



DNV Guidance - approval of retrofit installations of ballast water treatment systems



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DNV Approval Ship and Offshore
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1 PURPOSE

The purpose of this guidance document is to give a procedure to follow when a DNV classed ship is subject to a retrofit installation of a ballast water treatment system (BWTS). The description includes all approvals required when a BWTS is to be installed onboard a ship classified by DNV. This guide will cover all requirements for installation of the BWTS in accordance with IMO Resolution MEPC.174(58), Guidelines G8.

2 INTRODUCTION

The International Convention for the Control and Management of Ships' Ballast Water and Sediments (hereafter called the Convention) was adopted in 2004 by IMO, and will enter into force 12 months after ratification by at least 30 States representing 35% of the world's merchant shipping tonnage. The Convention will require compliance for all ships and offshore structures regardless of age and size. All ships constructed in year 2012 and later shall have a treatment system installed by the entry into force date of the Convention. Older ships shall have a treatment system installed on the first intermediate or renewal survey, whichever occurs first, after the ships anniversary date of delivery in 2014 or 2016, depending on ballast water tank capacity. The Convention has not yet entered into force.

The US Coast Guard (USCG) Regulations (33 CFR part 151 & 46 CFR part 162) entered into force 21st of June 2012. All ships calling to US ports are required to do exchange of ballast water, and must have a treatment system installed within dates detailed below:

- On delivery for new ships constructed on or after 1st of December 2013
- First scheduled dry docking after 1st of January 2014 for ships with ballast water capacity larger than 1500 m³ or less than or equal to 5000 m³
- First scheduled dry docking after 1st of January 2016 for all other ships

3 APPROVAL PROCESS



The scope of the ship-specific design approval will depend on the certification requirement or class notation required by the ship.

For ships requesting a class notation BWM-T and/or a certificate or statement of compliance (CoC or SoC) with the Convention, DNV Rules Pt.6 Ch.18 must be followed.

For ships installing a treatment system for purposes of testing, or without requiring any certification, DNV Rules Pt.4 Ch.1 requires that a minimum safety standard must be followed, depending on the treatment technology.

For BWTS which are type approved by DNV, the design approval is required for all piping components and electrical control systems that are outside the scope of supply from the BWTS manufacturer. For BWTS that is not type approved by DNV, additional documentation has to be submitted for approval to ensure proper operation of the treatment system according to type approval given, safety of crew, ship and the environment.

For installations of BWTS onboard vessels in operation (retrofit installation), it is required to submit documentation for all ship systems affected by the BWTS installation. Details are presented on the following pages.

When a successful installation design approval is granted and initial surveys for commissioning and verification of installation is satisfactory completed, DNV can offer the optional class notation BWM-T and/or a CoC or SoC.



If sailing to the US coast, the BWTS must be type approved by USCG. Alternatively, BWTS manufacturers can submit an application to the USCG to obtain the status as Alternative Management System (AMS, ref USCG 33 CFR part 151.2026).

Such designation will allow the ship to trade with US ports for a period of 5 years starting from the date the ship would otherwise be required to have a USCG Type Approved BWTS. After the 5 years period, the BWTS must have obtained type approval by the USCG in order for the ship to be able to continue trading with US ports.



4 GENERAL

A document identifying the philosophy of ballast water management must be submitted for approval. The document shall identify how the ship is intended to operate the BWTS as an integral part of its ballast water system in order to meet the requirements of the Convention.

The same information shall also be reflected in a BWM Plan of the ship. Furthermore, details of access and handling of sediment residues in the ballast tanks must be included in the BWM Plan.

5 PIPING SYSTEM

When installing a BWTS, the existing piping system will be modified. DNV shall verify that the installation is carried out according to the BWM Convention and applicable DNV Rules to ensure functionality of the treatment system and safety of the ship by maintaining the ballasting function of the ship. The following documents related to piping systems will be requested.

- A piping diagram of ballast water system with modification arrangement including sampling facilities following Guidelines G2 of the Convention.
- If the BWTS is connected to other systems, these drawings shall also be submitted, i.e:
 - Bilge system piping diagram
 - Cooling system piping diagram
 - Exhaust system piping diagram
 - Fuel oil system piping diagram
 - Etc.

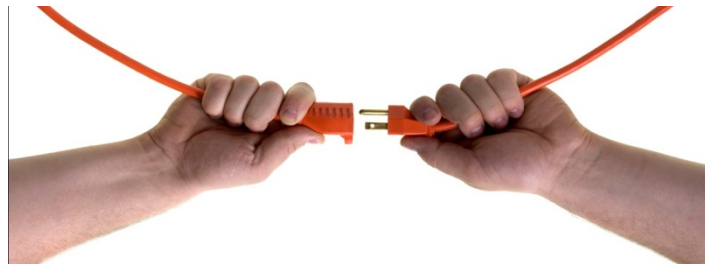
- If a BWTS is not type approved by DNV, the type approval certificate shall be submitted. The following information shall be submitted if not included in the certificate:
 - Working parameters of the main BWTS equipment including monitoring equipment, set points and control philosophy.
 - Treatment rated capacity (TRC)
 - Pump or compressors capacity
 - Operational limits shall be provided for the treatment system (e.g. pH, salinity, temperature, humidity, turbidity, power consumption, holding time, UV intensity)
 - A safety risk assessment needs to be submitted if the BWTS is using or producing hazardous and harmful substances for human health or the environment, for example:
 - Systems using active substances (as defined in Resolution MEPC.169(57), Guidelines G9)
 - Systems using chemical injections or neutralizing agents
 - All systems producing flammable, toxic or explosive gases/ liquids such as chlorine, hydrogen, ozone, oxygen, nitrogen, hydrogen peroxide, acids etc.Such a safety risk assessment is a class prerequisite for DNV to allow the system to operate onboard ships classed with DNV.

It is required that the flag state of the ship has explicitly accepted the type approval certificate issued to the BWTS. The manufacturer of the BWTS must submit such a statement to DNV.

- If the BWTS is arranged within a new compartment (container on the deck, modified ballast tank, etc.), drawings of the following systems shall be sent for evaluation:
 - Bilge system piping diagram
 - Ventilation piping diagram
 - Access to the new compartment showing that maintenance can be done as required by Guidelines G8.
- A ballast water management plan shall be updated with relevant information with respect to BWTS Management. DNV has created a template that can be used to prepare a ballast water management plan. The plan can be found here:
www.dnv.com/bwm

6 ELECTRICAL SYSTEM

Installation of a BWTS affects the electrical system of the vessel. To ensure the modification is carried out in a safe manner and following DNV Rules, DNV requests documentation addressing the changes to be submitted as one package.



- A description of the changes in the electrical system shall be submitted.
- Updated electrical power single line diagram shall be submitted showing where changes are done in the electrical system; correct short circuit level on the switchboards should be included.
- If the BWTS is arranged in a separate new distribution onboard, this should be certified if over 100kW (ref. DNV Rules Pt.4 Ch.8 Sec.1 Table B3 if the vessel shall have BWM-T class notation).
- Drawings of the switchboard modifications shall be submitted as follows:
 - Cable and circuit breaker rating together with nominal current and effect of all new consumers.
- An updated electric load balance shall be submitted as follows:
 - New consumers to be added.
 - This can be based on original load balance from new-building phase or it can be based on measurements during condition in which is relevant for the upgrade. Documentation with a conclusion should be forwarded.
- Making and breaking of new circuit breakers shall be considered towards relevant short circuit level.
 - The relation between the valid short circuit level and the breakers making/breaking capacities shall be considered for:
 - Existing installation with a need for new short circuit calculations; making and breaker capacity for all breakers, also existing installation.
 - If no new short circuit calculation is required; making/breaking capacities for new circuit breakers should be considered towards the valid short circuit calculation (old one).
 - For new short circuit calculations, it shall be evaluated and concluded with regard to:
 - Breakers currently installed in the switchboard and new breakers introduced (making/breaking capacities).
 - System selectivity table or diagram showing upstream breaker towards largest downstream breaker.

7 CONTROL SYSTEM

The control system of the BWTS will have to be connected to existing systems on the vessel. DNV will request the following documents to verify that the implementation of the new control system has been performed according to DNV Rules.

- A control and monitoring system block diagram shall be submitted for the BWTS.
- A control and monitoring system power supply arrangement shall be submitted for the BWTS.
- A list of controlled and monitored points on the BWTS.
- Description of the interface towards the ship's existing systems.
- If the BWTS is not type approved by DNV, the full requirements in DNV Rules Pt.4 Ch.9 Sec.1C Table C2 will in general apply in addition to the description of the interface towards the ship's existing system.

Note: The following documentation is normally not required for ballast water treatment systems and is only applicable when specifically required by the rules:

- Functional failure analysis (Z070)
- Failure mode and effect analysis (FMEA) (Z071)



8 FIRE SAFETY

If the installation requires changes to the ship arrangement, special care has to be taken to the fire safety arrangement. The following considerations shall be made regarding fire safety.

- If the BWTS is located in a new compartment, the structural fire safety integrity, detection, escape arrangement etc. has to be evaluated.
- If the BWTS is located in an existing machinery space, this will normally not influence the fire safety arrangement.
- DNV will carry out approval of fire safety for the Cargo Ship Safety Certificate and Cargo Ship Safety Equipment Certificate if authorized by the flag administration.

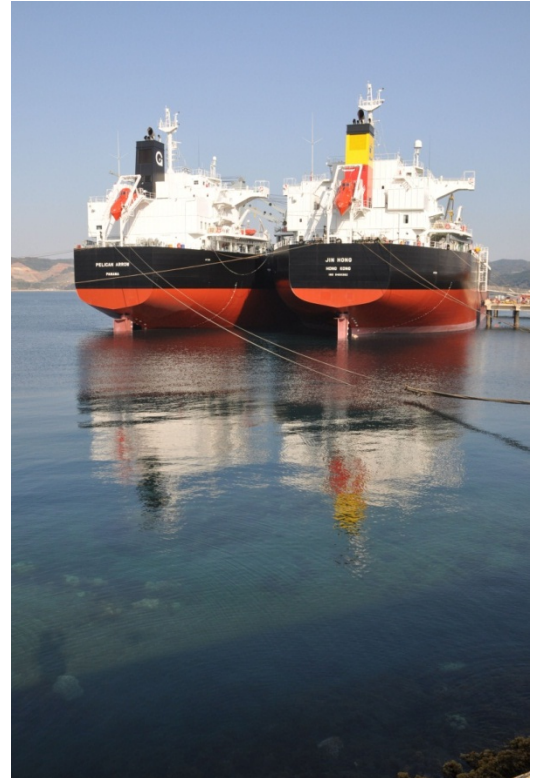


9 STABILITY

The installation of the BWTS might have an impact on the ships stability. In order to evaluate the impact, DNV will request the following documentation.

- In case lightweight change due to the installation of a BWTS will exceed 2%:
 - New Trim and Stability booklet with DNV approved lightweight shall be submitted for approval.
 - It might be required to carry out an inclining test. Alternatively DNV may accept lightweight calculation if the attending surveyor can easily verify weight and center of gravity of all installed equipment. The light weight calculation shall then be endorsed by the attending surveyor and submitted to DNV Høvik.
Note: For passenger vessels an inclining test will be mandatory if the lightweight change exceeds 2%.
- In case lightweight change due to the installation of a BWTS is less than 2%, no update of stability documents is required. However, the weight and center of gravity of the ballast water treatment system installation must be recorded onboard.
- An updated watertight integrity plan shall be submitted if the installation of the BWTS will change the vessel's watertight integrity such as:
 - Relocation of watertight bulkheads
 - New openings (external/internal)
 - New pipe routings in the damage zone which may lead to progressive flooding in case of breached pipes,

Based on this, DNV will evaluate if the stability documents need to be reapproved.



10 STRUCTURE

In order to evaluate how the structure will be influenced by the installation of a BWTS, DNV will request documentation regarding the impact on the ship structure.

- If static forces are higher than 50 kN or the moment is higher than 100 kNm, an updated structural drawing reflecting the new arrangement, including supporting structure and information on reaction loads, shall be submitted for approval.



11 DOCUMENTATION REQUIREMENTS

All the documents required for approval of the BWTS installation with regards to Piping, Electrical, Control, Fire Safety, Stability and Structure are repeated in the list below.

Documentation type	Additional description	Check
Philosophy document	Operation details of ballast water system	
Piping system		
Piping diagram	Ballast water system with modification arrangement	
Piping diagram	Bilge system, cooling system , exhaust system, fuel oil etc. if modified	
Safety risk assessment	If the BWTS is using or producing hazardous and harmful substances for human health or the environment	
Type approval certificate	Including BWTS operational details	
Statement for acceptance of the BWTS	Statement from the flag state of the ship	
Bilge system piping diagram Ventilation piping diagram Access arrangement	If the BWTS is arranged within a new compartment	
Electrical systems		
Description of changes	Changes in the electrical system	
Updated electrical power single line diagram	Including correct short circuit level on the switchboards	
Certification of new distribution onboard	If over 100 kW (ref. DNV Rules Pt.4 Ch.8 Sec.1 Table B3)	
Drawings of the switchboard modifications	Including cable and circuit breaker rating together with nominal current and effect of all new consumers	
Updated electric load balance	Including new consumers	
New short circuit calculations	If required	
Control systems		
Control and monitoring system block diagram	For the BWTS	
Control and monitoring system power supply arrangement	For the BWTS	
List of controlled and monitored points	Points controlled or monitored by the BWTS	
Description of the interface towards the ship's existing systems		
Document required in DNV Rules Pt.4 Ch.9 Sec.1C Table C2		
Fire safety		
Structural fire safety integrity, detection, escape arrangement etc.	Only if the BWTS is located in a new compartment	
Cargo Ship Safety Certificate and Cargo Ship Safety Equipment Certificate	If DNV is authorized by the flag administration	
Stability		
New Trim and Stability booklet	If installation of a BWTS will exceed 2% lightweight change	
Inclining test or lightweight calculation	If installation of a BWTS will exceed 2% lightweight change	
An updated watertight integrity plan	If the installation of the BWTS will change the vessel's watertight integrity	
Structure		
Updated structural drawing	If static forces are higher than 50 kN or the moment is higher than 100 kNm	