



## PROPER VENTILATION & PROTECTION OF A RESIDENTIAL RANGE IN A COMMERCIAL BUILDING

### THIS WHITE PAPER WILL ADDRESS:

- Residential and Commercial Kitchens
- Related Kitchen Code Definitions
- Code Specifics and Compliance
- Pulling It Together

### COMMERCIAL OR RESIDENTIAL?

Commercial buildings and residential buildings have a completely different set of codes which are typically considered to be mutually exclusive. This also applies to kitchens in these types of buildings. There is a noticeable difference between a full commercial kitchen producing large quantities of food daily and a residential style kitchen where the appliances may only cook small meals on occasion.

Restaurant, hotel, or university kitchens are considered to be commercial kitchens because they produce food to be sold for profit. Per code, commercial kitchens are required to have Type I or Type II commercial kitchen hood packages. Because of the frequency and temperature of the cooking, they are highly regulated for safety purposes. Although code does not require residential style kitchens to use a commercial hood, a similar level of protection is often recommended, if not required. Assisted living facilities, places of worship, classrooms, fire stations, college dormitories, or multi-family dwellings are common applications where food is prepared in a commercial building but is not sold for profit.

In discerning code requirements for these conditions - where food is prepared in a commercial building but is not sold for profit - confusion can often arise. For example, consider a small kitchenette designed with a single residential range that is located in an accessible area within an assisted living care facility. In this instance, a residential style kitchen resides within an overall commercial building. When residential and commercial components intermix, it can be unclear which codes apply. This kitchen is not subject to the same requirements as a full commercial kitchen. But both commercial and residential requirements demand equipment that ensures occupant safety. In general, code requirements for commercial kitchens are more detailed, with specific operation, fire protection, filtration, and construction demand, while residential code requirements are generally more lenient.



To better understand code compliance for domestic and residential style kitchens, the chart below defines the applicable codes and terminology used within them.

CODE NAME	DESCRIPTION
NFPA 101	National Fire Protection Association Life Safety Code addressing the construction, protection, and occupancy features necessary to minimize danger to life from the effects of fire.
IMC	The International Mechanical Code establishes the minimum acceptable level of safety and protects life and property from the hazards associated with installation and operation of mechanical systems.
IBC	The International Building Code provides minimum requirements to safeguard the public health, safety and general welfare of the occupants of new and existing buildings.
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, including but 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.
Group I-2 Condition 1	Includes facilities that provide nursing and medical care, including but not limited to nursing homes and foster care facilities.
Group R-2	Residential occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature, such as hotels, apartments, and dormitories.
Health Care Occupancy	Per NFPA 101, an occupancy used to provide in-patient treatment or care simultaneously to four or more patients who are mostly incapable of self-preservation due to age, physical, or mental disability, or because of security measures not under the occupants' control such as hospitals and nursing homes.
Residential Board and Care Occupancy	Per NFPA 101, an occupancy used for lodging and boarding of four or more residents, not related by blood or marriage to the owners or operators for the purpose of providing personal care services.
UL 300A	Underwriter Laboratories Outline of Investigation for Extinguishing System Units for Residential Range Top Cooking Surfaces.
UL 300	Underwriter Laboratories Standard for Fire Testing of Fire Extinguishing System Units for Protection of Commercial Cooking Equipment.
UL 507	Underwriter Laboratories Standard for Electric Fans.
UL 762	Underwriter Laboratories Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances.
UL 710	Underwriter Laboratories Standard for Exhaust Hoods for Commercial Cooking Equipment.

## COMPLYING WITH CODE

With any application, the local authority having jurisdiction (AHJ) determines what is compliant with the code. It is important to consult the code authority directly on requirements for a particular application. Most local code authorities base compliance on the universally accepted I-Codes – the International Mechanical Code (IMC), the International Building Code (IBC), and the National Fire Protection Association Life Safety Code (NFPA 101).

IMC is the standard code referenced in the context of mechanical systems, including kitchens. IMC Section 507 is the specific section that addresses commercial kitchen hoods. It states that commercial cooking requires a Type I or Type II kitchen hood, whether a domestic appliance is being used or not: “Domestic cooking appliances utilized for commercial purposes shall be provided with Type I/II hoods.”. IMC states that a domestic appliance utilized for domestic purposes within a commercial setting is required to comply with IMC Section 505. and does not require any compliance within IMC 507. This excludes the requirement of a type I hood, a UL 762 listed grease exhaust fan, or any grease-rated ductwork. IMC section 505 revolves around the requirements for domestic cooking equipment. It states that **WHERE DOMESTIC EXHAUST EQUIPMENT IS PROVIDED, IT MUST HAVE ALL OF THE FOLLOWING:**

- A UL 507 listed exhaust fan
- Outdoor discharge through sheet metal duct in Group I-1 and I-2 applications
- Make-up air when the system is exhausting more than 400 CFM

While not commonly referenced with commercial kitchen spaces, the International Building Code (IBC) has useful occupancy classifications for residential kitchens. Occupancy types sort structures or spaces based on their hazard levels and provide specific requirements for each. While essentially all commercial kitchens are within occupancy Group A-2, residential kitchen occupancies are much more varied. If the residential kitchen isn't the main purpose of the space, it falls within the occupancy group of the overall space it is located in. This is important because certain occupancies require additional features beyond what is dictated by IMC 505. For example, in Group I-1 and I-2 occupancies, facilities where staff members administer care or custodial labor for a number of patrons (see formal definitions on page 2), recirculating fans within the hood are prohibited, and an automatic fire suppression system is required.

When the application does not fall within these occupancies - such as with fire stations, places of worship, and teaching kitchens - a recirculating hood can be used without make-up air (exhaust is typically 250 - 300 CFM), eliminating the need for ducts through the building or other additional equipment. This makes implementation and installation much simpler and more cost-effective - especially in applications with major construction or budget constraints.

**CONCERNING FIRE SUPPRESSION, IBC SECTION 904.13 DICTATES REQUIREMENTS FOR DOMESTIC COOKING SYSTEMS FOR GROUP I-1, I-2, AND R-2 OCCUPANCY. FOR THESE OCCUPANCIES, THE HOOD MUST:**

- Be equipped with a pre-engineered automatic fire-extinguishing system listed and labeled in accordance with UL 300A
- Include a means of manual actuation of the fire system
- Interconnect the fuel and electric power supply

Many of these same applications that fall under Group I-1 and I-2 occupancy - health care occupancies and residential board and care occupancies - also fall under the scope of NFPA 101 Life Safety Code. Under these circumstances, a few other **REQUIREMENTS FOR THE IMPLEMENTATION OF DOMESTIC RANGES ARE NECESSARY:**

- The cooktop must have a range hood of at least equal to the width of the cooking surface with clean-out capable grease collectors
- The cooktop is protected with a fire suppression system listed in accordance with UL 300 or is tested and meets all requirements of UL 300A and includes a means of manual actuation
- An interlock is included to turn off all fuel or electric sources to the range when the fire suppression system is activated
- Portable fire extinguishers are located in the kitchen
- A switch, located in the same room, which deactivates the range when the kitchen is not under staff supervision or after 2-hours of usage of the range
- At least two smoke detectors
- The hood system has a minimum airflow of 500 CFM

A growing market in health care, assisted living, and rehabilitation centers increases the need for a code-compliant domestic kitchen exhaust solutions with a trusted and approved UL 300A fire system.

To revisit the aforementioned example, what is the proper method of protection for this small, single range kitchenette located in an accessible area within an assisted living care facility? First, we have identified that the appliance is a residential range, not a commercial appliance. We also know that it is used solely to cook meals for the residents of the facility, and no cooking will be done for profit. Per **IMC section 507**, these two items dictate that a Type I or Type II exhaust hood does not need to be provided. Because the appliance is in a domestic space, the class of occupancy must then be determined; assisted living care facilities can fall within the Group I or Group R occupancy depending on the occupant capacity of the building. If this facility houses more than 16 people, excluding staff, this building is placed within the Group I-2 occupancy. With the kitchen fully defined, what hood should be placed over this range?

### **OPTION 1 - COMMERCIAL KITCHEN HOOD**

Looking solely at requirements within the I-Codes, there is no definite answer as to what style of hood to use, only what features that hood must provide. Revisiting the requirements in **IMC section 505 and 507**, we see that commercial kitchen code requirements are not mutually exclusive to commercial kitchens. A residential kitchen may be properly protected with a commercial kitchen hood system, as the protections offered by a commercial Type I system meet, or exceed, the requirements of **IMC section 505**. Theoretically, a full Type I hood system is a valid solution above this residential range by providing fire suppression and proper fuel interlocks. While this is a potential option, one must consider the size and cost of a commercial hood, especially in comparison to the space it's located in and the appliance underneath it.

These commercial systems are designed for heavy-duty, constant cooking. Just as this space likely isn't using a commercial freezer or dishwasher, the usage of a commercial hood may be excessive.

### **OPTION 2 - TRADITIONAL DOMESTIC HOOD**

A simple residential hood provided by a hardware store would typically fail to meet the required safety features. While these light-duty hoods exhaust effluent from the appliance and may even satisfy the code requirements in lesser occupancies, for these Group I situations, they're often lacking critically important features, like fuel disconnects and listed fire suppression systems.

### **OPTION 3) HOODS SPECIFICALLY DESIGNED FOR DOMESTIC RANGES IN A COMMERCIAL SPACE**

Many manufacturers closely follow code requirements and changes, and the market has seen the introduction of hoods specifically designed for domestic kitchens within commercial spaces. Typically originating from commercial kitchen/fire system manufacturers, full hood systems, as well as stand-alone UL 300A fire suppression systems, are designed around the various code requirements mentioned previously. These systems are recommended because they are specifically designed for the listed purpose of residential ranges. They can provide facility owners with confidence in code compliance and improved aesthetics within the facility, all while being more cost effective than a full commercial hood system.

Code requirements are continuously developing, both in distinguishing domestic kitchens from commercial kitchens and in defining the differences in their requirements. When determining the style of a kitchen, whether residential or commercial, always be aware of the type of appliances, their purpose and the style of cooking. If the cooking is determined to be domestic, identify the occupancy of the space to define further requirements. To ensure proper compliance, discuss these topics regularly with your local AHJ, especially as these codes continue to evolve.



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