Procedure for Installation of Ballast Water Treatment Systems on LR Classed Ships

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# Contents

**PROCEDURE FOR INSTALLATION OF BALLAST WATER TREATMENT SYSTEMS ON LR CLASSED SHIPS**

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Section 1: Introduction

1.1 Introduction
This document provides guidance for the approval and installation of ballast water treatment systems (BWTSs) on board Lloyd's Register (LR) classed ships and is to be considered as a supporting document to the relevant Sections of the applicable LR Rules. This document provides information on what information will be required by LR to appraise BWTSs and guidance on good practice. Whilst not mandatory Rules in themselves, LR requires achieving an equivalent level of safety as would be achieved if the requirements were applied, in case of any deviations from the requirements contained within this document. This document is also intended to support clients by making clear the differences between statutory approval of BWTSs and class approval of BWTSs.

1.2 About the Ballast Water Management Convention
The International Convention for the Control and Management of Ships’ Ballast Water and Sediments (BWM Convention) was adopted by the International Maritime Organization (IMO) on 13 February, 2004. The Convention will enter into force 12 months after ratification by 30 States, representing 35 per cent of the world’s merchant shipping tonnage. The BWM Convention requires all ships of 400 gross tonnes and above to implement a Ballast Water and Sediments Management Plan, to carry out ballast water management to a given standard and to carry a Ballast Water Record Book. The BWM Convention requires that BWTSs comply with ballast water performance standard Regulation D-2 and that testing and certification are to be carried out in accordance with IMO Resolution MEPC.174(58) and, if applicable, IMO Resolution MEPC.167(57).

In addition to complying with statutory requirements, BWTSs installed on ships classed by (or intended to be classed by) LR must comply with the applicable LR Rules, which may be:
- Lloyd’s Register’s Rules and Regulations for the Classification of Ships or
- Lloyd’s Register’s Rules and Regulations for the Classification of Special Service Craft or
- Lloyd’s Register’s Rules and Regulations for the Classification of Naval Ships or

According to the type of ship and which rule set applies, hereinafter referred to as the applicable LR Rules.

1.3 What this ShipRight procedure contains
Section 2 – The different BWTS categories of approval and surveys – describes the various approvals necessary for the installation of BWTSs on ships classed by LR. This includes both the statutory requirements (IMO BWM Convention) as well as LR’s class requirements.
Section 3 – Installation – provides guidance and recommendations to be considered by those planning to install BWTSs on ships classed by LR. This guidance should be considered as supplementing the applicable LR Rules and all applications to install such systems are subject to the usual rigours of LR’s design appraisal process.

Section 2: The Different BWTS Categories of Approval and Surveys

There are two separate and distinct approvals for BWTSs, statutory approval and class approval. Statutory approvals are within the jurisdiction of the Approving Administration and it is the Administration which defines the testing and acceptance criteria. The class approval is carried out against the applicable LR Rules.

Installation surveys are required to ensure that the BWTS is installed in accordance with the approved drawings and meets LR requirements. On-going surveys ensure that the system is maintained and operated correctly and that accurate records are kept on board.

2.1 Statutory type approval

2.1.1 BWM Convention

It is anticipated that all BWTSs intended for installation on LR classed ships will have statutory type approval from an Approving Administration in accordance with IMO Resolution MEPC 174(58) – Guidelines for Approval of Ballast Water Management Systems (G8). This is a one-off approval of a specific design of BWTS.

G8 statutory type approval indicates that the BWTS has achieved the ballast water discharge standard of Regulation D-2 in land-based and shipboard evaluations and did not cause unacceptable harm to the environment or public health.

As part of the G8 approval, systems that use an active substance (defined by the IMO as ‘a substance or organism, including a virus of fungus, that has a general or specific action on or against harmful aquatic organisms and pathogens’) require an additional approval from the IMO in accordance with IMO Resolution MEPC 169(57) – Procedure for Approval of Ballast Water Management Systems That Make Use of Active Substances (G9).

A number of Administrations rely on LR to provide technical support when reviewing BWTSs for compliance with the G8 guidelines. However, it is important to reiterate that LR has no control over the approval requirements as defined by the Approving Administration or over the acceptance criteria.

LR has produced separate G8 approval guidance for equipment manufacturers which can be downloaded from www.lr.org/bwm.

Assuming that LR is to undertake the statutory approval as a Recognised Organisation (RO), then the BWTS manufacturer is responsible for:

- nominating the Approving Administration;
- arranging for land-based and shipboard testing;
- providing LR with all documentation required by IMO Resolution MEPC 174(58);
- obtaining both basic and final active substance approval from the IMO in accordance with G9, where applicable;
- providing documented evidence to LR for systems that do not use an active substance, explaining why G9 approval is not required;
- paying fees directly to:
  - the IMO for active substance basic and final approval, if applicable
  - the land-based test facility
  - the company carrying out the shipboard testing
  - the Approving Administration.

2.2 Class approval of BWTS

When installing BWTSs on board LR classed ships, the BWTSs and the ship-specific BWTS installation, including associated piping, cabling etc., are to comply with the applicable LR Rules.

2.2.1 BWTS design approval

Class approval of the BWTS will take the form of a Machinery General Design Appraisal (MGDA) covering engineering systems and electro-technology class requirements only. This one-off approval is required for each design of BWTSs. The MGDA is valid for five years and is only applicable to BWTS installed on LR classed ships. A BWTS that has a class approval issued by another class society must meet LR Rule requirements before being installed on an LR classed ship.

The MGDA may be issued as a single certificate or as two linked certificates for engineering systems and electro-technology.
BWTS manufacturers are to provide information on whether treated ballast water can generate hydrogen or other hazardous gases or substances, affect ballast water tank coatings or can result in accelerated corrosion of system coatings. LR will require a risk assessment to be carried out and may stipulate additional conditions in the MGDA where any of these risks are applicable.

Where risk assessment is to be used to support the approval of a BWTS, the risk assessment process is to be carried out in accordance with the LR ShipRight Procedure Assessment of Risk Based Designs.

### 2.2.2 What BWTS design approval indicates

LR design approval (MGDA) of the BWTS indicates that:
- the BWTS satisfies the applicable LR Rules.

LR design approval of the BWTS does not indicate that:
- ship-specific installation particulars have been approved.

### 2.2.3 Documentation to be submitted for BWTS design approval

The following documentation is to be submitted by the BWTS manufacturer:

1. General arrangement drawings, piping diagrams and process flows of the BWTS, along with electrical and control single line diagrams.
2. A technical description of the BWTS’s operating principles including a risk assessment where one or more of the following apply:
   - if the system uses noxious chemicals,
   - can result in hazardous gases or vapours may accumulate within the ballast system during operation,
   - where the treated ballast water may result in deterioration of tank coatings or accelerated corrosion.
3. The types of valves and materials used for each component, pipe sizes, thicknesses and joints, temperature and pressure ratings, electrical main power cable drawings.
4. Control, monitoring and safety system documentation, including system operating principles and functionality and capability when operating under both normal and foreseeable abnormal conditions.
5. Details of the temperatures and pressures expected along with the BWTS temperature and pressure design ratings.
6. Software quality plan.
7. Environmental test data confirming compliance with LR Test Spec 1.

### 2.3 Class approval of a ship-specific installation

BWTS installations on board LR classed ships are to be approved by LR in accordance with the applicable LR Rules. The BWTS installation includes the BWTS and associated piping, cabling, etc. The LR BWTS Type Approval or LR MGDA is to be submitted along with the ship-specific installation plans. If the BWTS does not have LR Type Approval or an LR MGDA, then a design appraisal against the Rules will be required for each individual installation on board an LR classed ship.

The installation approval is to ensure that the installation on board satisfies the applicable LR Rules and that the safety and reliability of essential systems and services of the ship are assured.

Where the installation plans meet the requirements of the LR Rules, a Design Appraisal Document (DAD) will be issued.

What an LR BWTS installation DAD indicates:
- that the ship-specific BWTS installation satisfies the requirements of the applicable LR Rules.

### 2.4 LR BWTS Type Approval (Optional)

LR Type Approval is an impartial certification service providing independent third party type approval certificates attesting to a product’s conformity with LR’s Rule requirements, LR’s Type Approval Procedures and that the BWTS holds a valid statutory approval.

LR Type Approval of BWTSs is optional and can be assigned to a BWTS that has obtained G8 statutory type approval from an Approving Administration.

Where a BWTS is type approved by LR, this confirms that the BWTS meets the requirements of the applicable LR Rules and replaces the MGDA.

As part of the Type Approval process, a design assessed against LR Test Specification No.1 is to be carried out.

### 2.4.1 What LR Type Approval indicates

LR Type Approval indicates:
- that the BWTS satisfies the relevant LR Rules and that the BWTS holds a statutory approval issued by the Approving Administration.
- that the BWTS satisfies LR’s Test Specification No.1.
- that the BWTS manufacturer’s production facility satisfies LR’s Type Approval requirements.
- that the BWTS manufacturer’s quality assurance system satisfies LR’s Type Approval requirements.
2.4.2 The LR BWTS Type Approval process
Assistance on Type Approval services will be supplied by local LR Offices on request and further information is available on the LR Type Approval website: www.lr.org/sectorsmarine/Services/certification/TA/index.aspx

2.4.3 Documentation to be submitted for LR Type Approval
The BWTS manufacturer is responsible for submitting all necessary supporting documentation and for both implementing and then maintaining satisfactory production control systems.

The following documentation is to be submitted to the Type Approval team in addition to that which is required for the BWTS design approval:

- a copy of the G8 statutory approval certificate for the BWTS;
- a copy of the G9 approval documentation including the GESAMP-BWWG report (for BWTSs using active substances), where applicable;
- the technical installation specification which was submitted in support of the BWTS statutory approval;
- any documents required to support the approval of scaled versions of the BWTS to be approved in accordance with BWM.2/Circ.33 – Guidance on Scaling of Ballast Water Management Systems;
- a copy of the manufacturer's quality assurance certification (e.g., ISO 9001 certification);
- any other supporting documentation considered necessary by LR following a request for Type Approval services.

All documentation is to be in English. Translation costs will be incurred for documentation submitted in other languages which have to be translated by LR.

2.4.4 Validity of the LR BWTS Type Approval certificate
The Type Approval certificate is valid for five years and is subject to the BWTS conforming to the approval documentation referenced in the certificate. The manufacturer is to comply with LR's Type Approval requirements and the terms and conditions stated on the certificate.

Type Approval certificates can be extended for a further five years by making a request to LR. If the product and the place of production are the same as those specified in the original Type Approval certification, no additional documentation is required. The manufacturer is to issue a letter confirming this.

If a design modification is to be made, further design appraisal and/or testing will be required and an extension certificate will be issued upon satisfactory completion.

If changes are to be made after the Type Approval certificate has been issued, details must be submitted at the earliest opportunity, together with a statement of any impact that the changes have on the BWTS and the original Type Approval certification.

Major components used in the BWTS production must be of a type listed on the Type Approval certification.

Manufacturers must notify LR of proposed changes to the location of test and production facilities.

In addition to advising LR, any design or system performance upgrade outside the scope of the statutory approval against IMO Resolution MEPC.174 (58) is to be brought to the attention of the authorising body.

LR reserves the right to withdraw a Type Approval certificate if:

- any subsequent design changes are deemed to adversely affect the provisions under which LR Type Approval certification was issued.
- a safety or any other feature of the product is found to be unsatisfactory in service.
- improper use is made of the certificate, or of LR’s name, in marketing the product.
- LR’s fees are not duly settled.
- the address of the production facility changes, without LR being notified.

2.5 Class installation survey
All BWTSs installed on LR classed ships will be surveyed by an attending Surveyor during the installation process.

The installation survey indicates that the BWTS installation has been surveyed and satisfies the LR Rules and the conditions of class.

2.6 Statutory installation surveys
The statutory surveys listed in Section 8 of Resolution MEPC.174 (58) are to be carried out, where LR acts as a RO for the Approving Administration, these surveys may be carried out by an LR Surveyor acting on behalf of the Administration.

Other specific survey instructions are contained in the IMO interim survey guidelines contained in BWM.2/Circ.7.
Section 3: Installation

3.1 BWTS design and safety

To ensure that the ship’s sea water ballast system remains operational in the event of a BWTS failure or emergency, a suitable BWTS by-pass which can be operated both locally and manually is to be installed.

BWTSs using chemicals/active substances are to have fully developed safety procedures which include, but are not limited to:
- loading chemicals;
- prevention of chemical tank overflow;
- safe handling and storage of chemicals on board;
- accidental spills and leakages;
- residual chemicals and by-product gases prior to discharge;
- chemical inhalation or contact with skin;
- management and disposal of wastes from filtered material.

Advice on the storage and handling of chemicals is contained in the IMO Circular BWM.2/Circ.20, and further guidance may be found in Pt 5, Ch 24, 3.3, 5.1 & 7.1 of the LR Rules for Ships which make provision for bulk handling and storage of chemicals for use in exhaust gas cleaning systems.

Safety features to prevent accidental discharge or operation are to be incorporated into the design including level, temperature and pressure indication, gas detection (where applicable) and chemical dosage monitoring. All shutdown conditions are to be defined.

Provision of sampling points and the sampling process are to comply with the requirements of MEPC.173 (58) – Guidelines for Ballast Water Sampling (G2).

For BWTSs using chemicals/neutralising agents, the quantities of such chemicals to be carried are to be considered relative to the expected rate of consumption, capacity of the ballast water system and required endurance.

The discharge of treated ballast water is to be monitored to ensure that it does not exceed acceptable discharge limits to sea. The chemical toxicity and quality of ballast water discharge may be regulated by local or national water quality regulations and can vary from port to port. These limits are to be adhered to where relevant in addition to the IMO D-2 Standard. It is the responsibility of the Operator to be aware of any such restrictions and to comply with them.

3.2 Piping materials

Piping materials and valves are to comply with the applicable LR Rules.

Filtration units within BWTSs are to comply with a recognised National or International Standard.

For BWTSs using chemicals/active substances, materials are to be suitable for using them with the chemicals and active substances proposed. In general, LR would expect such installations to meet the materials and piping requirements of the LR Rules for Ships Carrying Liquid Chemicals, where applicable.

Plastic pipes proposed for connecting the BWTS with other shipboard sea water ballast piping are to meet the fire endurance requirements of Pt 5, Ch 12, Table 12.5.3 of the LR Rules and Regulations, with reference to IMO Resolution A.753(18) for those Sections that cannot be isolated from the ballast system.

In addition, the use of plastic pipes is to comply with any additional requirements of the Flag & Approving Administrations.

3.3 Electrical systems

Electrical systems are to comply with the electrotechnical requirements of the applicable LR Rules.

Programmable electronic equipment is to be certified by a recognised authority as suitable for the environmental conditions in which it is intended to operate. This may be satisfied if it meets the requirements of LR Test Specification No. 1.

3.4 Location

3.4.1 BWTS restrictions in hazardous areas

The installation of BWTSs in hazardous areas will be considered on a case-by-case basis, applying the requirements of the applicable LR Rules.

Installation is not to permit ballast water discharge from hazardous areas to non-hazardous areas.

By-products of treated ballast water in ballast water tanks located in non-hazardous areas are not to render the area hazardous.

Subject to full review and acceptance by LR, transfer of ballast water from machinery spaces to a hazardous area may be accepted but not vice versa.
3.4.2 Installation in cargo pump room

For existing ships and ships under construction, installation of BWTS within cargo pump rooms should be avoided. If restrictions imposed by space prevent installation in locations other than the cargo pump room, then consideration may be given to installation in cargo pump rooms. In all such cases a suitable technical justification is to be provided.

Installation in cargo pump rooms may invalidate hazardous area classification of such spaces, consequently, they will need to be re-assessed and certified.

If the installation is a potential source of hazard gases then any equipment located in the space is to be certified for operation in hazardous atmospheres. For existing ships, where space available for installation may be limited, consideration should be given to selecting a BWTS which can be split into various sub-components. These sub-components may then fit within the available spaces and with existing systems without needing any special consideration as a result of conflicting with statutory requirements or the applicable LR Rules.

Where the BWTS is to be installed within the pump room instead of within a ballast treatment room (BTR), then a risk assessment process meeting the requirements of the ShipRight Procedure Assessment of Risk Based Designs is to be carried out in support of installing the BWTS in the pump room. Categorisation of the ballast treatment room (BTR) is to be submitted to LR along with technical and operational justification for the reasons preventing installation in non-hazardous or less hazardous locations. Reference is to be made to:

- operational requirements such as the ballast transfer rate;
- size and footprint of the BWTS;
- integration with existing pipe work;
- safe operation of the BWTS and other equipment within the pump room.

The following details related to the suitability of all equipment to be contained within the space must be submitted in accordance with the applicable LR Rules:

- safe-type certification details of all electrical equipment;
- the gas group and temperature class of equipment;
- ventilation arrangements;
- hazardous area zoning in accordance with recognised National or International Standard.

If the BTR is adjacent to a cargo pump room it should be categorised as a cargo pump room in accordance with SOLAS Chapter II-2, Regulation 4.5.1.1.
Section 4: References


2. IMO Resolution MEPC.169(57) – Procedure for Approval of Ballast Water Management Systems that make use of Active Substances (G9), adopted on 4 April, 2008.


6. IMO BWM.2/Circ.20 – Guidance to Ensure Safe Handling and Storage of Chemicals and Preparations used to Treat Ballast Water and the Development of Safety Procedures for Risks to the Ship and Crew Resulting from the Treatment Process.

7. IBMW.2/Circ.7 – Interim Survey Guidelines for the purposes of the International Convention for the Control and Management of Ships’ Ballast Water and Sediments under the Harmonized System of Survey and Certification (resolution A.948 (23)), 27 October 2006.


13. Lloyd’s Register’s ShipRight Procedure Assessment of Risk Based Designs.


15. Lloyd’s Register Type Approval Procedure TA01.

16. IACS Unified Requirement F44 (UR F44) – Fore Peak Ballast System on Oil Tankers.

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