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MSC.1/Circ.1648
15 June 2022

**AMENDMENTS TO THE GUIDELINES FOR THE ACCEPTANCE OF
ALTERNATIVE METALLIC MATERIALS FOR CRYOGENIC SERVICE IN SHIPS
CARRYING LIQUEFIED GASES IN BULK AND SHIPS USING GASES OR OTHER
LOW-FLASHPOINT FUELS (MSC.1/CIRC.1622)**

- 1 The Maritime Safety Committee, at its 102nd session (4 to 11 November 2020), acknowledging a potential need for alternative metallic materials to be used for the construction and safe operation of low-temperature fuel and cargo-carrying ships and the need for guidance in this respect, approved the *Guidelines for the acceptance of alternative metallic materials for cryogenic service in ships carrying liquefied gases in bulk and ships using gases or other low-flashpoint fuels* (MSC.1/Circ.1622).
- 2 The Maritime Safety Committee, at its 105th session (20 to 29 April 2022), approved amendments to the Guidelines, as set out in the annex, prepared by the Sub-Committee on Carriage of Cargoes and Containers (CCC), at its seventh session (6 to 10 September 2021).
- 3 Member States are invited to use the Guidelines in conjunction with the annexed amendments and to bring them to the attention of all parties concerned.

ANNEX**AMENDMENTS TO THE GUIDELINES FOR THE ACCEPTANCE OF
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- 1 In the appendix, the existing text of the 1.9 and 2.9 are replaced with the following:

"Corrosion test: The type of corrosion tests to be applied will depend on the material, type of weld and the specific cargoes or fuels listed in the IGC or IGF Codes. The tests should include tests for general corrosion, intergranular corrosion and stress corrosion. The tests should be carried out in accordance with, ASTM A262, ASTM G31, ASTM G36, ASTM G58, ASTM G123 or other relevant recognized standards. In the absence of a relevant recognized standard for the specific cargo or fuel, the test procedures should align with the general principles of corrosion tests that follow the recognized standards listed herein.

Acceptance criteria: In accordance with the relevant recognized standard approved by the Administration for the material's intended service. In the absence of a relevant recognized standard for the specific cargoes or fuels, the results should align with other recognized standards, and projected corrosion rates and test outcomes should be subject to the satisfaction of the Administration."
- 2 In the appendix, the following new paragraph 1.10 is added after existing paragraph 1.9:

"1.10 **Corrosion test for ammonia compatibility:** The additional test should be carried out in accordance with the test requirements set out in appendix 2 to qualify for ammonia service.

Acceptance criteria: should be in accordance with the acceptance criteria set out in appendix 2."
- 3 In the appendix, the following new paragraph 2.10 is added after existing paragraph 2.9:

"2.10 **Corrosion test for ammonia compatibility:** The additional test should be carried out in accordance with the test requirements set out in appendix 2 to qualify for ammonia service.

Acceptance criteria: should be in accordance with the acceptance criteria set out in appendix 2."
- 4 Appendix is renamed as appendix 1 and the following new appendix 2 is added after appendix 1:

"APPENDIX 2

ADDITIONAL COMPATIBILITY TEST REQUIREMENTS FOR AMMONIA SERVICE

The test should be carried out in accordance with a recognized standard such as ASTM B858. This standard is applicable to copper alloys and not specifically to high manganese austenitic steel. Consequently, the following additional non-standard test should be performed:

- .1 Specimens should be prepared in accordance with standards ISO 7539-2 and ISO 16540. The specimens should be bent, prior to testing, using the four points bending test under constant strain. The total maximum strain of the sample should be equal to the yield strength of the material at atmospheric temperature. Strain gauges should be applied to measure the strain applied. In the case of welded specimens, strain gauges should be applied to each side of the welded joint. The sample should be constrained to maintain its form during testing.
 - .2 Two specimens (one welded and one base metal) should each be immersed in the following four ammonia environments for a period of 30 days:
 - .1 liquid phase ammonia environments, obtained by cooling of ammonia below liquefaction temperature with the following liquid ammonia compositions:
 - .1 0.1% weight of water and 2.5 ppm of oxygen; and
 - .2 2.5 ppm of oxygen.
 - .2 gas phase ammonia environments, at ambient temperature and atmospheric pressure with the following compositions:
 - .1 pure ammonia; and
 - .2 0.9% volume of oxygen and 99.1% volume of ammonia.
- Stress corrosion cracking tests should be performed in agreement with requirements of standards ISO 7539 and ISO 16540.
- .3 Test report should provide all procedures, set-up data, examinations, information about the environment, in agreement with standard ISO 16540 and include:
 - .1 the orientation, types and dimensions of specimens;
 - .2 four points bending test set-up data;
 - .3 target stress and applied deflection;
 - .4 strain measurement procedures;
 - .5 loading procedures; and
 - .6 test environment.

Test acceptance criteria

After immersion, all specimens should be examined for stress corrosion cracking under an optical microscope with proper magnification. The location and the number of cracks should be specified, and a dye penetrant test performed to confirm the results as necessary. For welded joints, the location of cracks should be described as located in the base metal, weldment or HAZ. If no superficial crack is observed, a longitudinal cut should be done at two different locations and a cross section examination with proper magnification should be performed. The presence of any corrosion pitting and the maximum depth should be reported. The results should be approved by the Administration. "
