

Residential Cooking Application Design Recommendations

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Background:

CaptiveAire, the nation's largest commercial cooking ventilation manufacturer, has traditionally focused on commercial grade ventilation equipment for restaurants. Historically there has been a large gap in safety and performance between residential grade ventilation equipment, which generally does not incorporate any fire protection measures, and commercial grade equipment.

Though there is no accepted definition for "commercial" as opposed to "residential" (IMC 2018, "Commercial Cooking Appliances" definition commentary), code typically differentiates them based on if food is being sold. Though this requirement is clear for many commercial cooking operations, it becomes muddled in the case of a large charity kitchen. Though no profit is made, operations can be quite substantial. Considering this, the commentary section for "Commercial Cooking Appliances" states that in these cases "considerations such as volume and frequency of cooking must dictate what is commercial" because "as the volume and frequency increase, so too do the hazards associated with such cooking".

The appeal of residential style kitchens is that they avoid many of the stringent code requirements of commercial kitchens, making them more economical and less onerous to install. This white paper will discuss the differences between residential and commercial kitchens, the codes that govern each and how to design a residential style kitchen.



Differences in Code between Commercial and Residential Cooking Operations:

Commercial cooking operations in a restaurant, food hall, hotel or other for-profit entities are governed by commercial kitchen codes including UL 710 (Standard for Exhaust Hoods for Commercial Cooking Equipment), NFPA 96 (Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations), as well as International Mechanical Code (IMC), International Building Code (IBC), and potentially various energy codes. Type 1 or Type 2 hoods are required for collecting and removing grease vapors and smoke, and for collecting and removing steam heat or odors, respectively. Strict cleaning and inspection regiments are mandated due to the volume and temperature of cooking. UL 300 listed fire systems are required for Type 1 applications to protect staff, patrons and the structure.

Residential cooking operations on the other hand have none of these requirements. As of the release of this bulletin, no current UL standard exists to govern residential exhaust hoods from a performance and safety perspective. IMC only requires compliance with Section 505, "Domestic Cooking Exhaust Equipment", which eliminates the need for a Type 1 hood, grease-rated ductwork, or a grease-rated (UL 762) listed fan.

The current definitions for residential cooking applications are therefore governed by separate and less familiar code, which is broad in nature, namely: IBC occupancy classifications, NFPA 101, and UL300A.

IBC Occupancy Classifications:

IBC and IMC reference occupancy classifications which are used to represent varying levels of hazard and risk to building occupants and adjacent property. Though not usually referenced with commercial cooking operations as most commercial kitchens are Group A-2, IMC Section 505 "Domestic Kitchen Exhaust Equipment" makes specific mention of Group I-1, I-2 and R.

“A”, “I” and “R” denote “assembly”, “institutional” and “residential” groups, respectively. Understanding the requirements and limitations of these various occupancy groups is imperative to understand what equipment is required to meet code. For example, a space would fall under the occupancy group of the larger space if the residential kitchen wasn’t the main use of the space.

Group I-1 includes occupancies “for more than 16 persons, excluding staff, who reside on a 24-hour basis in a supervised environment and receive custodial care” which includes, but is not limited to, “alcohol and drug centers, assisted living facilities, congregate care facilities, group homes, halfway houses, residential board and care facilities, and social rehabilitation facilities” (IBC 308.2). Allowances are provided for these kinds of occupancies with fewer than 16 persons to be reclassified as Group R-4 or R-3. Further classification includes Condition 1 and 2 which splits occupancies into those which all persons receiving care are capable of responding to an emergency situation without assistance, and those that require limited assistance, respectively.

Group I-2 includes occupancies “used for medical care on a 24-hour basis for more than five persons who are incapable of self-preservation” which includes, but is not limited to, “foster care facilities, detox facilities, hospitals, nursing homes and psychiatric hospitals” (IBC 308.3). Condition 1 and 2 also exist for Group I-2 which breaks down this group into occupancies that “provide nursing and medical care but do not provide emergency care”, and those that can provide emergency care. Condition 1 would include, but is not limited to, nursing homes and foster care facilities.

Finally, Group R includes occupancies for sleeping purposes that do not already fall under Group I. Within Group R, Group R-2 specifically applies to two or more dwelling units, in which the occupants are primarily permanent in nature such as apartments and dormitories.

NFPA 101:

NFPA 101 is a life safety code that protects people based on building construction, protection, and occupancy features that minimize the effects of fire and related hazards. Specific to residential style kitchens, NFPA 101 states that new and existing health care occupancies must comply with additional life safety requirements. These include:

- A maximum of 30 beds/persons in the facility
- A hood greater or equal in length to the cooking surface
- A minimum of 500 cfm
- A UL300 or UL300A fire system interlocked to turn off all sources of fuel and electrical power to the cooking equipment
- No solid fuel or deep fat fryers
- A locked switch preventing startup, and limiting operation to 120 minutes
- A portable fire extinguisher

UL 300 vs UL 300A:

The final point of clarification around residential cooking code is the difference between UL 300 and UL 300A. UL 300 is the “Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment” and is required from commercial cooking hoods, while UL 300A is the “Standard for Extinguishing System Units for Residential Range Top Cooking Surfaces” and only applies to residential cooking.

UL 300 fire systems are considered “universal” and can be installed in any hood with AHJ (Authority Having Jurisdiction) approval. Conversely, UL 300A fire system are specifically designed for a specific hood covering residential range top cooking applications.

CaptiveAire’s UL 300A listed fire system for residential hoods is the only unlimited suppressant, water-based residential fire system on the market today. The fire system for residential hoods builds off of years of experience with the comparable commercial version that’s UL 300 listed. Unlike other UL 300 fire systems, this UL 300A fire system uses the same proven components from the UL 300 version but with nozzles and piping designed for the smaller residential hood.



IBC requires that domestic cooking systems for Group I-1, I-2 and R-2 be equipped with an automatic, pre-engineered fire extinguishing system listed and labeled in accordance with UL 300A.

Residential Hood Application Design and Engineering Suggestions:

The first step to any residential design is to ensure the appliances to be covered are in fact residential appliances. This should be stated clearly on the specification sheet of the appliance, and/or the appliance should resemble something that would clearly be acceptable in a residential application. These are generally limited to gas, electric, or convection ranges or range/oven combinations. Indoor BBQ or commercial duty equipment are specifically prohibited. Next, designers should ensure that the cooking operation is solely non-profit/non-commercial. If these two requirements are met, IMC 507 states that a Type 1 or 2 hood is not required.

As the space is non-commercial, the specific class of occupancy must be determined based on the number of occupants to determine requirements. See "IBC Occupancy Classifications" above. It is the opinion of CaptiveAire that recirculating hoods should never be used, even when code allows, due to the dramatic decrease in indoor environmental quality (IEQ). The preferred design is to duct all exhaust effluent outside and use a Dedicated Outside Air System (DOAS) or similar HVAC solution to replace the exhausted air. The improved air quality will more than compensate for any initial cost increase for ventilation over the life of the building.

After occupancy class is determined, the hood can be chosen. As part of this selection, the space in which the hood will be installed and the total length of appliance(s) to be covered must be considered. Proper commercial hood design incorporates overhang requirements on both the sides and the front of the hood. Though IMC 505 doesn't require it for residential hoods, the equipment will perform best when adequate overhang is utilized.

Though a Type 1 commercial hood could cover a residential appliance, and would exceed all requirements of IMC 505, the hood is also likely oversized for the cooking intensity and frequency of a residential application, more expensive, and may induce a code official to enforce the more stringent commercial code requirements as this specific configuration is undefined in code.

The second option would be a traditional residential hood, like that found at a home improvement store. This style of hood, though very cost effective, is usually missing key safety features required for the I-Group occupancies, like listed fire systems, appliance interlocking, or a reliable method to interlock with building ventilation systems.

The best and final option is to choose a residential hood system specifically designed to meet the IMC 505, NFPA 101 and UL300A requirements.

CaptiveAire's Integrated Residential Cooking Hood:

As the nation's largest commercial kitchen ventilation manufacturer in the United States, CaptiveAire has leveraged our commercial kitchen expertise to develop a residential hood with the quality, safety and attention to detail normally reserved for the commercial space.

With a large capture volume to contain more cooking effluent, removable and washable UL 1046 grease-rated filters, simple controls with automatic fan and light activation, a UL 300A fire system with electronic detection, and a variable speed integral UL 507 exhaust fan mounted in the hood riser, CaptiveAire produces the most robust residential hood in the industry. Couple that with other features like dimmable lights, NFPA 101 compliance, factory-service system design verification, and six commercial manufacturing plants around the country to quickly serve our customers, and you have one winning combination. Let's get cooking!

