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Ships and marine technology — Fire-extinguishing systems for protection of galley deep-fat cooking equipment — Fire tests

Navires et technologie maritime — Systèmes d'extinction des incendies de l'équipement de bacs de friture dans les cuisines — Essais d'incendies

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15371 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Lifesaving and fire protection*.

It is intended to supplement International Maritime Organization (IMO) requirements for fire testing galley deep-fat cooking equipment on commercial ships complying with the 1974 Safety of Life At Sea Convention (SOLAS 74), as amended.

Ships and marine technology — Fire-extinguishing systems for protection of galley deep-fat cooking equipment — Fire tests

1 Scope

1.1 This International Standard covers the performance during fire tests of pre-engineered fire-extinguishing system units intended for the protection of galley deep-fat cooking equipment.

1.2 Pre-engineered fire-extinguishing system units are required to comply also with the requirements for construction and performance as applicable to specific types, designs, sizes and arrangements, but all such additional requirements which apply are not considered to be within the scope of these requirements for fire tests.

2 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

2.1
cooking grease
a vegetable shortening incorporating an antifoaming agent

2.2
cylinder/valve assembly
a container that incorporates a valve and that provides storage of the extinguishing agent and expellant gas until the valve is actuated

NOTE For cartridge-operated units, this assembly includes the extinguishing-agent storage container and cartridge mechanism.

2.3
deep-fat fryer
a commercially available electric cooking appliance in which cooking greases in depth are used

2.4
discharge nozzle
a device that is used to distribute the extinguishing agent over or into a specific area

2.5
discharge rate
the ratio of the quantity of extinguishing agent discharged from a nozzle to the discharge time measured to within ±1 s, expressed in kg/s

2.6
discharge time
the time interval between the first appearance of extinguishing agent at the nozzle and the time at which the discharge becomes predominantly gaseous or ceases

2.7
expellant gas
nitrogen air or other gas used to facilitate the discharge of the extinguishing agent

2.8
extinguishing system unit
identified components that can be assembled into a system for the discharge of an extinguishing agent through fixed piping and nozzles for the purpose of extinguishing fires

2.9
gas cartridge
a container that provides storage for an expellant gas only

2.10
manual means of actuation
a means of system actuation in which a system is discharged by manual means

2.11
multiple-vat deep-fat fryer
multiple electric fryers which are mechanically joined together

NOTE Each vat incorporates a separately controlled heating source.

2.12
operable pressure range
the pressure range corresponding to the pressures in the storage container at the specified minimum and maximum temperatures for which the extinguishing system unit is intended to be operable

2.13
operational pressure
the pressure developed in a fully charged container conditioned at 21 °C for at least 24 h

2.14
pre-engineered system
a system that is tested in accordance with the limitations prescribed by the manufacturer for maximum and minimum pipe lengths, accessories, number of fittings, number and types of nozzles, nozzle placement, types of fire risk and the maximum dimensions and areas of the appliances to be protected

2.15
pressure vessel
pressure cylinder
a container that provides storage for the extinguishing agent and expellant gas

2.16
product
any fire-extinguishing system or any part thereof covered by these requirements unless specifically noted otherwise

2.17
split-vat deep-fat fryer
an electric fryer that incorporates a dividing partition which splits the fryer in sections

NOTE Each split-vat fryer incorporates a separately controlled heating source.

3 Extinguishing tests

3.1 General

3.1.1 An extinguishing system unit shall be tested with each type of deep-fat fryer with which it is intended to be used. Specific test methods are contained in 3.2 and 3.3.

3.1.2 When fire tested, the extinguishing system unit shall cause the flame in the appliance to be completely extinguished, and not permit re-ignition of the grease for 20 min or until the grease temperature is at least 34 °C below its observed auto-ignition temperature, whichever is longer.

3.1.3 The fire test shall be conducted using a minimum discharge rate condition which is achieved by assembling the extinguishing system using its maximum piping limitations with respect to number of fittings and size and length of pipe in accordance with the manufacturer's installation instructions.

3.1.4 The cylinder/valve assembly shall be filled to its rated capacity and the cylinder or gas cartridge pressurized with the expellant gas to the normal operating pressure at 21 °C. The cylinder/valve assembly or gas cartridge used for these tests shall be conditioned for at least 16 h at the minimum storage temperature specified in the manufacturer's installation instructions. As an alternative to the conditioning, stored pressure units may be under-pressurized to simulate the pressure at the minimum storage temperature.

3.1.5 Extinguishing tests shall be conducted with maximum and minimum nozzle heights, with each nozzle positioned in the most difficult location and orientation allowed by the manufacturer's installation instructions with respect to fire extinction.

3.1.6 The length and width of the cooking area of the appliance being tested shall correspond to the maximum area coverage and dimension limitations specified in the installation instructions.

3.1.7 Multiple-appliance protection for single discharge nozzle coverage shall be tested as per the manufacturer's installation instructions.

3.1.8 Prior to the conduct of each extinguishing test, the appliance shall be cleaned and provided with a new cooking grease.

3.2 Fire-testing criteria

3.2.1 The deep-fat fryer used for this test shall be a commercially available electric deep-fat fryer, at least 230 mm deep, having a cooking surface area as specified in the manufacturer's installation instructions. For a deep-fat fryer with an integral drip board, or the like, the calculated cooking area, along with the drip area, shall be as indicated in the manufacturer's installation instructions.

3.2.2 All deep-fat fryers tested in accordance with 3.2.1 and 3.2.3 to 3.2.8 shall demonstrate an average heating rate of not less than 7 °C and an average cooling rate of not more than 3 °C per minute. The average heating and cooling rates shall be determined by heating the liquid grease in an uncovered fryer. The time required to heat the grease from 260 °C to 315 °C shall be used to calculate the rise in temperature of the appliance. The liquid grease in the uncovered fryer shall be heated at the fryer's maximum energy input. When the temperature of the liquid grease reaches 315 °C, the fryer's energy source shall be immediately shut off and the cooling rate of the liquid grease, in °C per minute, shall be measured (when the temperature of the grease returns to 315 °C) between the temperatures of 315 °C and 260 °C. The fryer shall be tested with an ambient temperature of 21 °C ± 5 °C throughout the duration of the test. The thermocouple monitoring the grease temperature shall be installed as indicated in 3.2.6.

3.2.3 Multiple-vat and split-vat deep-fat fryers shall be separately tested with the discharge nozzle positioned in the most difficult location and orientation allowed by the manufacturer's installation manual.

3.2.4 Split-vat fryers shall be tested wherein one or more vats adjacent to the vat to be spontaneously ignited are filled with liquid cooking grease and heated to 175 °C to 190 °C. Energy shutoff for all vats shall occur when the extinguishing system is actuated.

If saponified foam from the adjacent vat(s) rolls over into the burning vat after system actuation, the grease temperature of the adjacent vat(s) shall be reduced to the point where foam rollover does not occur or a means shall be provided to prevent foam from rolling over into the burning vat.

3.2.5 The fryer shall be filled with new, unused liquid grease until the grease level is 75 mm below the top edge of the fryer (see 3.1.8). The liquid grease shall have an auto-ignition temperature not less than 363 °C when tested with deep-fat fryers of the type specified in 3.2.1. For a deep-fat fryer with an internal drip board, or the like, the grease level shall be at the fryer wall/drip board interface, when the grease is at a temperature of 175 °C to 190 °C, but in no case less than 75 mm below the top edge of the fryer.

3.2.6 The grease temperature during testing shall be measured with a thermocouple located 25 mm below the grease surface. The thermocouple shall be located not closer than 75 mm to any side of the fryer.

3.2.7 The liquid grease in the fryer shall be heated by its heating source until auto-ignition occurs. If the grease temperature reaches 363 °C and the grease still has not ignited, it shall be ignited manually. The fire shall burn freely with the fryer's heating source remaining on for a period of not less than one minute. After the free-burn period, the heating source shall be shut off and the extinguishing system unit shall be manually discharged.

3.2.8 Upon complete discharge of the extinguishing agent, the deep-fat fryer shall have complied with the requirements in 3.1.2.

3.3 Splash-testing criteria

3.3.1 When tested as described in 3.3.2 to 3.3.9, an extinguishing system unit shall:

— cause the fire in a deep-fat fryer to be completely extinguished;

— cause no splashing of grease due to the extinguishing system unit operation, as evidenced by the presence of drops of grease on the surrounding surface area.

3.3.2 The deep-fat fryer used for this test shall be as specified in 3.2.1.

3.3.3 The splash test shall be conducted using the maximum discharge rate condition for the test nozzle or nozzles.

NOTE The maximum discharge rate condition is generally obtained by using the maximum piping diameter, the minimum piping length, the minimum number of tees and elbows, and the cylinder or gas cartridge conditioned to the maximum operating temperature or pressurized to the maximum pressure corresponding to the maximum operating temperature for which the extinguishing system unit is intended.

3.3.4 The nozzle shall be located at the minimum height specified by the manufacturer's installation manual and positioned in the orientation most likely to create splashing of hot grease.

3.3.5 The fryer shall be filled with liquid grease until the grease level is 75 mm below the top edge of the fryer.

3.3.6 The grease temperature during testing shall be measured with a thermocouple installed as specified in 3.2.6.

3.3.7 A clean surface at least 300 mm wide shall be prepared around the cooking appliance to detect splashing grease. The liquid grease in the fryer shall be heated by its heating source until auto-ignition occurs. If the grease temperature reaches 363 °C and the grease still has not ignited, it shall be ignited manually. Upon ignition, the fryer's internal heating source shall be shut off.

3.3.8 The fire shall burn freely until the cooking area is fully involved in flames having a height of approximately 900 mm, but in any case the fire shall be allowed to burn for at least 1 min.

3.3.9 When the cooking area is fully involved in flames, the extinguishing system unit shall be discharged and the discharge effects observed to determine compliance with the requirements in 3.3.1. Foaming over the edge of