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Summary

Fire test standard UL 300 has been a major factor in significant changes in how commercial cooking operations are protected from fire. This report looks at the background of UL 300 and changes in related NFPA National Fire Code documents. The dilemma of what to do about existing fire protection systems is also discussed.

Introduction

In 1998, a revolution in the fire protection of commercial cooking operations occurred. Several key fire protection standards were revised. While protection requirements for new installations seemed clear, fire protection professionals found themselves in a quandary over existing installations.

The changes raised doubts about the ability of existing fire protection systems to provide adequate protection. Questions arose as to which systems needed to be upgraded, the length of transition time that should be allowed, and the difference in loss exposure between existing protection and new criteria.

A driving force behind this fire protection revolution is one fire test standard developed by Underwriters Laboratories, Inc. (UL). First issued in 1992, UL 300, Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas, affects how kitchen fire protection systems are tested. The revised standard is intended to provide test conditions which more closely resemble the hazards faced in "real world" fire situations.

Background

Prior to 1998, the use of dry chemical fire extinguishing systems was a very popular and widespread method of fire protection for commercial cooking operations. Other protection options available include: wet chemical systems, carbon dioxide systems, automatic fire sprinklers, and foam-water sprinkler systems.

In 1998, three National Fire Protection Association (NFPA) documents added a requirement that fire protection systems for cooking appliances must comply with UL 300. In addition, a new category of portable fire extinguisher was introduced, Class K. The use of portable fire extinguishers in kitchens fire situations was also altered.

UL 300

Two primary developments are often cited as influencing the emergence of UL 300:

- High efficiency cooking appliances, and
- Use of vegetable cooking oils.

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In order to meet the demand for faster cooking, a new generation of well insulated, high efficiency cooking appliances was introduced. These appliances heat faster, cook hotter and cool slower. They are also more economical to operate since less energy is needed. To accommodate this new technology, higher temperature vegetable cooking oils were needed. Deep fat fryers in particular, need the high-temperature vegetable cooking oils.

Health concerns have also contributed to reduced use of animal fats or lard as a cooking oil. This has fire protection consequences. The auto-ignition temperature of most animal fat is in the range of 550-600°F compared to 685°F or higher for vegetable oils.

The typical fire in a deep fat fryer often results from heating the cooking oil to its auto-ignition temperature. Burning continues until the temperature of the oil is lowered below the flash point (or the fuel is exhausted). Insulated cooking appliances tend to retain heat and to slow cooling. This makes a fire more difficult to extinguish.

Extinguishing agents used in restaurant fire protection systems typically have an alkaline base. When the agent is discharged on a fire, a process called saponification occurs. The alkaline base of the extinguishing agent combines with the fatty acids in the cooking oil and forms a soap-like substance which blankets the surface. This helps smother the fire.

However, saponification occurs less with vegetable oils because they have significantly lower levels of fatty acids than animal fats do. In addition, the higher temperatures associated with cooking with vegetable fats contributes to the faster breakdown of the soapy layer. Therefore, the extinguishing capability of the fire suppression system is reduced and the probability of re-ignition is increased.

UL 300 is a test standard, which tests pre-engineered fire extinguishing systems for protection of restaurant cooking areas. This includes exhaust hoods, plenums, and ducts; and cooking appliances such as deep fat fryers, griddles, range tops, woks, upright broilers, and various types of char-broilers.

In addition to fire extinguishing tests, splash tests are conducted to ensure that the operation of the extinguishing system will not splash burning grease. Such splashing could result in spreading the fire and/or injuring an operator trying to manually extinguish the fire.

The test conditions under UL 300 are intended to more closely resemble actual field conditions and the hazards presented by “new” trends in cooking equipment:

- The deep fat fryer test appliance was changed from a fabricated pan (to simulate a fryer) to an actual commercial fryer with specified heating and cooling rates.
- The one-minute pre-burn after auto-ignition was changed to a two minute pre-burn for the deep fat fryer and other similar fire risks.
- The appliance “fuel-off” condition during pre-burn was changed to an appliance “fuel-on” condition.
- A minimum grease auto-ignition temperature of 685°F (363°C) was added.

UL 300 did not change the testing protocol for hood and duct protection.

The first edition of UL 300 was published in July 1992. Initially, the effective date was to be January 13, 1994 but it was later changed to November 21, 1994. A second edition was published March 29, 1996. In

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December 1998, the scope was revised to clarify that the document is a test standard rather than an installation standard.

All new restaurant fire protection systems manufactured after the above effective dates must comply with UL 300 to qualify for a UL Listing. Those systems, which receive the UL listing, are published in UL's annual Fire Protection Equipment Directory.

New Installations

All new restaurant fire protection systems manufactured after the effective date of November 1994 must comply with UL 300 to qualify for a UL Listing. In addition, NFPA 96 requires that such fire-extinguishing systems comply with UL 300. Used systems (or new systems manufactured prior to November 1994) that do not comply with UL 300 should not be installed.

Existing Installations

UL does not "unlist" restaurant fire protection systems that were listed prior to the implementation of UL 300. Such systems continue to qualify as a Listed product as long as the system is in compliance with its original Listing requirements.

One aspect of the UL listing is the hazard being protected. If high efficiency appliances and vegetable oil are being used, the hazard is now most likely outside the scope of the pre-UL 300 Listing. This situation may have been identified during the semiannual maintenance required by NFPA 17 or 17A.

Another aspect of the listing involves maintenance and servicing the protection system. Lack of proper replacement parts may mean the UL listing is void.

When considering the issue of retrofitting existing installations, consider that UL 300 is the "state-of-the-art" in restaurant cooking area fire protection. In some cases, it may be possible to "upgrade" an existing protection system to UL 300. In other cases, it may be more economical or practical to replace the protection system.

For upgrades, some components such as cylinders, certain nozzles, detection system and accessories may be reusable while others such as piping and HDR nozzles will need to be replaced. Since upgrades must meet the conditions for a listed system, it is not possible to mix components from different manufacturers. Existing pre-UL 300 wet chemical systems being upgraded will most likely need more agent. Although each manufacturer's system is different, on average about five times more wet chemical agent is needed to meet the UL 300 requirements.

Another factor when considering the need to retrofit is when a location has or could have both pre-UL 300 systems and UL 300 compliant systems. Obviously, mixing systems will complicate maintenance and testing and emergency response.

Indications that an existing protection system is not UL 300 compliant include:

- Use of dry chemical agent.
- Use of a single nozzle to protect multiple appliances.
- Use of a single nozzle to protect a combination griddle/range.

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To date, no dry chemical system has been listed under UL 300. However, existing dry chemical systems (separate from the system protecting the cooking appliance) may still be used for plenum and duct protection. UL 300 requires that multiple appliances be covered individually unless a specific listing is in the manufacturer's design, installation, and maintenance manual and the manufacturer must specifically test this arrangement under the UL 300 test standard.

Portable Fire Extinguishers

Another aspect that should not be overlooked is the changes with portable fire extinguishers:

- Designation of portable extinguisher use as secondary backup fire protection to the automatic fire protection system, and
- Use of the Class K portable extinguisher.

Use of portable extinguishers as backup to the automatic fire protection system may require a major education effort at some locations. In most cases, the portable fire extinguisher is considered the "first line of defense" against fire. Prior to the UL 300 "revolution" this was true for cooking operations. Now the first line of defense against fire in cooking operations is to activate the fire-extinguishing system.

Therefore, employees should be well trained in how to manually activate the system. If there is more than one system, it is important that each activation point clearly identifies what system or appliance is involved.

With the introduction of a Class K portable fire extinguisher, kitchens may contain two or more types of extinguisher. Employees need to be thoroughly trained in the proper use of each type. Extinguishers with a Class K rating are to be used on cooking appliances using combustible cooking media. These extinguishers will be marked with a picture of a frying pan. A multi-purpose (i.e., ABC) type extinguisher may also be present to protect against fires in paper (e.g., trash containers) and electrical equipment.

Note that NFPA 10 requires placement of extinguishers for Class K fires so that the maximum travel distance does not exceed 30 feet (9.15 m) from the hazard to the extinguisher. This is a shorter distance than required for fire extinguishers for Class A, B, and D fires.

References

1. Carey, William M. "The Evolution of Fire Protection For Commercial Cooking Equipment And The Next Generation of Test Standards or A Brief Introduction to UL 300." October 1996. Fire Risk Reduction Through Emerging Technologies Conference.
2. Fire Equipment Manufacturers Association, Inc. (FEMA). UL Standard 300: Questions & Answers. January 1997. www.taol.com/fema/ul300.htm accessed April 9, 1999].
3. HSB Industrial Risk Insurers. IRInformation IM.9.2.7, Deep Fat Fryers. December 1, 1995. HSB IRI: Hartford, CT. December 1, 1995.
4. Kidde-Fenwal, Inc. "UL 300: Meeting the New Standard For Commercial Cooking Fire Suppression." (Pamphlet) Form No. KF-0016. Ashland, MA.
5. Leicht, R.T. "UL 300 - Not Designed for Retroactive Implementation." Fire Marshals Quarterly (September 1997) page 11.
6. Nadolny, Gary A. "Discontinuation of R-101 Dry Chemical Restaurant Fire Suppression Systems" ANSUL General Bulletin No. 4013. March 16, 1998.
7. National Association of Fire Equipment Distributors (NAFED). "UL-300 Standard Update." 1997. [[Http://www.nafed.org/UL300.html](http://www.nafed.org/UL300.html) accessed February 26, 1999].
8. National Fire Protection Association. NFPA 10, Standard for Portable Fire Extinguishers. NFPA: Quincy, MA. 1998.
9. ---. NFPA 13, Standard for the Installation of Sprinkler Systems. NFPA: Quincy, MA. 1996.
10. ---. NFPA 17, Standard for Dry Chemical Extinguishing Systems. NFPA: Quincy, MA. 1998.
11. ---. NFPA 17A, Standard for Wet Chemical Extinguishing Systems. NFPA: Quincy, MA. 1998.

This information may not address all hazardous conditions at your location and does not warrant workplace safety or compliance with federal, state or local laws.

12. --. NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. NFPA: Quincy, MA. 1998.
13. Underwriters Laboratories Inc., Fire Protection Equipment Directory. UL: Northbrook, IL. 1999.
14. --. UL 300, Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas. 2nd Edition. UL: Northbrook, IL. 1996.
15. ESIN report number 64.10

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