

Chapter Eight – Fire-Extinguishing Systems

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Improperly wired extinguishing system control components. Installation and service should only be performed by properly trained individuals. Note: This is a red-tank Ansul and no longer factory compliant.

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ML (Max Load) fusible metallic link dated 2012; temperature rated 232°C/450°F



Range Guard/Kidde UL 300 appliance nozzle. Note: Aluminum grease seal at base of nozzle



Ansul stainless steel 1.5 gallon cylinder, recognized type to be used with UL300/1254.6 applications



Range Guard terminal fusible link detector bracket and link. Can be used with all Range Guard control heads.



UL 300 1 flow Ansul nozzle with rubber-type blow-off cap



Range Guard A+ mechanical control head

Fire-Extinguishing Systems

Introduction

This chapter addresses fire protection principles and requirements for commercial cooking appliances and exhaust system fire-extinguishing equipment including:

- Pre-Engineered Fixed Pipe Fire-Extinguishing Systems (Primary Protection)
- Water Sprinkler Systems
- Portable Fire Extinguishers (Secondary Protection)



Fire-extinguishing system distribution nozzles and detection links. Note required grease caps are missing from the appliance nozzles.

Extinguishing a fire in a commercial kitchen is no simple matter. Fires will generally involve very hot oils, as well as electricity, gas and ordinary combustibles such as paper, wood and cloth. Prior to the 1960's, portable and manually controlled CO₂ systems were used to extinguish fires.

In the early 1960's, the first dry chemical fixed pipe extinguishers were developed. Dry chemical powder was generally a sodium bicarbonate base.

The major drawback to dry chemical agents is that it does not adequately blanket and cool down the burning oils and other surfaces of appliances. For this reason in the early 1980's new wet chemical suppressants were developed to provide superior and cleaner fire protection.¹ Dry chemical systems are no longer allowed, as they are not compliant with UL 300 or NFPA 96 Standards.

In 2002, specially listed water sprinkler systems, as Listed in UL199E, was employed for protection of this hazard. These systems have automatic fire detector bulbs built into the nozzle head; but **no** manual pull exists.²

General Standards

UL - 300 and ULC/ORD - 1254.6

As of 1994 both Underwriters Laboratories and Underwriters Laboratories of Canada re-defined the listing requirements and test protocols for "Wet Chemical" extinguishing agents. These changes came about as a direct result of changing cooking styles and improved energy-efficient cooking equipment.

Oils are composed of "triglycerides," which consist of three long fatty acids chains attached to a glycerine backbone. As they deteriorate from heating, the triglycerides come apart, releasing free fatty acids into the oil.

In the past few years, restaurants have changed cooking oil from animal fats, which contain high levels of free fatty acids, to vegetable oils, which contain significantly lower levels of free fatty acids. Extinguishing agents are used to saponify (which means turn into soap) and form a blanket of foam, when they react with the free fatty acids. However, with lower levels of fatty acids, saponification was decreased; therefore, changes were required in the chemical make-up of the wet chemical extinguishing agent.

The new UL 300 and ULC/ORD 1254.6 1995 testing parameters are a more accurate reflection of "real world" situations compared to previous wet chemical testing parameters. In laymen's terms, "the wet just got wetter." The change in the cooking medium from animal fats to vegetable oils also resulted in higher autoignition temperatures of the cooking oil compared to animal fats.

¹ The first wet chemical system was developed in 1964 by Range Guard owned (at the time) by Automatic Sprinkler Corporation, but it took years before wet chemical came on the market.

² While UL 199E is allowed by some AHJs, it is not compliant to UL 300/1254.6.

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The autoignition temperature of most vegetable oils is approximately 363 °C (685 °F), which is as much as 57 °C (135 °F) higher than the autoignition temperatures of animal fat. The higher autoignition temperatures of the cooking oil and a change to more energy-efficient cooking equipment, allowed the oil to retain heat for a longer period of time.³

Clean vegetable oil fires are harder to extinguish due to the higher initial heat; because the major portion of wet chemical systems is water, more agent needs to be applied before the fire can be knocked down. That is the reason UL300 wet systems require more wet agent than pre UL300. The pre UL300 test protocol allowed for the use of mock appliances, immediate gas shut off at the first sign of flame, one minute pre-burn before system actuation and no reflash for 5 minutes. The UL300 test protocol is much more stringent; it requires real functional appliances, two minute pre-burn with fuel on before system actuation and no reflash for 20 minutes (fryers were found to reflash 8 to 10 minutes after initial knockdown due to heat retention and movement or breakdown of saponified layer above oil on the pre UL300 applications).

For these reasons, only wet chemical systems are approved for cooking equipment protection under the revised test protocol. Most areas require that wet chemical extinguishing systems be up to UL 300 or ULC/ORD 1254.6 1995 listing. It must be noted that there are still a few jurisdictions that continue to allow pre-UL 300 wet chemical systems to remain in use.

NFPA 96 and 17A Fire-Extinguishing System Requirements

In commercial cooking facilities, fixed fire-extinguishing systems are the primary means of fire control. *NFPA 96, Chapter 10* requires fire-extinguishing equipment for the protection of hoods, exhaust plenums, exhaust duct systems, and grease removal devices. Cooking equipment that produces grease-laden vapors and could be a source of ignition of grease in the exhaust system is also required to be protected by a fire-extinguishing system.

Additional *NFPA 96, Chapter 10* requirements:

- Fire-extinguishing systems shall comply with UL 300
- Any appliances and exhaust components that are not addressed in UL 300 or other equivalent test standards, shall be protected with an automatic fire-extinguishing system(s) in accordance with the applicable NFPA standards, local codes, and approved by the AHJ
- Automatic fire-extinguishing equipment provided in listed recirculating systems must comply with UL 197, Standard for Commercial Electric Cooking Appliances
- Systems in single hazard areas shall be arranged for simultaneous operation upon activation of any of the systems
- All sources of fuel or electric power for cooking equipment shall be automatically shut off
- Readily accessible means of manual activation shall be in a path of egress
- An audible or visual alarm shall be provided to show activation of a fire-extinguishing system
- In an occupancy provided with a fire alarm system, the fire alarm system shall activate at the same time as the cooking equipment fire-extinguishing system

NFPA 96 and 17A requires that fire protection systems be installed and maintenance manuals be consulted in accordance with ANSI/UL 300 or other equivalent standards, and applicable NFPA standards.⁴

In addition to these requirements for fixed pipe fire-extinguishing systems, NFPA 96 also requires portable fire extinguishers listed for such use.⁵

Important Note: “Noncompliant” or “Obsolete” as used in this chapter is defined as not up to the current manufacturer’s specifications. Some jurisdictions may allow older components.

³ Lake, James D, Section 11, Chapter 4 Chemical Extinguishing Agents and Application Systems, *NFPA Fire Protection Handbook* 19th Edition.

⁴ See *NFPA 96, 10.2.3**

⁵ See the *Portable Fire Extinguisher Section* in this chapter.