.1.2-1**.

Table 3.3.3 Requirements that may be reduced for *BWMS* storing, introducing or generating chemicals depending on the chemicals

Requirement	Conditions to be met before reducing the requirement
3.2.3-5	The stored chemicals are neither toxic nor flammable
3.3.1	No dangerous gas will be generated by the *BWMS*
3.3.2	The *BWMS* does not use any flammable or toxic chemical substances
3.6.1-1	No toxic chemical is stored and no toxic gas will be generated by the *BWMS*
3.7.1-1, **-3** and **-6**	No toxic chemical is used or will be generated by the *BWMS*

Notes

1 *IMO (GESAMP) MEPC* reports issued during the basic and final approval procedures and the "safety hazards" listed in **Chapter 17, Part S of the Rules for the Survey and Construction of Steel Ships** are to be considered for this purpose.

2 The "chemicals" described in the table include *BWMS* additives.

3.2 Fire Categorisation

3.2.1 General

BWMR are to be categorised as the following **(1)** and **(2)** in accordance with **Chapter 9, Part R of the Rules for the Survey and Construction of Steel Ships** and Regulation II-2/9 of *SOLAS*.

(1) *BWMR* containing oil-fired inert gas generators (i.e. *BWMS* categories 3b and 3c) are to be treated as machinery spaces of category A.

(2) Other *BWMR* are to be considered as other machinery spaces and are to be categorised, depending on the ship type in accordance with Regulations II-2/9.2.2.3 (10) or (11), 9.2.2.4 (7) of *SOLAS* or **9.2.3-2(7) and 9.2.4-2(7), Part R of the Rules for the Survey and Construction of Steel Ships**.

3.2.2 *BWMS* Located in tanker cargo areas

Notwithstanding **3.2.1** above, where *BWMS* are located in tanker cargo areas as allowed by the relevant requirements of the Rules, said *BWMR* are to be categorised as "cargo pump-rooms" as defined in **9.2.4-2(8), Part R of the Rules for the Survey and Construction of Steel Ships** for determining the extent of fire protection to be provided.

3.2.3 Storage of Chemicals

1 Storage spaces for liquid or solid chemicals for *BWMS* are to be categorised as the following **(1)** and **(2)** in accordance with **Chapter 9, Part R of the Rules for the Survey and Construction of Steel Ships** and Regulation II-2/9 of *SOLAS*.

(1) On passenger ships carrying more than 36 passengers
   (a) "Other spaces in which flammable liquids are stowed" as defined in Regulation II-2/9.2.2.3.2.2(14) of *SOLAS* when flammable products are stored.
   (b) "Store-rooms, workshops, pantries, etc." as defined in Regulation II-2/9.2.2.3.2.2(13) of *SOLAS* in all other cases.

(2) On other ships
   (a) "Cargo pump-rooms" as defined in **9.2.4-2(8), Part R of the Rules for the Survey and Construction of Steel Ships** when located in the cargo areas described in **2.1.1(2)**.
   (b) "Service spaces (low risk)" as defined in **9.2.3-2(5) and 9.2.4-2(5), Part R of the Rules for the Survey and Construction of Steel Ships** when the surface area is less than 4 m^2 and when no flammable products are stored.
   (c) "Service spaces (high risk)" as defined in **9.2.3-2(9) and 9.2.4-2(9), Part R of the Rules for the Survey and Construction of Steel Ships** in all other cases.

2 Since it is understood that only chemical injection (i.e. *BWMS* category 6), in-line flocculation (i.e. *BWMS* category 2) and technologies using neutraliser injection (i.e. *BWMS* categories 4, 5, 6 and 7) will need chemical or additive storage, such *BWMS* are subject to **-1** above.

3 When chemical substances are stored in same spaces containing ballast water management machinery, such spaces are considered to be both the spaces described in **-1** above and as the machinery spaces described in **3.2.1**.

4 When chemical substances are stored inside integral tanks, ship shell plating is not to form any boundary of the tank.

5 Tanks containing chemicals are to be segregated from accommodation, service spaces, control stations, and machinery spaces not related to the *BWMS* as well as from drinking water and stores for human consumption by means of cofferdams, void spaces, cargo pump rooms, empty tanks, oil fuel storage tanks, *BWMR* or other similar spaces. On-deck stowage of permanently attached deck tanks or installation of independent tanks in otherwise empty hold spaces is to be considered as satisfying this provision.

3.3 *BWMR* Locations and Boundaries

3.3.1 General

1 *BWMR* containing equipment for *BWMS* for the following **(1)** to **(4)** purposes are to be equipped with tested gastight and self-closing doors without holding back arrangements.

(1) *BWMS* storing, introducing or generating chemical substances

(2) De-oxygenation by inert gas generators

(3) Electrolysis

(4) Ozone injection

2 The *BWMR* doors described in **-1** above are to be led to open decks but are not to be self-closing.

3.3.2 *BWMS* Using Chemical Substances

For *BWMS* using chemical substances storing, introducing or generating chemicals, *BWMR* and chemical substance storage spaces are not to be located in accommodation areas. Ventilation exhausts or other openings from such spaces are to be located not less than 3*m* from entrances, air inlets and openings to accommodation spaces. This requirement need not apply when *BWMS* are located in engine rooms.

3.3.3 *BWMS* Using Ozone

1 *BWMS* using ozone (hereinafter referred to as "ozone-based *BWMS*") (i.e. *BWMS* categories 7a and 7b) are to be located in dedicated compartments, separated from other spaces by gastight boundaries. Access to such *BWMR* from other enclosed spaces is to be through airlocks only, except when the only access to that space is from an open deck.

2 Access to the ozone-based *BWMR* may be provided through engine rooms when the following **(1)** and **(2)** are satisfied.

(1) Access from the engine room to the *BWMR* is through an airlock.

(2) An alarm repeater, which will repeat any alarm activated in the engine room, is provided in the *BWMR*.

3 Signs are to be affixed on the doors of ozone-based *BWMR* providing the crew with warnings that ozone may be present and with the necessary instructions to be followed before entering such spaces.

3.4 Fire Fighting

3.4.1 Fixed Fire Extinguishing Systems

1 Fixed fire extinguishing systems are to comply with relevant provisions of **Part R of the Rules for the Survey and Construction of Steel Ships**.

2 *BWMR* containing equipment related to ozone-based *BWMS* are to be provided with fixed fire extinguishing systems suitable for category A machinery spaces and capable of manual release.

3 When fixed fire-extinguishing systems are provided for *BWMR*, such systems are to be compatible with *BWMS* and the chemical products that are used, stored or generated in the *BWMR*. Specific attention is to be paid to potential chemical reactions between fire extinguishing media and chemical products used for water treatment. Water-based fire-extinguishing systems are to especially be avoided in the case of sulfuric acid storage.

4 When foam fire extinguishing systems are installed in the *BWMR*, their efficiency is not to be impaired by the chemicals used by the *BWMS*.

5 When fixed fire-extinguishing systems are installed in the *BWMR*, automatic *BWMS* shut-down upon release of fixed fire extinguishing systems is to be arranged. Any need for cooldown necessary for safe shut-down is to be considered in shut-down sequences.

6 When *BWMS* that includes air or O_2 storage are located in spaces provided with fixed gas fire-extinguishing systems, the air or O_2 storage is to be taken into account for gas capacity calculations, unless discharge pipes from safety valves for the air or O_2 storage are led directly outside the space.

3.4.2 Portable Fire Fighting Equipment

At least one portable fire extinguisher that complies with **Part R of the Rules for the Survey and Construction of Steel Ships** and suitable for electrical fires is to be provided for *BWMR* containing UV-type *BWMS*.

3.5 Fire Prevention

3.5.1 Equipment Protection

1 Overcurrent or overvoltage protection is to be installed to protect UV-type *BWMS*.

2 Electrolysis reactors are to be provided with at least with two independent means of monitoring operations. Monitoring systems are to initiate audible and visual alarms and automatic shut-downs of *BWMS* when anomalies are detected. Requirements for shut-down arrangements are described in **2.2.1-12**.

3 When pressure relief valves are provided in addition to the shut-down arrangements described in **-2** above, vents of such valves are to be led to safe locations on open decks, and such valves are to be positioned so as to optimally remove gas from electrolysis reactors.

3.5.2 Fire Detection

1 Fixed fire detection and fire alarm systems complying with **Part R of the Rules for the Survey and Construction of Steel Ships** are to be provided for spaces containing inert gas generators or ozone generators.

2 Sections of fire detectors which cover control stations, service spaces or accommodation spaces are not to include *BWMR* containing equipment related to ozone-based *BWMS*.

3.6 Ventilation

3.6.1 Equipment Requirements

1 Ventilation systems for *BWMR* containing *BWMS* for the following **(1)** to **(4)** purposes are to be independent of ventilation systems serving other spaces.

(1) *BWMS* storing, using or generating chemical substances

(2) De-oxygenation, including pasteurisation and de-oxygenation (i.e. *BWMS* categories 3 and 8)

(3) Electrolysis

(4) Ozone injection

2 Ventilation exhausts for *BWMR* containing nitrogen generators are to be located in the lower parts of spaces in order to efficiently disperse dangerous gases heavier than air.

3 Ventilation exhausts for *BWMR* containing electrolysis systems are to be located so as to be able to efficiently disperse dangerous gases that may be generated during electrolysis. Due regard to be paid to the expected quantity and density of such gases when designing the ventilation exhaust.

4 Ventilation ducts serving *BWMR* for ozone-based *BWMS* are to satisfy the following **(1)** to **(3)**.

(1) Parts of ducts located outside *BWMR* are to be made of steel having thicknesses of at least 3 *mm* for ducts with free cross-sectional areas of less than 0.075 m^2, thicknesses of at least 4 *mm* for ducts with free cross-sectional areas between 0.075 m^2 and 0.45 m^2 and thicknesses of at least 5 *mm* for ducts with free cross-sectional areas exceeding 0.45 m^2.

(2) Ducts are to be suitably supported and stiffened.

(3) The outside openings of ducts are to be fitted with protective screens of not more than 13 *mm* ×13 *mm* mesh.

5 Ventilation systems for *BWMR* containing ozone-based *BWMS* or ventilation systems for hydrogen de-gassing arrangements required by **2.2.4-1(5)** are to be interlocked with the *BWMS* in accordance with the following **(1)** and **(2)**.

(1) In the case of loss of ventilation (primary and secondary), visual and audible alarms are to be activated both inside and outside the *BWMR* and at locations where responsible members of the crew are on duty. If ventilation is not restored after a pre-set time, the *BWMS* is to automatically shut-down. Any need for cooldown necessary for safe shut-down is to be considered in shut-down sequences.

(2) *BWMS* are not to be started without ventilation systems running.

6 For the ventilation systems described in **-5** above, relevant requirements in **2.2.4** are to be satisfied.

3.6.2 Ventilation Rates

1 An adequate power ventilation system is to be provided in enclosed *BWMR*.

2 The ventilation capacity is to be at least 30 air changes per hour where explosive or toxic gases may be generated during operation of the *BWMS*. The *IMO* reports issued during the basic and final approval procedures in accordance with *IMO (GESAMP) MEPC* report and "safety hazard" as listed in **Chapter 17, Part S of the Rules for the Survey and Construction of Steel Ships** are to be used as references for identifying those cases.

3 The ventilation capacity may be reduced as following **(1)** to **(6)**.

(1) Flocculation-type *BWMS* : 6 air changes per hour

(2) De-oxygenation, incl. pasteurisation and de-oxygenation (categories 3 and 8): 6 air changes per hour

(3) Full flow electrolysis: 6 air changes per hour

(4) Side-stream electrolysis: 20 air changes per hour

(5) Ozone injection: 20 air changes per hour

(6) Chemical injection: 6 air changes per hour

4 Notwithstanding **-1** to **-3** above, more stringent ventilation capacity requirements in other parts of the NK Rules like **Part S of the Rules for the Survey and Construction of Steel Ships** may apply to spaces located in cargo areas.

3.7 Personal Equipment

3.7.1 Personal Equipment

1 Suitable protection equipment (as recommended by the product manufacturers) is to be available on board for the protection of crew engaged in the servicing, maintenance and repair of *BWMS* storing, using or generating chemicals. Such equipment is to consist of large aprons, special gloves with long sleeves, suitable footwear and coveralls made of chemical-resistant materials as well as tight fitting goggles, face shields or both. Protective clothing and equipment are to cover all skin so that no part of the body is unprotected. Moreover, such equipment is to be provided separately without taking into account the equipment required by other mandatory requirements.

2 Work clothes and protective equipment are be kept in easily accessible places and in special lockers. Such equipment is not to be kept within accommodation spaces; this, however, need not apply to new, unused equipment or equipment which has not been used since undergoing a thorough cleaning process. Notwithstanding **-1** above, storage rooms for such equipment may be located within accommodation spaces when adequately segregated from living areas such as cabins, passageways, dining rooms, bathrooms, etc.

3 When *BWMS* storing, using or generating chemicals are installed on board, suitably marked decontamination showers and eyewashes are to be available in convenient locations in close proximately to the *BWMS* and the chemical store-rooms.

4 Emergency escape breathing apparatuses (EEBD) are to be provided in *BWMR*. Such apparatuses may be one of the EEBDs provided in accordance with **Chapter 13, Part R of the Rules for the Survey and Construction of Steel Ships**. EEBDs need not be required for *BWMS* category 1.

5 Personal ozone detectors, calibrated per manufacturer specifications, are to be provided for persons engaged in the servicing, maintenance and repair of ozone-based *BWMS*.

6 Two-way portable radiotelephones dedicated for *BWMS* service, maintenance and repair are to be provided, in addition to those required by **Part R of the Rules for the Survey and Construction of Steel Ships** for fire-fighting purposes. Such radiotelephones are to be properly identified in order to avoid mix-up with those radiotelephones intended for fire-fighting operations. When *BWMS* may release explosive gases, such radiotelephones are to be of a certified safe type suitable for use in hazardous area zone 1 as defined in **Part H of the Rules for the Survey and Construction of Steel Ships**. When *BWMS* store, use or generate chemical substances, such radiotelephones are to undergo deep cleaning or de-contamination after use. Two-way portable radiotelephones need not be required for *BWMS* category 1.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2022.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the application for approval of the installation of Ballast Water Management Systems is submitted to the Society before the effective date. Notwithstanding the provision, the amendments apply to ships for which the date of contract for construction* is on and after the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

GUIDANCE FOR BALLAST WATER MANAGEMENT INSTALLATIONS

GUIDANCE

2022 AMENDMENT NO.1

Notice No.35 30 June 2022

Resolved by Technical Committee on 26 January 2022

Notice No.35 30 June 2022
AMENDMENT TO THE GUIDANCE FOR BALLAST WATER MANAGEMENT INSTALLATIONS

“Guidance for ballast water management installations” has been partly amended as follows:

Amendment 1-1

Part 2 SURVEYS

Chapter 1 GENERAL

Section 1.2 has been added as follows.

1.2 Preparation for Survey and Other Items

1.2.5 Procedure for Tests, Wear and Tear, etc.

With respect to **1.2.5, Part 2 of the Rules**, surveyors are to confirm at periodical surveys that asbestos-free declarations and supporting documents are provided for any replaced or newly installed fittings, equipment, parts, etc.

Chapter 2 REGISTRATION SURVEYS

2.1 Registration Surveys during Construction

Paragraph 2.1.1 has been added as follows.

2.1.1 Registration Surveys

With respect to **2.1.1-2, Part 2 of the Rules**, surveyors are to confirm the asbestos-free declarations and supporting documents specified in **2.1.2-2(4), Part 2 of the Rules**.

2.1.3 Inspections of Equipment

Sub-paragraph -1 has been amended as follows.

1 For the purpose of **2.1.3-2(10), Part 2 of the Rules**, ~~inspections are~~ commissioning testing of *BWMS* is to be carried out after all equipment (including associated piping, etc.) has been fully installed on board in consideration of BWM.2/Circ.70/Rev.1 *2020 Guidance for the Commissioning Testing of Ballast Water Management Systems* and in accordance with **Annex 2.1.3-2(10) "Guidance Procedure for Commissioning Testing"**.

Sub-paragraph -2 has been deleted.

~~**2** During the inspections specified in **-1 above**, in addition to BWM.2/Circ.70/Rev.1 *2020 Guidance for the Commissioning Testing of Ballast Water Management Systems*, the following are to be undertaken for the sampling and analysis of the *BWMS* referred to in **2.1.3-1(10), Part 2 of the Rules.**~~

~~(1) Collection of representative samples~~

~~(a) Representative samples are to be collected from the sampling facilities specified in **1.5, Part 3 of the Rules** during the corresponding ballast water discharge after the full treatment has been applied.~~

~~(b) The total sample volume is to be at least 1 m^3; a smaller volume, however, may be used in cases where it is validated to ensure representative sampling of organisms.~~

~~(c) The applicable self-monitoring parameters (e.g. flow rate, pressure, TRO concentration, UV transmittance/intensity) of the *BWMS* are to also be assessed, taking into account the system design limitations of the *BWMS*; in addition, the correct operation of all sensors and related equipment is to be confirmed.~~

~~(2) Analysis of representative samples~~

~~Representative samples are to be analysed for its compliance with the requirements specified in **(1) and (2) of 3.2, Part 3 of the Rules**, using the indicative analysis methods listed in BWM.2/Circ.42/Rev.2, as may be amended.~~

Chapter 4 OCCASIONAL SURVEYS

Section 4.1 has been amended as follows.

4.1 ~~General~~Occasional Surveys

4.1.1 General

1 The wording "the Society may approve the survey methods which it considers to be appropriate." in **4.1, Part 2 of the Rules** means survey methods which the Society considers to be able to obtain information equivalent to that obtained through traditional ordinary surveys where a surveyor is in attendance.

Annex 2.1.3-2(10) has been added as follows.

Annex 2.1.3-2(10) "Guidance Procedure for Commissioning Testing"

1.1 Equipment

1.1.1 General

1 Testing are to be conducted using indicative analysis equipment accepted by the Society.

2 Information and reference to the acceptance documents for the equipment used are to be submitted to the Society in the report which includes the results from the commissioning test performed in accordance with *BWM*.2/*Circ*.70/*Rev*.1(as amended).

3 In case the indicative analysis equipment used at the testing has not previously been accepted by the Society, the following information is to be submitted to the Society:

(1) Equipment information (type, model, technology used, evidence of calibration, detection range, organism type/size classes that can be analyzed);

(2) Test results conduct for the verification of accuracy, detection range and repeatability; and

(3) Certificate of standards, if applicable

4 In case the commissioning test requires the operators to work in hazardous areas (e.g., pump room for tankers, etc.), the service suppliers are either to have the equipment certified for use in such spaces or to provide the surveyor with a list of vessels for which they would not be able to conduct testing.

5 For indicative analysis equipment planned to be used, the equipment *OEM* instruction manuals are to be available.

6 The manuals specified in **-5** above is to include, at least, clear guidance for the proper storage, handling, operation, maintenance, repair, and calibration of the equipment.

7 Service suppliers may use specialty devices (e.g., sieves, screens, etc.) to separate the different organism sizes classes (i.e., $\geq 10\ \mu m$ to $< 50\ \mu m$, and $\geq 50\ \mu m$, and indicator microbes) to support analysis of each size class.

8 Equipment used for the analysis of physical and/or chemical water parameters other than those specified in **Table 1.1** is to be suitable for the intended use.

9 Indicative analysis equipment is to be properly stored or transported to avoid damage and disturbance to calibrations, etc. when transporting from the service suppliers' facilities to the vessels.

Table 1.1

Sizes of viable organisms	Number of viable organisms
Greater than or equal to $50\ \mu m$	less than $10\ /m^3$
less than $50\ \mu m$ and greater than or equal to $10\ \mu m$	less than $10/ml$

1.2 Sampling and Analysis of Ballast Water

1.2.1 Sampling

1 Service suppliers are to follow relevant guidelines on sampling of ballast water.

2 A standard operating procedure is to be defined for sampling of uptake water. Discharge sampling are to follow *IMO Res. MEPC*.173(58).

1.2.2 Analysis

1 The representative samples are, at least, to be analyzed with indicative analysis methods if the standards as per **Table 1.1** are met.

2 Detailed analysis of all organism type/size classes or combination of detail and indicative analysis can also be performed.

3 In such cases as specified in **-2** above, equipment, procedures and methods for such analysis, where applicable, are to be in accordance with relevant international standard and/or industry standards accepted by the Society. For all equipment planned to be used, the instruction manuals are to be available.

1.3 Records and Reporting

1.3.1 Records

Service suppliers are to maintain a record of the following:

(1) Operation of the *BWMS* during test period, including any recorded data or operator observations associated with the performance deviations, alarms or abnormal/unexpected operations; and

(2) Applicable self-monitoring parameters

1.3.2 Reporting

1 Service suppliers are to provide reports detailing the results of sampling and analysis of ballast water and assessment of self-monitoring parameters during commissioning testing.

2 Information and reference to the acceptance documents for the equipment used for the testing should be included in the report.

3 The format of the report is to be acceptable to Society and contain the following information as a minimum:

(1) Manufacturer's name of the *BWMS*

(2) Model name of the *BWMS*

(3) *SDL* and the *BWMS* technology limiting operating conditions

(4) Operation required (e.g., ballasting, de-ballast, circulation, one pass, in tank, etc)

(5) Treatment rated capacity of the *BWMS* (m^3/h)

(6) Relevant performance parameters (e.g. flow rate, pressure, Total Residual Oxidants (*TRO*), *UV* intensity, *UV* dose, or other relevant parameters)

(7) Alarms developed during the testing

(8) Installation location the *BWMS*

(9) Type Approval issued by and Certificate No . of the *BWMS*

(10) Installation date of the *BWMS*

(11) Method used for the testing

(12) Results of sample analysis (includes the record as specified in **1.3.1** and the raw data generated from the used testing equipment)

(13) Flow rate of ballast pump and volume of ballast tanks, used for the testing

(14) Comments/Notes (information on filter and other major components and process measurements etc.)

1.4 Other

1.4.1 General

For commissioning testing, attention is to be paid to complying with national regulations of the flag states in which the ships are registered, if any.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2022.

Amendment 1-2

Part 3 EQUIPMENT FOR BALLAST WATER MANAGEMENT

Chapter 3 BALLAST WATER MANAGEMENT

Section 3.3 has been amended as follows.

3.3 Ballast Water Management System (*Regulation* D-3 of *Annex*)

~~**1** The requirements of this section from -3 to -9 apply to (1) or (2) below:~~
~~(1) *BWMS* of which an application for approval for the plans is made on or after 1 January 2017; or~~
~~(2) *BWMS* which is installed in ships contracted for construction on or after 1 January 2017.~~

~~**2**~~**1** The wording "installed" in **3.3-1(1)(a)** and **(b), Part 3 of the Rules** refers to either the following **(1)** or **(2)**.
(1) The contractual date of delivery of the *BWMS* to the ship
(2) In the absence of the date of **(1)** above, the actual date of delivery of the *BWMS* to the ship

~~**3**~~**2** The wording "the guidelines developed by the *IMO*" in **3.3-1(1)(b), Part 3 of the Rules** refers to *MEPC*.174(58) or *MEPC*.279(70).

~~**4** Where the system uses chemical substances indicating possible unacceptable adverse effects to human health and the equipment in "*BWMS* using active substances or preparations" specified in **3.3-1(2), Part 3 of the Rules**, the following requirements **(1)** to **(9)** are to be satisfied. The following requirements may be appropriately relaxed depending of the chemical substances.~~
~~(1) For the space where the system is installed, at least two sets of full protective clothing, gloves, boots, and tight-fitting goggles or face shields are to be provided. The equipment is to be kept in readily accessible places.~~
~~(2) Underneath chemical storage tanks, piping flange joints connected to the tanks and pumps, drain pans are to be provided.~~
~~(3) The materials used for the chemical storage tanks, piping and fittings are to be resistant to such chemicals.~~
~~(4) Chemical storage tanks are to have sufficient strength and be constructed such that maintenance and inspection can be easily performed.~~
~~(5) Chemical storage tank air pipes are to be led to a safe area on open deck.~~
~~(6) High water level alarms are to be provided in chemical storage tanks, audible and visual alarm signals are to be given at near chemical storage tanks, in addition to the spaces mentioned in **3.3-2(1)(b), Part 3 of the Rules**.~~
~~(7) An operation manual containing chemical injection procedures, alarm systems, measures in case of emergency, etc., is to be kept onboard.~~
~~(8) Handling procedures are to be in accordance with the Material Safety Data Sheet (*MSDS*) and *BWM.2/Circ*.20.~~
~~(9) Additional requirements may be required, when the Society considers such necessary.~~

~~**5** Where the system generates dangerous gas in "*BWMS* using active substances or preparations" specified in **3.3-1(2), Part 3 of the Rules**, the following requirements **(1)** to **(8)** are to be satisfied.~~
~~(1) The system is, in general, not to be located in any spaces where crews normally work.~~
~~(2) Gas detection equipment is to be fitted in the spaces where dangerous gas could be present. The gas detection equipment is to be designed and tested in accordance with *IEC* 60079-29-1~~

or recognized standards acceptable to the Society. In the event of leakage, an audible and visual alarm is to be activated at the following spaces:

(a) *BWMS* control station; and

(b) The local manual control of the *BWMS*.

(3) As far as practicable, pipes flowed dangerous gas is to be joined by welding.

(4) The arrangements used for gas relieving, i.e. degas equipment or equivalent, are to be provided with monitoring measures with independent shutdown. The open end of the gas relieving device is to be led to a safe area on open deck.

(5) The pipes for dangerous gas are not to pass through accommodation spaces and control stations.

(6) Operation of *BWMS* in the spaces is to be interlocked with ventilation such that the ventilation is to be in operation at all times.

(7) The ventilation line of a space where dangerous gas could be present is to be led to a safe area on open deck.

(8) Additional requirements may be required, when the Society considers such requirements necessary.

6 In applying **3.3-2, Part 3 of the Rules**, *BWMS* is to be operated at a flow rate within the Treatment Rated Capacity (*TRC*) range specified in the type approval certificate.

7 In applying **3.3-2(1)(f)** and **(2)(h), Part 3 of the Rules**, the valves in the by-pass line which trigger the by-pass operation are to be remote-controllable by control equipment or fitted with open/close indicator for automatic detection of the by-pass event.

8 In applying **3.3-3, Part 3 of the Rules**, design and installation of *BWMS* are to comply with followings in addition to the relevant requirements of **the Rules for the Survey and Construction of Steel Ships**.

(1) Related piping of *BWMS* is to comply with followings.

(a) Piping is to be designed in accordance with approval conditions for *BWMS* in **3.3-1(1)** and **(2) in Part 3 of the Rules**.

(b) *BWMS* and related piping and equipment are to be installed in such a way that cleaning, inspection, maintenance and operation can be easily performed.

(c) When fresh water is supplied to the system for treatment or maintenance, etc., measures are to be adopted to ensure that sea water does not contaminate the fresh water system.

(d) Where a vacuum may occur in the ballast line due to the height difference, a suitable protection means is to be provided, e.g. P/V valves or breather valves, and their outlets are to be led to safe area on open deck.

(e) The length of pipe and the number of connections are to be minimized in piping system containing dangerous gases/liquids in high concentration.

(f) Pipe joints specified in above **(e)** are to be of welded type except for connections to shut off valves, double walled pipes or pipes in ducts equipped with mechanical exhaust ventilation. Alternatively it is to be demonstrated that risk of leakage is minimized and the formation of toxic or flammable atmosphere is prevented.

(g) Location of pipe system specified in above **(e)** is to be away from heat sources and protected from mechanical damage.

(2) For ships fitted with dangerous ballast tanks, where the ballast water is passed through a system for measuring total residual oxidants (*TRO*) or total residual chlorine (*TRC*) before discharge, the requirements for the system in non-hazardous area such as engine room are as given below.

(a) The sampling facility (for *BWMS* monitoring/control) is to be located within a gas tight enclosure (hereinafter, referred to as a cabinet), and the following **i)** to **iii)** are to be complied with.

i) In the cabinet, a stop valve is to be installed in each sample pipe.

ii) Gas detection equipment is to be installed in the cabinet and the valves specified in **i)** above are to be automatically closed upon activation of the gas detection equipment.

iii) Audible and visual alarm signals are to be activated at the spaces specified in **3.3.5(2)(a)** and **(b)** when the concentration of explosive gases reaches a pre-set value, which should not be higher than 30% of the lower flammable limit (LFL) of the concerned product.

(b) The standard internal diameter of pipe penetrating a bulkhead is not exceeded 12 *mm*.

(c) Pipes penetrating a bulkhead are to be constructed of corrosion resistant material.

(d) The penetration of pipes between hazardous area and non-hazardous area is to be welded on both sides.

(e) The measuring system is to be installed as close to the bulkhead as possible, and the length of measuring pipe is to be as short as possible.

(f) Stop valves are to be located in the non-hazardous area, in both the suction and return pipes close to the bulkhead penetrations. A warning plate stating "Keep valve closed when not performing measurements" is to be posted near the valves. Furthermore, in order to prevent backflow, a water seal or equivalent arrangement is to be installed on the hazardous area side of the return pipe.

(g) A safety valve is to be installed on the hazardous area side of each sampling pipe.

(h) If safety valve is installed in the sampling system, hydrostatic test is to be carried out at a pressure greater than that required to open the valve, or at a pressure greater than the operating pressure of cargo pump and ballast pump if no valve is provided.

(i) No opening is to be provided in the non-hazardous area for the sampling line.

(j) The sampled ballast water is to be returned to the pipping from which the water is sampled or to the ballast tank.

(k) The standard internal diameter of sampling pipes is the minimum necessary in order to achieve the functional requirements of the sampling system.

(3) For the spaces, including hazardous area, where toxicity, asphyxiation, corrosivity or reactivity is present, these hazards are to be taken into account and additional precautions for the ventilation of the spaces and protection of the crew are to be considered.

(4) The electric equipment of *BWMS* is to comply with followings.

(a) The relevant electric equipment of *BWMS* is to have a degree of protection suitable for the installed location in accordance with **H2.1.3-4, Part H of the Guidance for the Survey and Construction of Steel Ships**.

(b) When the electric equipment is to be installed in a hazardous area of a tanker, ship carrying dangerous chemicals in bulk, or a ship carrying liquefied gases in bulk, the equipment is to comply with **Chapter 4, Part H of the Rules for the Survey and Construction of Steel Ships**.

(c) Total capacity of generator is to cover maximum power demand when operating *BWMS*, including the ballasting under the normal seagoing conditions, loading/unloading cargoes and entering/leaving a port, etc.

(5) For tankers carrying flammable liquids having a flashpoint not exceeding 60 °C, products listed in the *IBC* Code having a flashpoint not exceeding 60 °C or cargoes heated to temperature above their flashpoint and cargoes heated to temperature within 15 °C of their flashpoint, in general, two independent *BWMS* may be required - i.e. one for ballast tanks in hazardous areas and the other for ballast tanks in non-hazardous areas. However, one *BWMS* may be required provided that the following **(a)** and **(b)** are satisfied:

(a) The interconnection of ballast piping between hazardous areas and non-hazardous areas

may be accepted if an appropriate isolation arrangement is applied. Means of appropriate isolation are as follows:

i) Two screw-down check valves in series with a spool piece (refer to **Fig.3.3-1i)**); or

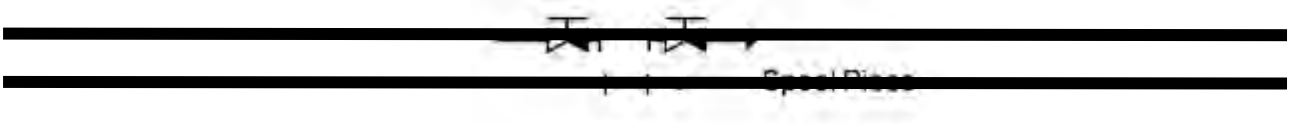
ii) Two screw-down check valves in series with a liquid seal at least 1.5 *m* in depth (refer to **Fig.3.3-1ii)**); or

iii) Automatic double block and bleed valves and a non-return valve (refer to **Fig.3.3-1iii)**).

(b) Ballast water originating from a hazardous area is not to discharge into a non-hazardous area, except as given by **3.3-7(2)**. Examples of appropriate isolation arrangements are shown in **Fig.3.3-2(1)** and **(2)**. Isolation arrangements specified in **(a)i)** to **iii)** are to be fitted on the exposed deck in the hazardous area.

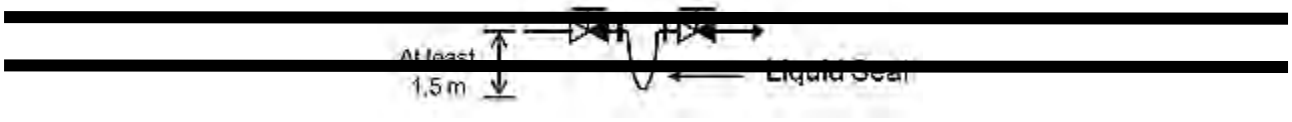
Fig.3.3-1 Means of appropriate isolation

i)



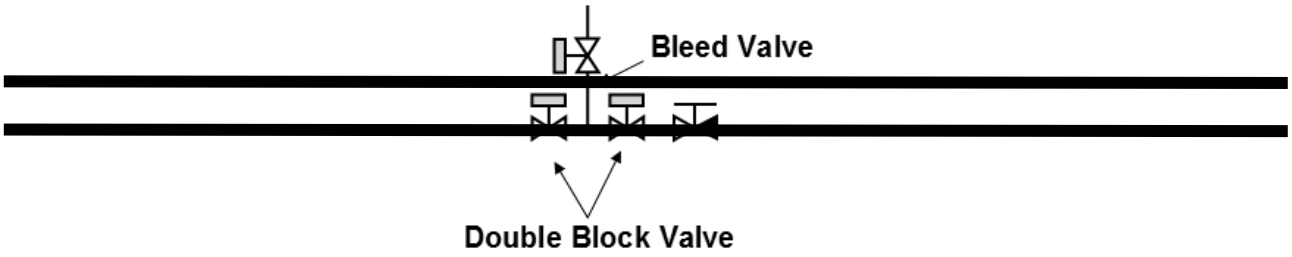
Or

ii)



Or

iii)



(6) The following requirements of ventilation **(a)** and **(b)** are to be satisfied.

(a) *BWMS* not in hazardous areas:

i) *BWMS* that does not generate dangerous gas is to be located in an adequately ventilated area.

ii) *BWMS* that generates dangerous gas is to be located in a space fitted with a mechanical ventilation system providing at least 6 air changes per hour or as specified by the manufacturer, whichever is greater.

iii) Ventilation openings are to be led to a safe area on open decks.

(b) *BWMS* in hazardous areas

i) *BWMS*, regardless of whether or not it generates dangerous gas, is to be located in a space fitted with mechanical ventilation complying with relevant requirements, e.g. **Part H, Part N** and **Part S of the Rules for the Survey and Construction of Steel Ships**.

ii) **(a)iii)** above is to be complied with.

(7) Where *BWMS* is installed in an independent compartment, the compartment is to satisfy the following requirements **(a)** and **(b)**.

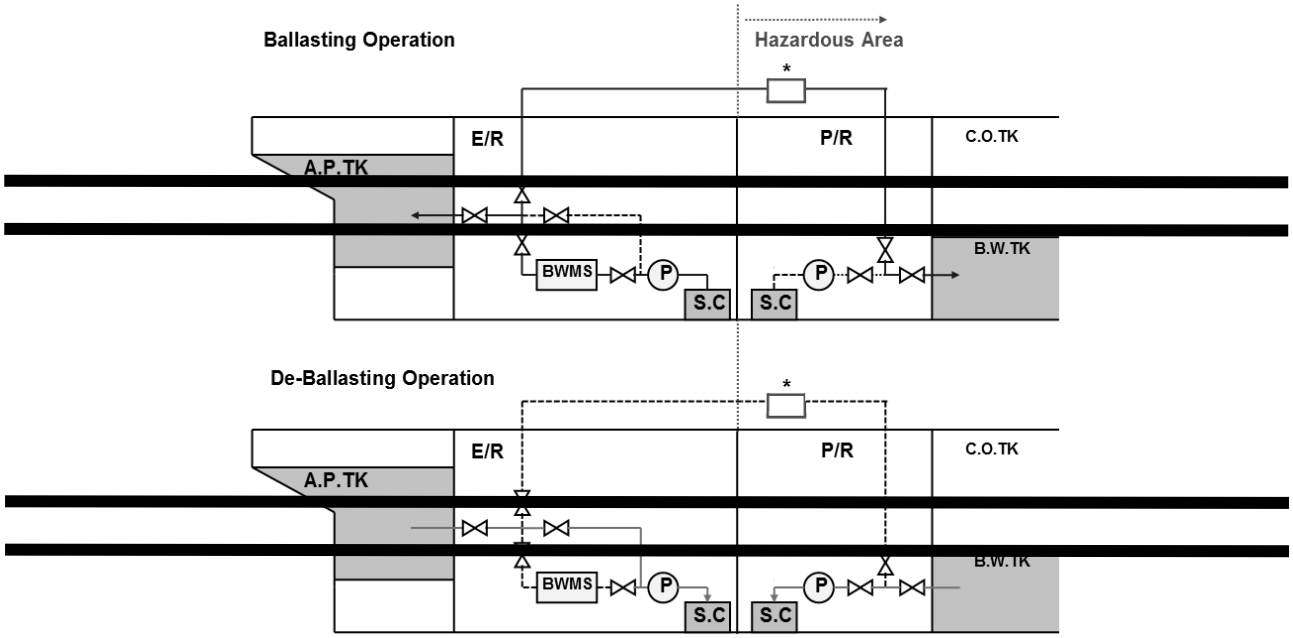
~~(a) The compartment is to be provided with fire integrity equivalent to "other machinery spaces".~~

~~(b) The compartment is to be positioned outside of any combustible, corrosive, toxic, or hazardous areas unless otherwise specifically approved.~~

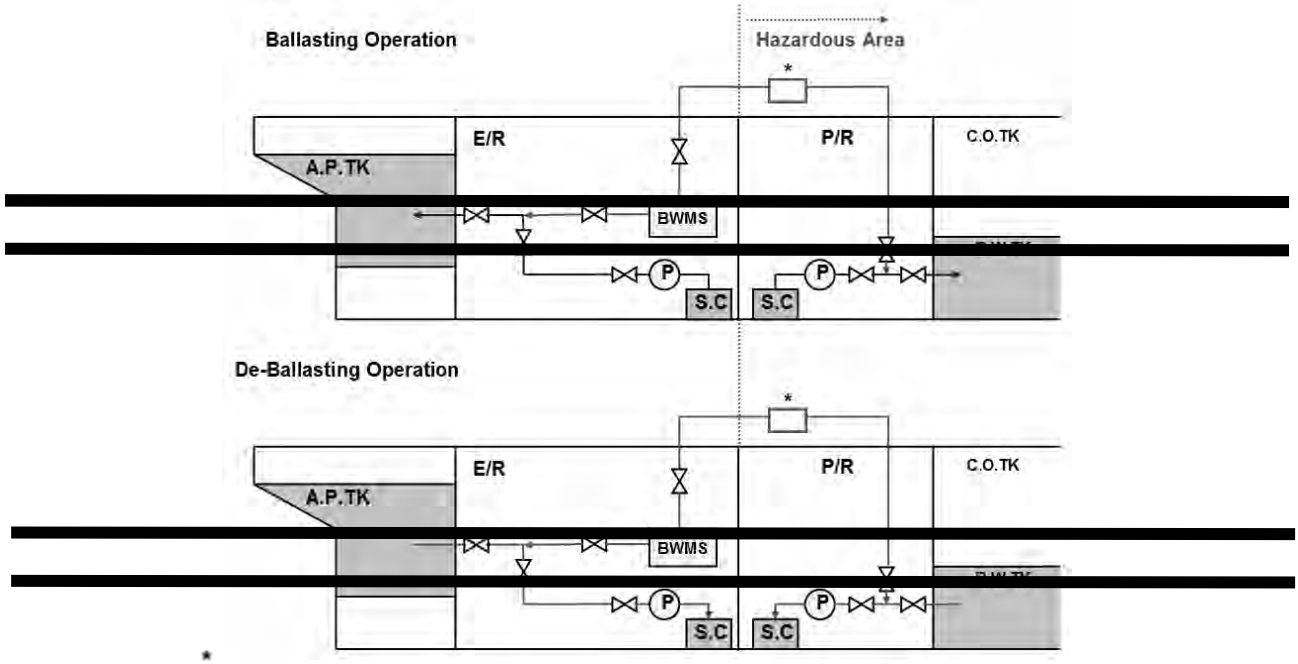
~~(8) A risk assessment may be conducted to ensure that risks, including but not limited to those arising from the use of dangerous gas affecting persons on board, the environment, the structural strength or the integrity of the ship are addressed.~~

~~**9** "*BWMS* is to be approved by the Society" specified in **3.3.1(1), Part 3 of the Rules** means the systems which are approved in accordance with **Chapter 11, Part 2 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.~~

~~Fig.3.3-2(1)　　*BWMS* which does not require after-treatment~~



~~Fig.3.3-2(2)　　*BWMS* which require after-treatment (Injection type)~~



* ~~Appropriate isolation means (refer to **3.3-6(5)(a)i)** to **iii))~~

Part 4 has been added as follows.

Part 4 REQUIREMNETS FOR BALLAST WATER MANAGEMENT SYSTEM INSALLATION

Chapter 2 ARRAGEMENT, PIPING, ELECTRICAL INSTALLATIONS, ETC.

2.2 Installation

2.2.3 Requirements for Tankers

When providing the alternative means of isolation described in **2.2.3-14, Part 4 of the Rules**, the following **(1)** and **(2)** are recommended.

(1) The means of isolation provides suitable protection measures for hydrocarbon, flammable or toxic liquids or vapours emanating from the hazardous areas.

(2) The means of isolation is located on either the following **(a)** or **(b)**.

(a) Open decks

(b) As high as possible in machinery spaces (in principle, just below the main deck). When piping penetrates bulkheads between engine rooms and hazardous areas (such as cargo pump rooms), the safety and gastightness of such penetrations are to be taken into account.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2022.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the application for approval of the installation of Ballast Water Management Systems is submitted to the Society before the effective date. Notwithstanding the provision, the amendments apply to ships for which the date of contract for construction* is on and after the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.