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NATIONAL STANDARD

ANSI/CAN/UL/ULC 300:2019

STANDARD FOR SAFETY

Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment

Approved American National Standard
ANSI

ANSI/UL 300-2019

Standards Council of Canada
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SCC FOREWORD

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UL Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment, ANSI/CAN/UL/ULC 300:2019

Fourth Edition, Dated June 10, 2019

Summary of Topics

The Fourth Edition of UL/ULC 300 has been issued to reflect the latest ANSI and SCC approval dates and to incorporate the proposal dated November 2, 2018.

The requirements are substantially in accordance with Proposal(s) on this subject dated November 2, 2018.

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Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment

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Second Edition – March, 1996
Third Edition – May, 2005

Fourth Edition

June 10, 2019

This ANSI/CAN/UL/ULC Safety Standard consists of the Fourth Edition.

The most recent designation of ANSI/UL 300 as an American National Standard (ANSI) occurred on June 10, 2019. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC).

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Preface

This is the Fourth Edition of the ANSI/CAN/UL/ULC 300, Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment.

UL is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. ULC Standards is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Annex A, identified as Informative, is for information purposes only.

This ANSI/CAN/UL/ULC-300 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This Fourth Edition Joint American National Standard and National Standard of Canada is based on, and now supersedes, the Third Edition of UL 300, Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment, and the First Edition of ULC/ORD-C1254.6-1995, Other Recognized Document for Fire Testing of Restaurant Cooking Area Fire Extinguisher System Units.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a "yes" or "no" answer based on the literal text of the requirement concerned.

To purchase UL Standards, visit the UL Standards Sales Site at http://www. shopulstandards. com/ HowToOrder.aspx or call tollfree 1-888-853-3503.

This Edition of the Standard has been formally approved by the UL Standards Technical Panel (STP) on Extinguishing Systems, STP 300.

This list represents the STP 300 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

STP 300 Membership

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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

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INTRODUCTION

1 Scope

1.1 These requirements cover the performance during fire tests of pre-engineered fire extinguishing system units intended for the protection of commercial cooking equipment for restaurants, cafeterias and other similar venues. For installation requirements, see the following documents: NFPA 17, Standard for Dry Chemical Extinguishing Systems; NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; NFPA 17A, Standard for Wet Chemical Extinguishing Systems; and the National Building Code of Canada. Note that local authorities having jurisdiction should be consulted prior to installation.

1.2 Pre-engineered fire extinguishing system units, agents, or both shall also comply with the requirements for construction and performance as applicable to specific types, designs, sizes, and arrangements. Such additional requirements include ANSI/CAN/UL/ULC 1254 and are not within the scope of these requirements for fire tests.

1.3 The term "product" as used in this standard refers to all fire extinguishing systems or any part thereof covered by the requirements unless specifically noted otherwise.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurements

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

5 Glossary

5.1 For the purpose of these requirements, the following definitions apply.

5.2 COOKING APPLIANCE – A cooking device that has or is capable of having a surface of liquid grease or one in which grease is involved, such as a deep fat fryer, griddle, range, chain broiler, electric char-broiler, charcoal broiler, mesquite broiler, gas-radiant char-broiler, wok, tilt skillets, and similar appliances. The protected area is limited to the cooking surfaces of the appliance only.

5.3 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. For cartridge operated units, this assembly includes the extinguishing agent storage container and cartridge mechanism. When actuated, the valve releases the agent into the distribution network of the extinguishing system.

5.4 DISCHARGE RATE – The ratio of the quantity of agent discharged from a nozzle to the discharge time measured within ±1 s. When a minimum discharge rate is indicated, reference is made to the minimum quantity of agent discharged and the time measured within ±1 s.

5.5 DISCHARGE NOZZLE – A device that is used to uniformly distribute the extinguishing agent over or into a specific area.

5.6 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.

5.7 DUCT (OR DUCT SYSTEM) – A continuous enclosed passageway for the transmission of air and cooking vapors.

5.8 EXPELLANT GAS – Dry nitrogen, dry air, or other gas used to facilitate the discharge of the extinguishing agent.

5.9 EXTINGUISHING SYSTEM UNIT – Identified components that are assembled into a system for the discharge of an extinguishing agent through fixed piping and nozzles for the purpose of extinguishing fires.

5.10 GAS CARTRIDGE - A container that provides storage for an expellant gas.

5.11 GREASE – For test purposes, grease is new vegetable shortening incorporating an anti-foaming agent. For hood and duct and broiler testing only, grease shall be new or used vegetable shortening, or rendered animal fat.

5.12 GREASE FILTER – A component of a grease vapor removal system that deflects the air and vapors passing through it in such a manner as to result in the grease vapors to concentrate, condense, or both, for the purpose of grease collection.

5.13 HOOD – A device provided as part of an exhaust system to direct and capture grease vapors and exhaust gases from a cooking appliance.

5.14 LOW QUALITY FATTY BEEF STEAKS – Steaks that contain 20 – 30 percent fat or gristle, well marbled, and uniform in size. An example of a cut of meat which meets the requirement is "goose neck round," which is 70 – 80 percent lean.

5.15 MANUAL MEANS OF ACTUATION – A means of system actuation in which the system operator initiates system discharge.

5.16 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.

5.17 OPERATING PRESSURE – The pressure in a fully charged container at 70°F (21°C).

5.18 PLENUM – The volume of enclosed space between the grease filters and the portion of the hood above the grease filters in a hood and duct system.

5.19 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 and nozzle placement, types of fire risks and their maximum areas, volumes, or both areas and volumes of protection.

5.20 PRESSURE VESSEL (CYLINDER) – A container that provides storage for the extinguishing agent and expellant gas, or when used at a location remote to the extinguishing system unit, provides storage for expellant gas.

5.21 TILT SKILLETS/BRAISING PANS – Cooking devices which are intended to braise, simmer, saute, or fry foods.

PERFORMANCE

6 Cooking Appliance Extinguishment Tests

6.1 General

6.1.1 An extinguishing system unit is to be tested with each type of cooking appliance with which it is intended to be used. Specific cooking appliance test methods are contained in 6.2 – 6.18.

Exception: Protection for tilt skillets is to be based upon the coverage limitations provided for deep fat fryer protection.

6.1.2 Except as provided in 6.1.14, the appliances used in testing shall meet the minimum requirements as described in the applicable subsections of Section 6.

6.1.3 When tested with a cooking appliance, an extinguishing system unit shall:

a) Result in the flame in the appliance to be completely extinguished upon complete discharge of the extinguishing agent;

b) For deep fat fryers, woks, and ranges, not permit re-ignition of the grease for 20 min or until the temperature of the grease decreases at least 60° F (34° C) below its observed auto-ignition temperature, whichever is longer; and

c) For all appliances other than deep fat fryers, woks- and ranges, not permit re-ignition of grease for 5 min.

6.1.4 Unless otherwise noted, each test is to be conducted using the minimum quantity of the extinguishing agent and the minimum discharge rate condition of the extinguishing system unit test nozzle or nozzles. To obtain the minimum discharge rate condition, an extinguishing system unit is to be assembled using its maximum piping limitations with respect to number of fittings and size and length of pipe.

6.1.5 The cylinder is to be filled to its rated capacity and the cylinder or gas cartridge pressurized with the expellant gas to the normal operating pressure at 70°F (21°C). The cylinder or gas cartridge used for these tests is to be conditioned, after charging, for at least 16 h at the minimum storage temperature prior to the test. As an alternative to conditioning at the minimum storage temperature for 16 h, extinguishing system

units that utilize dry nitrogen or dry air as an expellant gas are to be tested by under pressurizing the cylinder or gas cartridge at ambient temperature to simulate the pressure at minimum operating temperature.

6.1.6 Each cooking appliance extinguishment test is to be conducted in an environment in which the ambient temperature is not less than 50°F (10°C).

6.1.7 Extinguishment tests are to be conducted at both the maximum and minimum nozzle heights, with the nozzle positioned in the most difficult locations and orientations allowed by the installation instructions with respect to complying with the fire extinguishment requirements. Splash tests are to be conducted at the minimum nozzle height, with the nozzle positioned in the most difficult locations and orientations allowed by the installation instructions with respect to complying with the splash requirements.

6.1.8 The length and width of the cooking area of the appliance being tested are to correspond to the maximum area coverage limitation specified in the installation instructions.

6.1.9 Multiple appliance protection for single discharge nozzle coverage is to be tested per the manufacturer's installation instructions.

6.1.10 Appliances shall be permitted to be protected with multiple nozzles based on the single nozzle appliance coverage specified and the area of coverage for each nozzle does not exceed its single appliance coverage.

6.1.11 Deep fat fryers, having a total cooking area greater than 6 square feet (0.55 m^2), shall be permitted to be protected with multiple nozzles when:

a) Compliance with the Cooking Appliance Extinguishment Tests using a specified cooking appliance and surface area; and

b) The fryer model number is referenced in the manufacturer's installation instructions.

6.1.12 Tilt skillets/braising pans are required to comply with 6.1.10 and not 6.1.11.

6.1.13 A gas radiant char-broiler with integral solid fuel holder(s) intended for flavoring (for example, a solid fuel holder intended for flavoring with mesquite wood) shall simultaneously comply with the requirements of 6.5 and 6.9. The appliance model with the corresponding size shall be referenced in the manufacturer's installation instructions.

6.1.14 Appliances equipped with an attached moveable obstruction or fixed obstruction(s), such as a cover, shall be evaluated at worst case fixed obstruction locations in accordance with the applicable subsections of Section 6. The appliance model with an integral moveable obstruction or fixed obstruction (s) or the appliance model and the model of the device providing the obstruction with the corresponding appliance size shall be referenced in the manufacturer's installation instructions.

Exception: The appliance model is not required in the manufacturer's installation instructions when a range back shelf obstruction is evaluated.

6.2 Deep fat fryer

6.2.1 The deep fat fryer used for this test is to be a commercially available natural gas or propane fired deep fat fryer, at least 9 inches (229 mm) deep, and having a cooking surface area as specified in the manufacturer's installation instructions. For a deep fat fryer with an integral drip board, or similar item, the calculated cooking area, along with the drip area, is to be as indicated in the manufacturer's installation instructions.

6.2.2 All deep fat fryers tested in accordance with 6.2.1 and 6.2.3 – 6.2.8 shall demonstrate an average cooling rate of not more than 5°F (2.8°C) per min. The liquid grease in an uncovered fryer is to be heated at the fryer's maximum energy input. When the temperature of the liquid grease reaches 600°F (316°C) the fryer's energy source is to be immediately shut off and the cooling rate of the liquid grease (°F per min) is to be measured (when the temperature of the grease returns to 600° F (316° C)) between the temperatures of 600 and 500°F (316 and 260°C). The fryer is to be tested with an ambient temperature of 70 ±10°F (21 ±5°C) throughout the duration of the test. The thermocouple monitoring the liquid grease temperature is to be installed as indicated in 6.2.6.

Exception: When compliance with the deep fat fryer requirements is demonstrated using a specified cooling rate greater than 5° F (2.8° C) per min, the protection of a deep fat fryer with a cooling rate exceeding 5°F (2.8°C) per min is permitted. Fryers with a cooling rate exceeding 5°F (2.8°C) per min shall be specifically indicated by model number in the manufacturer's installation instructions.

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

6.2.4 Split vat fryers are to be tested wherein a vat(s) adjacent to the vat to be spontaneously ignited is filled with liquid grease and heated to 350 – 375°F (177 – 191°C). The grease level for the adjacent vat(s) is to be at the bottom of the drip board, and not greater than 3 inches (76.2 mm) below the top of the vat when the grease temperature is between 350 – 375°F (177 – 191°C). Energy shutoff for all vats is to occur when the extinguishing system is actuated.

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

6.2.5 A 2 min free burn shall commence, with the energy source remaining on during the duration of the free burn, at auto-ignition or when the temperature reaches 685°F (363°C), whichever occurs last. When the test vat of the fryer includes an integral drip board, the vat is to be filled so that the grease level is at the top of the drip board when the grease temperature is between 550 – 600°F (288 – 316°C). In no case shall the grease level for any type of fryer be more than 3 inches (76.2 mm) below the top of the vat when the grease temperature is between 550 – 600°F (288 – 316°C).

6.2.6 The grease temperature during testing is to be measured with a thermocouple located 1 inch (25.4 mm) below the grease surface. The thermocouple is to be located not closer than 3 inches (76.2 mm) to the fryer's sidewall.

6.2.7 The liquid grease in the uncovered fryer is to be heated at the fryer's maximum energy input and at a rate not less than 12°F (7.2°C) temperature rise per minute as measured when the grease temperature is between 500 and 600°F (260 and 316°C). The grease is then continually heated using the same energy input until auto-ignition occurs. After auto-ignition of the liquid grease, the fire is to burn freely with the fryer's heating source remaining on for a period of not less than 2 min. After the free burn period of not less than 2 min, the heating source is to be shut off and the extinguishing system unit is to be discharged.

6.2.8 Upon complete discharge of the extinguishing agent, the deep fat fryer shall comply with the requirements in 6.1.2.

6.3 Griddle

6.3.1 Identical coverage and nozzle placement limitations for a griddle application are to be used based on a successful extinguishment test of a deep fat fryer. See 6.2.1 – 6.2.8.

6.3.2 The griddle used for this test is to be constructed of sheet metal at least 0.079 inch (2.01 mm) thick and is to be 1 inch (25.4 mm) deep.

6.3.3 The griddle is to be filled with liquid grease to a depth of 1/4 inch (6.4 mm).

6.3.4 The liquid grease in the griddle is to be heated by the griddle's heating source until spontaneous ignition occurs. After the cooking area is fully involved in flames, the fire is to burn for a minimum 1 min freeburn, with the heating source remaining on, after which the heating source is to be shut off and the extinguishing system unit is to be discharged.

6.3.5 Upon complete discharge of the extinguishing agent, the griddle shall comply with the requirements in 6.1.2.

6.4 Range top

6.4.1 The range top used for the test is to be a commercially available electric, natural gas or propane fired range top or a commercial range top burner to simulate variable range top configurations. When a manufacturer references protection for a range top incorporating a back shelf, a back shelf of the maximum size and located at the minimum height as specified in the manufacturers installation instructions is to be used for test. The cooking surfaces of the range top are to be the maximum as specified for coverage in the manufacturer's installation, operation and maintenance instruction manual.

6.4.2 The following test vessels are to be used for this test:

a) A cast iron skillet having a diameter of 13 to 14 inches (330 to 356 mm) at the top and having sides 1-1/3 – 2-3/8 inches (33.9 – 60.3 mm) high, measured from the inside of the skillet.

b) A stainless steel pot having a diameter of 10 ±1/4 inches (254 ±6.4 mm) at the top and having sides 7 to 8 inches (178 to 203 mm) high.

6.4.3 Separate extinguishment tests are to be conducted using each test vessel.

6.4.4 For the test with the cast iron skillet, the skillet is to be filled with liquid grease to a depth of 1 inch (25.4 mm). For the test with the stainless steel pot, the pot is to be filled with liquid grease to a depth of 4 inches (102 mm). The grease level is to be measured when the grease temperature is between 550 – 600° F (288 – 316°C).

6.4.5 A 2 min free burn shall commence, with the energy source remaining on during the duration of the free burn, at auto-ignition or when the temperature reaches 685° F (363° C), whichever occurs last. The grease temperature is to be measured with a thermocouple located 1/2 inch (12.7 mm) below the grease surface not closer than 3 inches (76.2 mm) to the test vessel wall.

6.4.6 The test vessel is to be positioned on a burner location(s) determined to be most difficult to achieve fire extinguishment. For the skillet test, the 10 inch (254 mm) pot is to be located adjacent to the skillet in the location determined most difficult with respect to achieving fire extinguishment. The range top burner for the test vessel is to be adjusted to the maximum intensity position and the grease continuously heated until auto-ignition occurs. After auto-ignition, the fire is to burn freely with the burner at its maximum intensity for a period of not less than 2 min. After the free burn period of not less than 2 min, the heating source is to be shut off and the extinguishing system unit is to be discharged.

6.4.7 Upon complete discharge of the extinguishing agent, the range top shall comply with the requirements in 6.1.2.

6.5 Gas radiant char-broiler

6.5.1 A commercially available gas radiant char-broiler or a char-broiler constructed to simulate a commercially available radiant broiler is to be used for this test. The char-broiler is to have a drip pan at least 1/2 inch (12.7 mm) deep located below the heating source. The char-broiler shall include a drip pan or equivalent solid bottom surface. The drip pan is to be filled with 1/8 inch (3.2 mm) of liquid grease. An extinguishing system unit is capable of being used with an electric char-broiler based on a successful extinguishment test using a gas radiant char-broiler, using identical coverage and nozzle placement limitations.

6.5.2 A thin plastic sheet, such as plastic food wrap, containing steaks and grease shall be placed on a flat surface at a location away from the char-broiler. The plastic sheet is to be covered with 1/4 inch (6.4 mm) of semisolid grease. Low-quality fatty beef steaks are then to be placed on top of the plastic sheet to cover an area equal to 80 – 90 percent of the char-broiler grate area.

6.5.3 The char-broiler's radiant panels are to be heated with the burners at their maximum intensity so that they are hot enough to ignite drops of liquid grease. When this occurs, the plastic sheet, grease and steaks are to be placed on the broiler's grill in the normal cooking position. The char-broiler is to become quickly involved in flames. The heating source is to be shut off and the extinguishing system discharged after the cooking area has been fully involved with flames for 1 min and the peak flame height is at least 3 feet (0.91 m).

6.5.4 Upon complete discharge of the extinguishing agent, the gas radiant char-broiler shall comply with the requirements in 6.1.2.

6.6 Electric char-broiler

6.6.1 A commercially available electric char-broiler or a char-broiler constructed to simulate a commercially available electric char-broiler is to be used for this test.

6.6.2 This test is to be conducted in the same manner as the gas radiant test specified in 6.5.1 – 6.5.4.

6.7 Lava, pumice, or synthetic rock char-broiler

6.7.1 Identical coverage and nozzle placement limitations for lava rock, pumice stone, or synthetic rock type char-broiler is to be used based on a successful extinguishment test of a lava rock type char-broiler. A gas or electrically heated char-broiler is to be used, and an extinguishing system unit is capable of being used with either heat source based on a successful extinguishment test using either heat source.

6.7.2 A commercially available lava, pumice, or synthetic rock char-broiler, or a char-broiler constructed to simulate a commercially available lava, pumice, or synthetic rock char-broiler, is to be used for this test. The char-broiler shall include a drip pan or equivalent solid bottom surface.

6.7.3 This test is to be conducted in the same manner as the gas radiant test specified in 6.5.2 – 6.5.4, except that the lava, pumice, or synthetic rock is to be heated in lieu of heating the gas radiant panels. The grate is to be covered with two layers of lava, pumice or synthetic rock, whichever is being used for test purposes.

6.8 Natural charcoal broiler

6.8.1 A commercially available charcoal broiler or a charcoal broiler constructed to simulate a commercially available charcoal broiler is to be used for this test. The char-broiler shall include a drip pan or equivalent solid bottom surface.

6.8.2 A thin plastic sheet, such as plastic food wrap, containing steaks and grease be placed on a flat surface at a location away from the charcoal broiler. The plastic sheet is to be covered with 1/4 inch (6.4 mm) of semisolid grease. Low-quality fatty beef steaks are then to be placed on top of the plastic sheet to cover an area equal to 80 – 90 percent of the cooking grate area.

6.8.3 The fuel grate is then to be covered with charcoal briquettes to the maximum depth limitation specified in the installation instructions. In any case, the charcoal depth is not to be less than two layers of briquettes.

6.8.4 The charcoal briquettes are to be heated until they are covered with ash. When this occurs, the plastic sheet, grease and steaks are to be placed on the broiler's grill in the normal cooking position. The broiler is to become quickly involved in flames. The fire is to burn freely until the cooking area is fully involved in flames having a height of 3 feet (0.91 m), and in any case the fire is to be allowed to burn at least 30 s. When the cooking area is fully involved in flames after 30 s or longer of flaming, the extinguishing system unit is to be discharged.

6.8.5 Upon complete discharge of the extinguishing agent, the charcoal broiler shall comply with the requirements in 6.1.2.

6.9 Mesquite wood char-broiler

6.9.1 A commercially available mesquite wood char-broiler or a mesquite wood char-broiler constructed to simulate a commercially available broiler is to be used for this test. The char-broiler shall include a drip pan or equivalent solid bottom surface. The test is to be conducted using the type of mesquite wood that is intended to be used with the char-broiler.

6.9.2 The test is to be conducted in the same manner as the natural charcoal broiler test specified in 6.8.1 – 6.8.5, except that the fuel depth is to be the maximum as specified by the manufacturer, and in no case less than 3 inches (76.2 mm), and mesquite wood is to be used instead of charcoal.

6.10 Upright broiler

6.10.1 A commercially available upright broiler or an upright broiler constructed to simulate a commercially available upright broiler is to be used for this test. The broiling chamber is to be located at or about the midheight of the broiler and is to incorporate a broiling grate. A drip pan is to be placed directly below the broiler chamber. The bottom of the broiling chamber is to slope downward towards the drip pan and have an opening to allow the drainage of the grease from the broiling chamber. The broiler is also to incorporate a completely enclosed warming chamber directly above the broiling chamber. The broiling chamber is to be connected by internal passages to the top of the broiler to provide for exhaustion of grease laden vapors. The broiler is to incorporate a grease trap.

6.10.2 The drip pan below the broiler chamber is to be filled with preheated grease. The inner surfaces of the broiling chamber, the exhaust passages, and the grease trap in the back of the broiler are to be coated with liquid grease to obtain a minimum loading of 0.3 pounds per square foot (1.5 kg/m^2).

6.10.3 Following the grease loading, low quality fatty beef steaks are to be placed on the broiler grate to cover an area between 80 and 90 percent of the cooking grate area.

6.10.4 The grease in the drip pan and broiling chamber is to be heated with a torch until the broiler is well involved in flames. This usually requires 2 to 3 min. After complete flame involvement of the drip pan, the broiler is then to burn freely for an additional 30 to 60 s, after which the extinguishing system unit is to be discharged.

6.10.5 Upon complete discharge of the extinguishing agent, the upright broiler shall comply with the requirements in 6.1.2.

6.11 Chain broiler

6.11.1 A commercially available chain broiler or a chain broiler constructed to simulate a commercially available chain broiler is to be used for this test. The bottom of the broiling chamber is to slope downward toward a drip pan and have an opening to allow the drainage of the grease from the broiler chamber.

6.11.2 The drip pan below the broiler chamber is to be filled with preheated grease. The inner surfaces of the broiler chamber, cooking portion, and grease trap are to be coated with liquid grease to obtain a minimum loading of 0.3 pounds grease per square foot (1.5 kg/m^2). Grease is also to be sprayed on all areas of the chain by causing the chain to rotate. When this is completed, 80 to 90 percent of the chain's cooking area is to be covered with fatty hamburgers (that is, meat that is 70 percent lean) and the chain rotation stopped.

6.11.3 The grease in the drip pan and the broiler chamber is to be heated with the broiler's burners and a torch or with a torch only until the broiler is well involved in flames. This usually requires 2 to 3 min. The broiler is then to burn freely for an additional 30 to 60 s after which the extinguishing system unit is to be discharged.

6.11.4 Upon complete discharge of the extinguishing agent, the chain broiler shall comply with the requirements in 6.1.2.

6.12 Wok

6.12.1 The minimum and maximum wok sizes specified in the manufacturer's installation, operation, and maintenance instruction manual are to be tested. The wok sizes are to be determined by the minimum and maximum height and diameter.

6.12.2 The heating source used for the tests is to be a commercially available electric, natural gas, or propane fired range top.

6.12.3 Separate extinguishment tests are to be conducted using the smallest and largest representative wok.

6.12.4 Each wok is to be tested with a liquid grease level at a depth that provides a 3 inch (76.2 mm) freeboard measured from the top edge of the wok, or a minimum grease level of 1 inch (25.4 mm), whichever provides greater depth of grease. The grease level is to be measured when the grease temperature is between 550 – 600°F (288 – 316°C).

6.12.5 A 2 min free burn shall commence, with the energy source remaining on during the duration of the free burn, at auto-ignition or when the temperature reaches 685°F (363°C), whichever occurs last. The grease temperature is to be measured with a thermocouple located 1/2 inch (12.7 mm) below the grease surface not closer than 3 inches (76.2 mm) to the test vessel wall.

6.12.6 The wok is to be positioned on a burner location(s) determined to be most difficult to achieve fire extinguishment. For the minimum size wok test, a maximum size wok is to be located adjacent to the test wok representing the location most difficult to achieve fire extinguishment. The range top burner for the test wok is to be adjusted to the maximum intensity position and the grease continuously heated until auto-ignition occurs. After auto-ignition, the fire is to burn freely with the burner at its maximum intensity for a period of not less than 2 min. After the free burn period of not less than 2 min, the heating source is to be shut off and the extinguishing system unit is to be discharged.

6.12.7 Upon complete discharge of the extinguishing agent, the wok shall comply with the requirements in 6.1.2.

6.13 Deep fat fryer extinguishment splash test

6.13.1 When tested as described in 6.13.2 – 6.13.6, an extinguishing system unit shall:

a) Result in the fire in a deep fat fryer to be completely extinguished; and

b) Result in no splashing of burning grease due to the extinguishing system unit operation, as evidenced by the presence of burning droplets of grease dispersed outside the fryer.

6.13.2 The deep fat fryer used for this test is to be as specified in 6.2.1.

6.13.3 The test is to be conducted using the maximum discharge rate condition for the test nozzle or nozzles. The maximum discharge rate condition is obtained by using the maximum piping diameter, minimum piping length, and minimum number of tees and elbows, with the cylinder or gas cartridge conditioned to the maximum operating temperature for which the extinguishing system unit is intended.

6.13.4 The fryer is to be filled with grease as specified in 6.2.5.

6.13.5 The grease temperature during testing is to be measured with a thermocouple as specified in 6.2.6.

6.13.6 The liquid grease is to be heated as specified in 6.2.7.

6.13.7 Upon complete discharge of the extinguishing agent, the deep fat fryer shall comply with the requirements in 6.1.2 and 6.13.1.

6.14 Deep fat fryer cooking temperature splash test

6.14.1 When tested as described in 6.14.2 – 6.14.6, an extinguishing system unit shall not splash grease droplets in excess of 3/16 inch (4.76 mm) diameter.

6.14.2 The deep fat fryer used for this test is to be as specified in 6.2.1.

6.14.3 The test is to be conducted using the maximum discharge rate condition for the test nozzle or nozzles. The maximum discharge rate condition is obtained by using the maximum piping diameter, minimum piping length and minimum number of tees and elbows, with the cylinder or gas cartridge conditioned to the maximum operating temperature for at least 16 h or pressurized to the maximum pressure corresponding to the maximum operating temperature for which the extinguishing system unit is intended.

6.14.4 The fryer is to be filled with liquid grease until the grease level is 3 inches (76.2 mm) below the top edge of the fryer. The grease level is to be measured when the grease temperature is between 350 – 375° F (177 – 191°C).

6.14.5 The grease temperature during testing is to be measured with a thermocouple as indicated in 6.2.6.

6.14.6 A flat metallic surface at least 30 inches (762 mm) wide having not more than a 1/16 inch (1.6 mm) deep layer of sodium bicarbonate dry chemical placed on top of the surface is to be prepared around the front and sides of the fryer to detect splashing grease. The liquid grease in the fryer is to be heated by

its heating source until a grease temperature of 350 to 375° F (177 to 191° C) is achieved. The extinguishing system unit is then to be discharged for 3 to 5 s.

6.14.7 The discharge effects are to be observed to determine compliance with the requirements in 6.14.1.

6.15 Range top extinguishment splash test

6.15.1 When tested as described in 6.15.2 – 6.15.6, an extinguishing system unit shall:

a) Result in the fire in a cast iron skillet to be completely extinguished; and

b) Result in no splashing of burning grease due to the extinguishing system unit operation, as evidenced by the presence of burning droplets of grease dispersed outside the cast iron skillet.

6.15.2 The range top used for this test is to be as specified in 6.4.1 and the cast iron skillet as specified in 6.4.2.

6.15.3 The test is to be conducted using the maximum discharge rate condition for the test nozzle or nozzles. The maximum discharge rate condition is obtained by using the maximum piping diameter, minimum piping length and minimum number of tees and elbows, with the cylinder or gas cartridge conditioned to the maximum operating temperature for at least 16 h or pressurized to the maximum pressure corresponding to the maximum operating temperature for which the extinguishing system unit is intended.

6.15.4 The cast iron skillet is to be filled with liquid grease as specified in 6.4.4.

6.15.5 The grease temperature during testing is to be measured as specified in 6.4.5.

6.15.6 The cast iron skillet is to be positioned on a burner location(s) to result in splashing of grease. The range top burner for the skillet is to be adjusted to the maximum intensity position and the grease heated with the skillet uncovered until auto-ignition occurs. After auto-ignition, the fire is to burn freely with the burner at its maximum intensity for a period of not less than 2 min. After the free burn period of not less than 2 min, the heating source is to be shut off and the extinguishing system unit is to be discharged.

6.15.7 The discharge effects are to be observed to determine compliance with the requirements in 6.15.1.

6.16 Range top cooking temperature splash test

6.16.1 When tested as described in 6.16.2 – 6.16.4, an extinguishing system unit shall not splash grease droplets in excess of 3/16 inch (4.76 mm) diameter.

6.16.2 The test requirements specified in 6.15.2, 6.15.3 and 6.15.5 are to be used for this test.

6.16.3 The cast iron skillet is to be filled with liquid grease until the grease level is 1 inch (25.4 mm) below the edge of the skillet. The grease level is to be measured when the grease temperature is 350 – 375°F (177 – 191°C).

6.16.4 A flat metallic surface at least 30 inches (762 mm) wide having not more than a 1/16 inch (1.6 mm) deep layer of sodium bicarbonate dry chemical placed on top of the surface is to be prepared around the front and sides of the range top to detect splashing grease. The liquid grease in the skillet is to be heated by its heating source until a grease temperature of 350 to 375°F (177 to 191°C) is achieved. The extinguishing system unit is then to be discharged for 3 to 5 s.

6.16.5 The discharge effects are to be observed to determine compliance with the requirements in 6.16.1.

6.17 Wok extinguishment splash test

6.17.1 When tested as described in 6.17.2 – 6.17.6, an extinguishing system unit shall:

a) Result in the fire in a wok to be completely extinguished; and

b) Result in no splashing of burning grease due to the extinguishing system unit operation, as evidenced by the presence of burning droplets of grease dispersed outside the wok.

6.17.2 The woks used for this test are to be as specified in 6.12.1.

6.17.3 The test is to be conducted using the maximum discharge rate condition for the test nozzle or nozzles. The maximum discharge rate condition is obtained by using the maximum piping diameter, minimum piping length and minimum number of tees and elbows, with the cylinder or gas cartridge conditioned to the maximum operating temperature for at least 16 h or pressurized to the maximum pressure corresponding to the maximum operating temperature for which the extinguishing system unit is intended.

6.17.4 The wok is to be filled with liquid grease as specified in 6.12.4.

6.17.5 The grease temperature during testing is to be measured with a thermocouple as specified in 6.12.5.

6.17.6 The wok is to be positioned on a burner location(s) to result in splashing of grease. The range top burner for the wok is to be adjusted to the maximum intensity position and the grease heated with the wok uncovered until auto-ignition occurs. After auto-ignition, the fire is to burn freely with the burner at its maximum intensity for a period of not less than 2 min. After the free burn period of not less than 2 min, the heating source is to be shut off and the extinguishing system unit is to be discharged.

6.17.7 The discharge effects are to be observed to determine compliance with the requirements in 6.17.1.

6.18 Wok cooking temperature splash test

6.18.1 When tested as described in 6.18.2 – 6.18.6, an extinguishing system unit shall not splash grease droplets in excess of 3/16 inch (4.76 mm) diameter.

6.18.2 The woks used for this test are to be as specified in 6.12.1.

6.18.3 The test is to be conducted using the maximum discharge rate condition for the test nozzle or nozzles. The maximum discharge rate condition is obtained by using the maximum piping diameter, minimum piping length and minimum number of tees and elbows, with the cylinder or gas cartridge conditioned to the maximum operating temperature for at least 16 h or pressurized to the maximum pressure corresponding to the maximum operating temperature for which the extinguishing system unit is intended.

6.18.4 The wok is to be filled with liquid grease until the grease level is 3 inches (76.2 mm) below the top edge of the wok. The grease level is to be measured when the grease temperature is 350 – 375°F (177 – 191°C).

6.18.5 The grease temperature during testing is to be measured with a thermocouple as specified in 6.12.5.

6.18.6 A flat metallic surface at least 30 inches (762 mm) wide having not more than a 1/16 inch (1.6 mm) deep layer of sodium bicarbonate dry chemical placed on top of the surface is to be prepared around the front and sides of the wok to detect splashing grease. The liquid grease in the wok is to be heated by its heating source until a grease temperature of 350 to 375° F (177 to 191° C) is achieved. The extinguishing system unit is then to be discharged for 3 to 5 s.

6.18.7 The discharge effects are to be observed to determine compliance with the requirements in 6.18.1.

7 Hood and Duct (Full Scale) Extinguishment Test

7.1 General

7.1.1 An extinguishing system unit intended to protect the hood and duct of a restaurant cooking area shall be tested as described below.

7.2 Hood

7.2.1 The hood dimensions are to be the maximum as specified in the installation instructions. See 7.2.2 and 7.2.3, and Figure 7.1.

7.2.2 The hood is to be at least 4 feet (1.2 m) wide, increasing in increments of 1 foot (0.3 m) only.

7.2.3 The hood is to be 4, 6, 8, 10, 12, 16, 20, or 24 feet (1.2, 1.8, 2.4, 3.0, 3.7, 4.9, 6.1, or 7.3 m) long, or longer than 24 feet (7.3 m) in increments of 6 feet (1.8 m) only.

7.2.4 The hood is to be constructed of sheet steel having a minimum thickness of 0.079 inch (2.01 mm).

7.3 Filter and frame

7.3.1 The filter frame is to be a "V" type extending the full length of the hood. The bottom portion of the filter frame is to be constructed of 2 by 2 inch (50.8 by 50.8 mm) angle iron having a minimum thickness of 1/8 inch (3.2 mm). Steel mesh type filters 2 inches (50.8 mm) thick shall be installed in the frame. Filters are to be installed at a 45 ±10 degree inclined position on both sides of the "V". During the extinguishment tests, the cooking appliance is to be located below the hood and filters. The hood and filters are to extend beyond each end of the appliance. See Figure 7.1.

Exception: The filter frame is not required to be a "V" type when another type of filter frame configuration, such as one using a single bank of filters, is specified in the installation instructions.