REVIEW OF BALLAST WATER MANAGEMENT SYSTEMS

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Purpose

This Plan Review Guideline (PRG) provides guidance regarding the information required to be submitted to the Marine Safety Center (MSC) for review of Ballast Water Management Systems (BWMS) for U.S. Type Approval.

Contact Information

If you have any questions or comments concerning this document, please contact the MSC by e-mail or phone. Please refer to Procedure Number E1-37.

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1. Applicability

This Plan Review Guideline (PRG) is applicable to manufacturers and Independent Laboratories (ILs) of Ballast Water Management Systems (BWMS) seeking type approval in accordance with 46 CFR 162.060.

2. Background

The Coast Guard's type approval regulations provide requirements that a BWMS must meet to obtain type approval. Once approved, a certificate number will be issued and an approval certificate will be sent to the BWMS manufacturer, pursuant to 46 CFR 162.060-10(g).

3. References

(a) Title 46 CFR 162.060
(b) EPA/600/R-10/146, Generic Protocol for the Verification of Ballast Water Treatment Technologies, version 5.1, dated September 2010
(c) Title 33 CFR 151.2030
(d) Ballast Water Frequently Asked Questions dated April 24, 2018
(e) Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (2008 VGP)
(f) Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (2013 VGP)
(g) International Association of Classification Societies Unified Resolution E10
(h) CG-OES Policy Letter 02-19, "Clarification on Water Volumes and Flow Rates for Ballast Water Management System (BWMS) Testing"
(i) CG-OES Policy Letter 01-20, "Use of Multiple Independent Laboratories (ILs) to Conduct Type Approval Testing of Ballast Water Management Systems (BWMS)"
(j) CG-OES Policy Letter 03-20, "Guidance on Testing Alternate Components for a Type Approved Ballast Water Management System (BWMS)"
(k) MSC Letter E1-1802787, "Ballast Water Management Systems (BWMS) Scaling Guidance"
(l) OES Letter 16705, "Clarification on Augmentation of Challenge Water Parameters (Water Quality and Organisms) for Ballast Water Management System (BWMS) Testing"
(m) OES Letter to ILs dated October 17, 2018
(n) OES Letter 16714, "Resonance Search Frequency for Ballast Water Management System (BWMS) Component Testing," dated April 22, 2019
(o) BWMS Type Approval Review Checklist

4. Definitions

a. **Active substance** – a chemical or an organism, including a virus or a fungus, which has a general or specific action on or against nonindigenous species. The Coast Guard does not consider ultraviolet (UV) systems to be systems that involve the use of active substances.

b. **Ballast Water** – any water and suspended matter taken onboard a vessel to control or maintain trim, draught, stability, or stresses of the vessel, regardless of how it's carried.

c. **Ballast Water Management System (BWMS)** – any system which processes ballast water to kill, render harmless, or remove organisms. The BWMS includes all ballast water treatment equipment and all associated control and monitoring equipment.

d. **Independent Laboratory (IL)** – an organization that meets the requirements in 46 CFR 159.010-3. ILs are involved in the independent evaluation, inspection, and testing of BWMS.

5. Initial Type Approval Certification

Approval Procedures

a. A BWMS manufacturer must submit a Letter of Intent to the MSC not less than 30 days before initiating any testing for U.S. Coast Guard BWMS type approval. (46 CFR 162.060-10(a))

b. The BWMS manufacturer must ensure the evaluation, inspection, and testing of the BWMS is conducted by an IL accepted by the Coast Guard. (46 CFR 162.060-10(b)) The official listing of Coast Guard ILs accepted for evaluation, inspection and testing of BWMSs in accordance with 46 CFR 162.060 can be found at the Coast Guard Maritime Information Exchange (CGMIX). Select "Ballast Water Management Systems - 162.060" from the "Approval Series Name" drop-down menu, and click Search.

c. The IL must conduct a Readiness Evaluation and determine the acceptability of the BWMS for testing. Upon determination that the BWMS is ready for testing, the IL will notify the MSC and provide the estimated date for commencement of type approval testing. (46 CFR 162.060-42(a))

d. A BWMS is eligible for approval if it meets the requirements in 46 CFR 162.060 and the ballast water discharge, preparation, active substance, or relevant chemicals are not found to be persistent, bioaccumulative, or toxic when discharged. (46 CFR 162.060-10(f)(5))

Information Required to be Submitted to the MSC in the BWMS Application

a. The BWMS manufacturer shall submit an application that contains the information listed in 162.060-14. (46 CFR 162.060-14)

b. The IL shall submit a test report that contains the information listed in 162.060-34. If using multiple ILs to conduct testing, BWMS manufacturers must designate one IL to

coordinate and oversee all testing and reporting, as per reference (i). (46 CFR 162.060-34)

c. A BWMS Type Approval Review Checklist, reference (o), is provided to give submitters an opportunity to cross reference between certain approval requirements of 46 CFR 162.060 and their application documentation. A completed checklist, while not required, will help facilitate the review of the type approval application.

Approval of Alternatives as Equivalent

a. Manufacturers and ILs may submit a written request to the MSC for approval of an alternative evaluation, inspection, or test required by 46 CFR 162.060, if the evaluation, inspection or test is not practicable or applicable. The regulations do not allow for waivers or exemptions of test requirements. The requests submitted under 46 CFR 162.060-10(b)(1) must include the justification for any proposed changes and contain full descriptions of any proposed alternative tests. (46 CFR 162.060-10(b)(1))

b. Every proposal for an alternative examination, test, or evaluation must address the required elements described in the regulation. Each proposal must explain why the requirement is not practicable or applicable. It must also explain how the proposed examination, test, or evaluation is equivalent to the requirement. Finally, the proposal must fully describe the proposed method and contain full descriptions of the proposed alternate tests, including detailed instructions on how the method is performed. The IL should review any information provided by the manufacturer to assess the equivalence of the alternate evaluation to the appropriate regulation.

Design and Construction Requirements

a. Each BWMS must be designed and constructed as stated in 46 CFR 162.060-20.

b. ILs should verify if a BWMS meets a recognized national or international standard for all related marine engineering and electrical engineering applications. For type approval requests intended for installation on U.S. vessels, the IL should verify that the BWMS is designed and constructed according to the requirements in 46 CFR Subchapters F and J. Detailed guidance on approval for BWMS installation on U.S. flag vessels is provided below. If it is the intention of the manufacturer to seek type approval for installation on both U.S. and international vessels, the IL should verify that the BWMS meets both the recognized national and international standard. For applications where the IL verifies the design and construction to a single standard, the MSC will consider type approval for use on vessels for which the system was designed. (46 CFR 162.060-20(a)(4))

c. A BWMS must meet recognized national or international standards for all related marine and electrical engineering systems. Options for conformance include federal regulations in 46 CFR Subchapters F and J, Rules of a Recognized Classification Society, or appropriate application of a standard published from one of the following

standards organizations: American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM), International Electro technical Commission (IEC), Institute of Electrical and Electronic Engineers (IEEE), International Organization for Standardization (ISO), National Electric Code (NEC), National Electrical Manufacturers Association (NEMA), Society of Automotive Engineers (SAE), or Underwriters Laboratory (UL).

Hazardous Locations

a. If the BWMS equipment is installed within a hazardous location, the BWMS must comply with the relevant requirements for use in hazardous locations, as defined in 46 CFR 111.105, or its foreign equivalent. (46 CFR 162.060-20(d))

b. BWMSs installed in hazardous locations on U.S. vessels must comply with 46 CFR 111.105. Equipment certified under EU ATEX Direction 94/9/EC does not comply with 46 CFR 111.105-7(a). Therefore, BWMSs certified to EU ATEX Direction 94/9/EC are not permitted in hazardous locations on U.S. flag vessels. Applicable electrical equipment should be certified by Coast Guard approved or recognized independent laboratories for use in hazardous areas. Copies of IECEx certificates or UL certificates should be provided to verify compliance for installation on U.S. flag vessels.

c. As specified in 46 CFR 162.060-38(a)(3)(v), the OMSM must describe locations where the BWMS can be installed. This description should include hazardous locations, if applicable. The type approval certificate will indicate if the BWMS can be installed in hazardous locations on a U.S. flag vessel, or a foreign flagged vessel, subject to the approval of the foreign administration.

Systems Intended for Installation on U.S. Flag Vessels

a. If the manufacturer is seeking approval for U.S. flag vessel installation, compliance must be verified to the requirements of 46 CFR Subchapters F and J.

b. Piping materials may be selected from 46 CFR 56.60 or the materials accepted for Section I or VIII of the latest version of the ASME Boiler and Pressure Vessel Code. Alternatively, ASTM F1155-98 is recognized as an acceptable alternative standard from which to select materials for vital piping systems. (46 CFR 56.60-1)

c. Material specifications must meet relevant Subchapter F regulations (or ASTM F1155). Some applicable sections of Subchapter F might include: piping (46 CFR 56.04), valves (46 CFR 56.20 and 46 CFR 54.15-10), pipe fittings (46 CFR 56.15-1), and flanges (46 CFR 56.60-1(b)).

d. Electrical components must comply with relevant Subchapter J regulations. Some applicable sections of Subchapter J might include: transformers (46 CFR 111.20),

motors (46 CFR 111.25), rectifiers (46 CFR 111.33), panelboards (46 CFR 111.40), circuit breakers (46 CFR 111.54), and motor controllers (46 CFR 111.70).

e. In cases where foreign material specifications are submitted, the manufacturers should demonstrate that all the requirements of 46 CFR Subchapter F are met or exceeded. An English translation of each foreign standard is to be provided, along with a comparison sheet demonstrating an item by item equivalence between the foreign specification and the U.S. specification with which it is being compared.

Operation Maintenance and Safety Manual (OMSM) Requirements

a. Each OMSM must include each section as specified in 46 CFR 162.060-38.

b. The current OMSM revision and date will be listed on the type approval certificate. Vessel crews refer to the specific OMSM listed on their type approval certificate to ensure the BWMS is operating in accordance with the manufacturer's specific instructions. Any separate documents referenced in the OMSM should be labeled with the revision number and date to account for version control.

Test Report Requirements

a. The Test Report must be prepared and submitted by an IL, and include the information specified in 46 CFR 162.060-34.

Land-based Testing Requirements

a. Each BWMS must undergo land-based testing and evaluations that meet the requirements of the ETV Protocol, reference (b). (46 CFR 162.060-26)

b. Reference (h) includes additional guidance on control water volumes.

c. Reference (l) includes additional guidance on challenge water augmentation. Section 5.2.2 of the ETV Protocol specifies that ambient (naturally occurring at the test site) organisms will be used, and also specifies a minimum diversity of five species over three phyla/divisions. Organisms from the ambient environment may be cultured and used to augment abundances in the challenge water, but natural relative frequency distributions should be maintained. Similarly, collections of ambient organisms may be made and concentrated and used to increase concentrations to the necessary levels. In either case, the procedures must be validated to demonstrate no adverse effects on organisms that would affect the ability of tests to characterize BWMS performance.

d. Operation and Maintenance (O&M) testing of at least 50 hours as specified in ETV Protocol section 5.4.5 may be conducted either during land-based or shipboard testing. In either case, testing must meet the specifications in ETV Protocol section 5.4.9.

e. The ETV Protocol states that commissioning, biological efficacy testing, and O&M testing are distinct phases. A request to combine the commissioning test with the first BE test can be submitted under the requirements of 46 CFR 162.060-10(b)(1).

Shipboard Testing Requirements

a. Shipboard tests must be conducted as specified in 46 CFR 162.060-28.

b. Multiple shipboard tests at the same geographic location during the same time period are not allowed during shipboard testing (i.e., two or more tests run simultaneously or immediately sequential, with treated water held in separate tanks). The intent of shipboard testing is the evaluation of the ability of a BWMS to effectively treat ballast water to meet the ballast water discharge standard under a range of conditions encountered over a range of locations and times. At least 24 hours should elapse between tests at one location.

c. Shipboard testing must be conducted across a range of geographic variability. Testing in at least two separate Large Marine Ecosystems is considered evidence of acceptable geographic variability. (46 CFR 162.060-28(e)(2))

d. The Coast Guard will consider requests made under 46 CFR 162.060-10(b)(1) to conduct whole effluent toxicity (WET) testing during land-based testing, with a test at each salinity for which the BWMS is being type approved. These requests must provide reasons why the WET tests are impracticable during shipboard testing. Title 46 CFR 162.060-28(g)(4)(v) requires the use of a WET testing methodology in accordance with the requirements of reference (e). The Coast Guard will also consider requests made under 46 CFR 162.060-10(b)(1) to use a WET testing methodology based on the Organization for Economic Co-operation and Development and/or International Organization for Standardization standards instead. As with conducting WET testing during land-based testing, such requests must demonstrate inapplicability or impracticability.

e. The Coast Guard does not consider UV and deoxygenation treatment to involve the use of an active substance, and those technologies are therefore not subject to WET testing requirements referenced in 46 CFR 162.060-28(g)(4)(v). Ozone treatment may result in toxic substance residuals that need to be evaluated against the VGP standards. The Coast Guard's objectives include promoting the development of innovative BWMS technologies that are practicable for shipboard use, rather than specifying which technologies should be developed into commercial products. If novel treatment methods are employed, manufacturers are encouraged to contact the MSC early to discuss the need for WET testing or the potential use of novel processes.

f. Multiple BWMS units on different ships may not be used for shipboard testing. One BWMS unit must be used for all testing over the shipboard test period.

Component Testing Requirements

a. The electrical and electronic components, including each alarm and control and monitoring device of the BWMS, must be subjected to environmental testing as per 46 CFR 162.060-30.

b. Testing may be conducted in accordance with International Association of Classification Societies (IACS) Test Specification for Type Approval (UR E10), reference (g). Certification to UR E10 may be accepted in lieu of component testing, without a request under 46 CFR 162.060-10(b)(1) being required, for common marine equipment. The common marine equipment provision does not apply to components installed in a control/monitoring panel. In accordance with 46 CFR 162.060-30(a), panels must be tested in their standard production configuration, which includes all subcomponents, whether or not they are type approved.

c. If components are to be installed in exposed areas on an open deck, or in enclosed spaces that are not environmentally controlled, additional testing must be conducted as per 46 CFR 162.060-30(a)(4) and 46 CFR 162.060-30(a)(7). As specified in 46 CFR 162.060-38(a)(3)(v), the OMSM must describe locations where the BWMS can be installed. This description should include open deck or enclosed spaces, if applicable.

d. Class society testing standards generally do not require testing of motors and motor controllers rated at less than 100 kW. In lieu of testing to class society standards, evidence must be provided which demonstrates that the motors and motor controllers rated at less than 100 kW were tested to an equivalent standard. This evidence must accompany a request under 46 CFR 162.060-10(b)(1). If no other documentation is available, then the equipment must be tested using the requirements of 46 CFR 162.060-30, as applicable.

e. Major resonant frequency is not defined in the regulations. Title 46 CFR 162.060-30(a)(3) applies to resonance frequencies found between 2 Hz and 80 Hz. If multiple major resonant frequencies are observed between 2 Hz and 80 Hz, the component should be vibrated at the major resonant frequency of greatest magnitude in each plane, as specified in 46 CFR 162.060-30(a)(1), for four hours. If no major resonant frequencies are discovered between 2 Hz and 80 Hz in any plane, the component shall instead be vibrated in that plane at 30 Hz for four hours. (46 CFR 162.060-30(a)(3))

f. Title 46 CFR 162.060-30(a)(1), states that each resonance search shall be conducted at a range of oscillation frequency from 2 to 80 Hz. Reference (n) provides guidance on conducing component testing with an allowable variation of up to 3 Hz (2-5 Hz) provided that the search is begun at the lowest frequency possible. Any component testing that does not include a resonance search down to 2 Hz, should include a determination by the IL regarding the acceptability of that test, and a statement as to the justification for the limitation. Justification should be based on a technical evaluation of the available data, not on dictated protocol of the testing facility.

Scaling

a. Due to the complexity of BWMS and the different methods employed to meet the discharge standard, the Coast Guard has determined that a standard procedure for scaling is not practical. Scaling of systems will be evaluated on a case-by-case basis taking into account the unique nature of each system. The MSC will make final determination on the acceptance of testing and numerical modeling during its review of the type approval application.

b. The manufacturer is responsible for completing the scaling study and submitting it to the IL for review. The IL is responsible for validating the assumptions, modeling, and quality of empirical data when evaluating the scaling study. Reference (k) provides guidance to better explain the expectations for using scaling to demonstrate that models of a BWMS meets the requirements of 46 CFR 162.060.

c. A minimum of two base units should be included in the scaling review documents, with treatment rated capacities (TRCs) at the low end and high end of the TRC range for scaled BWMS models. Typically, the scaling study will utilize the land-based and shipboard tested models as base units. Title 46 CFR 162.060-28(e)(1) requires the volumes and rates of ballast water used in shipboard testing be representative of the upper end of the treatment rated capacity, and be equal to or exceed those used during land-based testing. This range in data should inform a more accurate scaling study. The scaling data should be based on the same version BWMS that is being considered for type approval.

6. Amendments to Approved Systems

a. Following initial type approval, manufacturers may seek to include alternate components in the BWMS bill of materials (BOM) to provide users a wider range of options. Alternate components include any components not listed in the BWMS OMSM.

b. A manufacturer of a Coast Guard type-approved BWMS must notify the MSC in writing of any changes or proposed changes to the BWMS. The manufacturer may work directly with an IL to develop a testing and evaluation plan for submission to the MSC in support of their change request. After this notification has been received, the MSC will respond on a case-by-case basis with any additional testing or evaluations that must be completed for BWMS recertification. (46 CFR 162.060-16)

c. Reference (j) specifies specific alternate component guidance, including testing procedures for alternate filters.

7. Renewals

a. If the manufacturer is still producing the BWMS with no modifications from the original certificate, then a renewal request should be submitted from the manufacturer stating that “no changes have been made to the BWMS equipment or OMSM and the

BWMS continues to meet the requirements of 46 CFR 162.060." The renewal statement should preferably be on company letterhead and submitted at least 30 days before certificate expiration.

b. If the BWMS is no longer produced and the certificate expires, previously manufactured systems continue to be certified based on the date of manufacture. Any systems manufactured after the certificate expiration date are not considered type approved.

c. Any modifications to the design or construction require review by the MSC, in accordance with 46 CFR 162.060-16. If the modifications are approved, the manufacturer will be issued an amended type approval certificate. Manufacturers should work with their IL and the MSC to determine the necessary scope of testing, if any, prior to submission. Longer timelines for the review of amended certificates are typically needed. Failure to provide sufficient notice may result in the expiration of the original certificate before the modifications are approved.

d. As discussed in reference (m), when renewal is requested, the Coast Guard may require manufacturers to submit additional information supporting the operational limitations listed on the type approval certificate.

8. Disclaimer

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the MSC, the unit responsible for implementing this guidance.