ANNEX D

METHANOL SUPPRESSION FIRE TEST METHODOLOGY

11/2025

TABLE OF CONTENTS

LIST OF FIGURES

1. SCOPE

This test method establishes a consistent procedure for the preliminary evaluation of fixed fire suppression systems intended for use in environments with methanol pool fire hazards. The purpose of this test is to assess whether the proposed suppression system, in combination with a specific extinguishing agent, can control or extinguishing fires under defined, small-scale conditions. This method is intended as an initial screening tool to guide development and system selection prior to full-scale certification testing, and to support early-stage validation for solutions potentially applicable to marine fire protection scenarios.

2. SAMPLING AND DOCUMENTATION REQUIREMENTS

All components of the fire suppression system intended for evaluation shall be supplied by the system manufacturer or the party commissioning the test. The system shall be delivered in a condition representative of field use and include all elements necessary to simulate actual deployment in a machinery space or equivalent hazard environment.

Prior to testing, the following documentation must be submitted and reviewed:

- System layout and installation drawings
- Operating procedures and activation sequences
- Design calculations and performance specifications
- Identification and technical data sheets for all components

This test does not constitute formal system approval or component certification. It is the single responsibility of the manufacturer or system integrator to ensure that all materials, components, and configurations submitted for testing are compliant with applicable regulations and standards relevant to the intended end-use application.

3. FIRE TESTS

3.1. Test Principles

The objective of these tests is to assess the fire-extinguishing capabilities of different fire suppression systems using methanol pool fires as the representative hazard. The focus is on evaluating the performance of systems intended for local application or total flooding, under conditions designed to simulate confined machinery space scenarios or equivalent hazardous environments.

This method does not seek to validate individual components or provide system certification, but rather to verify the general effectiveness of the system configuration and extinguishing agent in extinguishing defined fires within a standardized, enclosed setting.

3.2. Test Enclosure

All tests shall be conducted within a test enclosure equivalent to the MOBAT unit or a comparable test chamber that meets the same structural and ventilation characteristics. The MOBAT unit consists of a test chamber with an approximate internal area of 5.92 m² and a minimum internal height of 2.45 m.

The test chamber shall allow for sufficient natural or mechanical ventilation to maintain oxygen concentrations above 20% by volume at a height representative of the combustion zone for the duration of the pre-burn period. This minimum oxygen concentration shall be maintained for the duration of the testing period for water-based FFFSs (i.e., water sprinklers, water mist, and foam) but not for gaseous or aerosol FFFSs. Openings, pressure relief hatches, or vents used to achieve this shall be documented and kept consistent across all tests to ensure repeatability.

3.3. Fire Scenarios

The test scenarios shall simulate methanol pool fire with a Heat Release Rate of 170 kW. The fires shall be produced using methanol with physical and chemical characteristics documented for each group used.

The fire pan used for this test shall have a diameter of 700 mm or an equivalent size that maintains the same hydraulic diameter.

4. INSTALLATION REQUIREMENTS FOR TESTS

The configuration and installation of fire suppression system components within the test enclosure shall resemble the intended operational design of the system under evaluation. The arrangement must simulate the intended delivery or operation of the system in a machinery space or equivalent application, including extinction agent, nozzle placement, coverage area, and discharge parameters.

For water-based or local application systems, the distance between the discharge nozzle(s) and the fire pan shall be maximized within the chamber dimensions to promote uniform agent distribution across the burning surface.

The spacing, orientation, and type of nozzles used shall comply with the minimum and maximum installation requirements defined by the manufacturer or system designer. In cases where more than one nozzle is required for the intended test, the layout shall be consistent with the system's design specifications and shall be submitted to the testing body in advance for review and inclusion in the final documentation.
It is the responsibility of the system provider to ensure that the installation complies to all applicable technical standards and represents a credible scenario for fire suppression performance evaluation.

5. TEST PROGRAMME

The fire suppression performance of the system under test shall be determined through the results observed and recorded during each fire scenario.

During the test series, the extinguishing agent shall be applied to methanol pool fires placed in a variety of positions within the test enclosure. The selected fire locations are intended to replicate potential real-world obstructions, and suppression coverage limitations. The following positions shall be included in the test programme:

- Centre of the MOBAT compartment
- Adjacent to one side wall
- In a corner near the main opening

Each fire location shall be tested under the same agent discharge configuration to evaluate system reliability and spatial performance variability. A schematic showing the fire pan locations shall be included in the test documentation (see Figure 1).

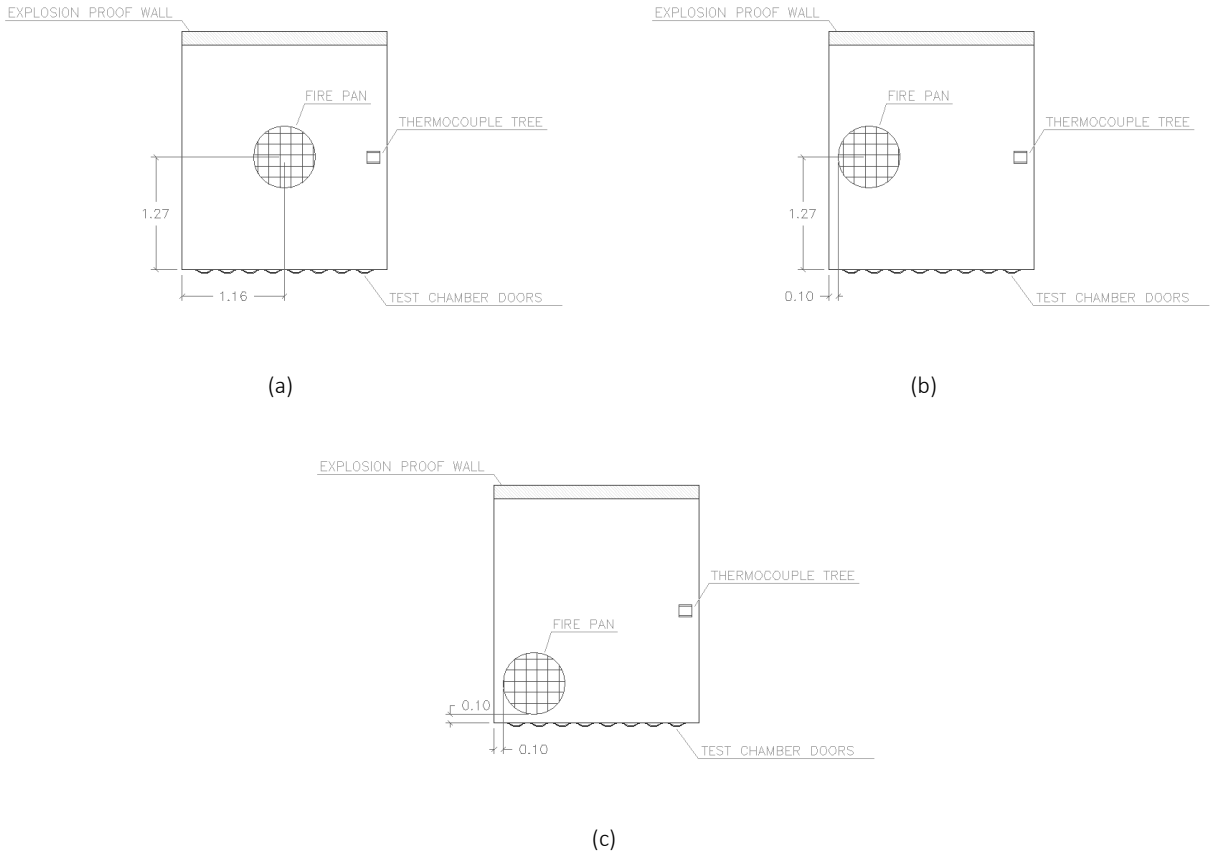

Figure 1. Different positions of the pool fire inside the MOBAT test chamber located at the center (a), along one side wall (b), and at the corner near the main opening (c).

5.1. Result Evaluation for Water-Based Systems

Water-Based Systems

For water-based solutions, the local application fire-fighting system seeks to extinguish the test fire within 5 minutes from the initiation of agent discharge. This duration is in accordance with reference guidance such as MSC/Circ.1387. Water discharge shall continue beyond the extinguishment point, if necessary, to prevent re-ignition.

6. TEST PROCEDURE

The following procedure outlines the standardized steps to be followed during fire suppression tests using either water-based or total flooding systems within the MOBAT unit or equivalent enclosure.

6.1. Pre-Burn Time

All tests shall include a pre-burn period of 30 seconds following ignition of the final fire source. This allows

the fire to develop sufficient heat release and stable combustion conditions prior to the activation of the suppression system. Timing begins after confirmation that all methanol sources are ignited.

6.2. Measurements

Throughout the test, the following parameters shall be recorded:

- Fuel mass (load cell)
- Temperature readings from thermocouples positioned over and around the fire
- Oxygen concentration inside the enclosure
- Visual and infrared imagery of fire behaviour

These measurements will be used to determine whether extinguishment has occurred and whether conditions remain stable post-discharge.

6.3. Water-Based System Test Procedure (Local Application)

1. Confirm that the MOBAT unit is safe to access and that the steel tray is in place.
2. Fill the fire tray with methanol to the required depth. Record all measurements.
3. Ignite the methanol and allow the fire to burn freely for 30 seconds.
4. Close the MOBAT door and monitor the oxygen concentration, ensuring it remains at or above 20% volume, as required by MSC/Circ.1387.

   Note: Openings in the enclosure may be adjusted slightly to maintain required oxygen levels during discharge.
5. Activate the water-based fire suppression system, discharging water mist for 300 seconds (5 minutes).
6. Monitor fire behaviour during and after the discharge, with a minimum 480-second observation period.
7. Evaluate extinguishment status based on thermal data, flame visibility, and infrared recordings.
8. If fires are extinguished, monitor for re-ignition and allow conditions to stabilize before reopening the test enclosure.
9. If fires are not extinguished, and the test area is deemed safe, manually smother the flames using fitted lids or wait until the remaining fuels is completely consumed.

7. PERFORMANCE CRITERIA

The outcome of each test shall be assessed based on the system's ability to extinguish or control the fire under the specified test conditions and within the defined performance timeframes.

7.1. Water-Based Systems

For water-based suppression systems, extinguishment is intended to be achieved within 5 minutes from the moment of agent discharge. The fire shall remain extinguished throughout the post-discharge monitoring period (minimum 180 seconds). Any sustained or spontaneous re-ignition observed after the discharge period shall be reported in the results as unsuccessful under the tested configuration.

8. DOCUMENTATION AND REPORTING

A complete report shall be prepared for each test conducted, including all relevant information necessary for traceability, repeatability, and technical evaluation. The report shall include, at least, the following elements:

- Identification of the system under test (manufacturer, agent, configuration)
- Detailed description of the test enclosure and instrumentation
- Drawings or schematics of nozzle layouts and fire pan positions
- Environmental conditions during the test (temperature, oxygen concentration)
- Fuel characteristics (type, volume, pan sizes)
- Description of test procedure followed
- Measured parameters (temperature profiles, mass loss, O_2 levels)
- Thermal and visual imagery
- Timeline event log (ignition, discharge, monitoring phase)
- Interpretation of results relative to acceptance criteria
- Deviations from standard procedure, if any
- Conclusions and recommendations

All data must be recorded using calibrated instruments, and system configurations must be documented in sufficient detail to allow for repeat testing or validation by third parties.