

to or less than 200 m³/h must not be downscaled.

(ii) Treatment equipment with a TRC greater than 200 m³/h but less than 1,000 m³/h may be downscaled to a maximum of 1:5 scale, but must not be less than 200 m³/h.

(iii) Treatment equipment with a TRC equal to or greater than 1,000 m³/h may be downscaled to a maximum of 1:100 scale, but must not be less than 200 m³/h.

(iv) The manufacturer of the BWMS must demonstrate by using mathematical modeling, computational fluid dynamics modeling, and/or by calculations, that any downscaling will not affect the ultimate functioning and effectiveness onboard a vessel of the type and size for which the BWMS will be approved.

(2) Greater scaling may be applied and lower flow rates used other than those described in paragraph (f)(1) of this section if the manufacturer can provide evidence from full-scale shipboard testing, in accordance with paragraph (f)(1)(iv) of this section, that greater scaling and lower flow rates will not adversely affect the testing's ability to predict full-scale compliance with the BWDS. The procedures of § 162.060-10(b)(1) of this subpart must be followed before scaling of flow rates other than those provided in paragraph (f)(1) of this section may be used.

(g) The test set-up, TRC, and scaling of all tests (including mathematical and computational fluid dynamics modeling) must be clearly identified in the Experimental Design section of the Test Plan.

§ 162.060-28 Shipboard testing requirements.

(a) The ballast water management system (BWMS) manufacturer is responsible for making all arrangements for a vessel on which to conduct shipboard tests, including the provision and installation of a BWMS.

(b) Shipboard tests must be conducted throughout a period of operation of at least 6 months. During the period of testing, all ballast water discharged to waters of the United States must be treated by the BWMS.

(c) BWMS approved under this subpart must undergo shipboard tests and

evaluations that meet the requirements of this section. The shipboard testing will verify—

(1) That the BWMS under consideration for approval, when installed and operated in the vessel in a location and configuration consistent with its final intended use on operating vessels (e.g., in the engine room or pump room), consistently results in the routine discharge of ballast water that meets the ballast water discharge standard (BWDS) requirements of 33 CFR part 151, subparts C and D; and

(2) That the operating and maintenance parameters identified by the manufacturer in the Operation, Maintenance, and Safety Manual (OMSM) are consistently achieved.

(d) The BWMS to be tested must be installed and operated in the vessel in a location and configuration consistent with its final intended use on operating vessels. Vessel crew must operate the BWMS during testing.

(e) The vessel used as a platform for shipboard testing under this section must be selected to meet the following criteria:

(1) The volumes and rates of ballast water used and treated are representative of the upper end of the treatment rated capacity for which the BWMS is intended to be used. Vessel tank size and flow rates must be equal to or exceed those used during land-based tests.

(2) The circumstances of the vessel's operation during the period of shipboard testing provide an acceptable range of geographic and seasonal variability conditions.

(i) The source water used for testing is representative of harbor or coastal waters. Testing must include temperate, semi-tropical, or tropical locations with ambient organism concentrations that will provide a significant challenge to the efficacy of the BWMS.

(ii) Concentrations of organisms greater than or equal to 50 micrometers, and organisms less than 50 micrometers and greater than or equal to 10 micrometers in the source water must exceed 10 times the maximum permitted values in the BWDS.

(3) The ports that the vessel visits provide adequate availability of transportation and scientific support needed to accomplish the necessary sampling and analytical procedures during the shipboard tests.

(f) The vessel's ballast water system must be provided with sampling ports arranged in order to collect representative samples of the vessel's ballast water. In addition to the sampling ports designed and installed in accordance with the specifications in the ETV Protocol (incorporated by reference, *see* §162.060-5), sampling ports must be located—

(1) As close as practicable to the BWMS prior to treatment to determine concentrations of living organisms upon uptake;

(2) As close as practicable to the BWMS overboard outlet prior to the discharge point to determine concentrations of living organisms prior to discharge; and

(3) Elsewhere as necessary to ascertain the proper functioning of the BWMS.

(g) All test results must be reported in accordance with paragraph (i) of this section. The efficacy of the BWMS must be confirmed during at least five consecutive valid test cycles.

(1) A test cycle entails—

(i) The uptake of ballast water by the vessel;

(ii) The storage of ballast water on the vessel;

(iii) Treatment of the ballast water by the BWMS, except in control tanks, if used, with no fine-tuning or adjustment of the system except as specifically detailed in the OMSM; and

(iv) The discharge of ballast water from the vessel.

(2) All test cycles must include quantification of the water quality parameters on uptake.

(3) All test cycles must include discharge tests and quantification of the concentration of living organisms in the treated ballast water on discharge. Sampling and analysis for living organisms will be in accordance with the ETV Protocol.

(4) A test cycle must meet the following criteria in order to be considered valid:

(i) The uptake of the source water must be conducted in accordance with paragraph (e)(2)(i) of this section.

(ii) Source waters must be analyzed for organisms greater than or equal to 50 micrometers and organisms less than 50 micrometers and greater than or equal to 10 micrometers. To simplify the testing program, these source water samples need only be collected and properly preserved and transported for counting by trained microscopists in land-based laboratories. The reported data by taxa (to the lowest reasonably identifiable taxonomic grouping) will be used to characterize the source water biological test conditions.

(iii) The BWMS must operate successfully as designed, maintaining control of all set points and treatment processes, including any pre-discharge conditioning to remove or neutralize residual treatment chemicals or by-products.

(iv) All design or required water quality parameters must be met for the discharged water.

(v) Whole effluent toxicity testing must be conducted in accordance with the December 2008 Environmental Protection Agency (EPA) Vessel General Permit (VGP) requirements (VGP Section 5.8; available at http://www.epa.gov/npdes/pubs/vessel_vgp_permit.pdf).

(5) The source water for all test cycles must be characterized by measurement of water quality parameters as follows:

(i) For all BWMS tests, salinity, temperature, and turbidity must be measured either continuously during or at the beginning, middle, and end of the period of ballast water uptake, as appropriate and practicable for the parameters to be measured.

(ii) Water quality parameters (e.g., dissolved and particulate organic material, pH, etc.) that may affect the efficacy of BWMS that make use of active substances or other processes, or water quality parameters identified by the manufacturer and/or the independent laboratory as being critical, must be measured either continuously during or at the beginning, middle, and end of the period of ballast water uptake, as appropriate and practicable for the parameters to be measured.

(h) Samples of ballast water must be collected from in-line sampling ports in accordance with the sampling specifications in the ETV Protocol.

(i) The following information must be documented during the entire period of BWMS testing operations conducted on the vessel:

(1) All ballast water operations, including volumes and locations of uptake and discharge.

(2) All test cycles, even those in which the BWMS failed to meet the BWDS, must be documented. The possible reasons for an unsuccessful test cycle must be investigated and included in the Test Report.

(3) All weather conditions and resultant effects on vessel orientation and vibration.

(4) Scheduled maintenance performed on the BWMS.

(5) Unscheduled maintenance and repair performed on the BWMS.

(6) Data for all engineering parameters monitored as appropriate to the specific BWMS.

(7) Consumption of all solutions, preparations, or other consumables necessary for the effective operation of the BWMS.

(8) All parameters necessary for tracking the functioning of the control and monitoring equipment.

(9) All instrument calibration methods and frequency of calibration.

(j) All measurements for numbers and viability of organisms, water quality parameters, engineering performance parameters, and environmental conditions must be conducted in accordance with the ETV Protocol. Where alternative methods are necessary, given constraints of the BWMS and/or the vessel, standard methods from recognized bodies such as EPA (in 40 CFR part 136), the International Standards Organization, or others accepted by the scientific community must be used, and must be accepted in advance by the Coast Guard.

(k) Test vessels discharging treated ballast water into the waters of the United States must be enrolled in the U.S. Coast Guard's Shipboard Technology Evaluation Program. Test vessels discharging treated ballast water into waters of other countries must secure all necessary approvals and per-

mits required for discharges of treated ballast water.

§ 162.060-30 Testing requirements for ballast water management system (BWMS) components.

(a) The electrical and electronic components, including each alarm and control and monitoring device of the BWMS, must be subjected to the following environmental tests when in the standard production configuration:

(1) A resonance search vertically up and down, horizontally from side to side, and horizontally from end to end, at a rate sufficiently low as to permit resonance detection made over the following ranges of oscillation frequency and amplitude:

(i) At 2 to 13.3 Hz with a vibration amplitude of ± 1 mm.

(ii) At 13.2 to 80 Hz with an acceleration amplitude of ± 0.7 g.

(2) The components must be vibrated in the planes specified in paragraph (a)(1) of this section at each major resonant frequency for a period of 4 hours.

(3) In the absence of any resonant frequency, the components must be vibrated in each of the planes specified in paragraph (a)(1) of this section at 30 Hz with an acceleration of ± 0.7 g for a period of 4 hours.

(4) Components that may be installed in exposed areas on the open deck or in enclosed spaces not environmentally controlled must be subjected to a low temperature test of -25 °C and a high temperature test of 55 °C for a period of 2 hours at each temperature. At the end of each test, the components are to be switched on and must function normally under the test conditions.

(5) Components that may be installed in enclosed spaces that are environmentally controlled, including an engine room, must be subjected to a low temperature test at 0 °C and a high temperature test at 55 °C, for a period of 2 hours at each temperature. At the end of each test, the components are to be switched on and must function normally under the test conditions.

(6) Components must be switched off for a period of 2 hours at a temperature of 55 °C in an atmosphere with a relative humidity of 90 percent. At the end of this period, the components must be switched on and must operate