FocusOnFACILITIES

Kitchen Hoods—Maintaining & Managing

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Our Diocese has a multitude of kitchen hoods in the buildings operated and maintained and each requires routine preventive maintenance, cleaning, and asset management. But, before we discuss preventive maintenance one should have some basic understanding of the kitchen hood design intent. Without this understanding of kitchen hood and associated makeup air ventilation, these assets can be:

- Fire safety liabilities
- Potential inefficient energy consuming and operating cost liabilities
- Health care liabilities to those working in the kitchen
- Reductions in the useful equipment service life investment

DESIGN INTENT

When a building program specifies a kitchen hood will be required to be furnished and installed, the design intent will require the kitchen design team to consider several tasks. The decision for the need to have a full-service kitchen or space for accommodating pre-prepared food for occupants and visitors will need to be made first.

A full-service kitchen will require one or more hoods depending on the extent of food service provided. There are two types of hoods and other components and systems that make up the hood exhaust system serving the cooking and/or fryer services.

The type of hood (Type I or Type II) will determine the kitchen mechanical system design. A valuable resource when engineering either one of these applications is American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 2019 Handbook, chapter 34, Kitchen Ventilation. There will also be the International Mechanical Code compliance, as well as the National Fire Protection Association (NFPA) 96

compliance to meet. In addition, the building will require licenses and permits, and they should be kept current and certain documents posted for viewing. We've included links to web sites where more detail is explained:

Code Requirements

Permits & Licenses

In addition to the references above, there are standards for construction of hoods and performance criteria. For Type I hood approval, it must comply with Underwriters Laboratories Inc. (UL) Standard #710 Type 1 Commercial Kitchen Ventilation Hoods. For fire safety standard, the Type I hood must comply with UL Standard 300.

Hood exhaust is just one part of the kitchen ventilation system. As noted by ASHRAE, "*kitchen ventilation has at least two purposes: (1) to provide comfortable environment in the kitchen and (2), to ensure the safety*

of personnel working in the kitchen and other building occupants."

The design criteria for a complete ventilation system can be broken out to include:

- Hood exhaust and the recommended performance criteria discussed in ASHRAE chapter 34 of the 2019 Handbook to capture, contain, and remove smoke, heat, and moisture.

- Makeup air to the kitchen to continuously compensate for the hood exhaust air flow in cubic feet per minute (CFM).

- Space pressure which is usually maintained at a "negative" pressure within the kitchen to ensure heat, smoke, odors, etc. do not migrate out of the kitchen into other spaces. A "rule of thumb" is to mechanically introduce, via a makeup supply air system, 80% of the total air being exhausted from the kitchen via kitchen hoods and other exhaust systems, e.g., dishwasher equipment exhaust CFM.

- Adjacent space design to be under a "positive" space pressure to provide makeup air to the adjacent kitchen, e.g., cafeteria supply air CFM. This adjacent space helps contain the kitchen heat, odors, etc. from flowing out into the cafeteria and/or other adjacent space.

PREVENTIVE MAINTENANCE

From a preventive maintenance point-of-view, facility management should have on file, record drawings for the heating, ventilating, and air-conditioning (HVAC), plumbing, electrical, and fire protection. There should also be kitchen equipment record drawings and the testing, adjusting, and balancing (TAB) final report. Annually an independent TAB technician, along with a commissioning authority should be contracted to test and adjust the supply and exhaust air systems, including the air velocity at each hood to confirm the system design intent is being met. Systems in excess of 10% supply air design criteria will result in wasted energy which equates to wasted utility operating cost. Supply air systems 10% less than design criteria will result in excessive space negative pressure which will result in adjacent space ventilation being drawn to the kitchen hoods for needed makeup air, thus affecting these other supply air systems.

It's been recommended that kitchen hoods be cleaned monthly. This can be done in-house by the maintenance person working with the kitchen staff. For more on kitchen hood cleaning, as well as the kitchen equipment, check out this article posted on the AirPro Indoor Air Solutions website. When cleaning the kitchen hood, stoves, and ovens, the facility person should go outside and clean the kitchen exhaust fan and the area around the fan where grease may have settled on the surface.

The sheet metal hood exhaust ductwork must be extended directly to outdoors in the most efficient manner and be sealed grease-tight and insulated on the exterior should a grease fire ignite in the exhaust ductwork. Ductwork is probably welded heavy gauge black iron steel. The insulation must be fire temperature rated to prevent the excessively hot sheet metal surface from generating a second fire outside the exhaust duct itself. Cleaning the ductwork should occur about every three months to avoid extreme grease-laden interior duct distribution. This type of cleaning should be completed by a duct cleaning service contractor experienced in kitchen exhaust cleaning.

Commercial, Type I kitchen hoods should be inspected monthly with the kitchen hood fire-extinguishing system requiring service at least bi-annually per NFPA 96. This work should always be performed by experienced maintenance personnel properly trained to this application. As a rule, this work will always be completed by an outside service contractor.

ENERGY CONSERVATION

Kitchen hood exhaust systems and the associated make up air systems to replace the hot, greasy, and moist exhaust air being discharged safely outdoors consume an excessive amount of energy heating outdoor air, as well as providing a level of air-conditioning energy to provide space comfort for the kitchen staff working around hot equipment. Kitchen food prep begins early if the facility offers breakfast, e.g., school and these systems continue to operate based on the hours of building occupancy.

Some building managers will try to reduce utility costs by shutting down the supply air system thinking they will save the heating, cooling, and electrical energy consumption. When makeup air systems operate, they

provide three functions:

1. Provide outdoor air to replace exhaust air from kitchen hoods, dishwashers, and other general exhaust systems

2. Condition the air prior to the air entering the kitchen space to reduce cold air draft on employees

3. Filter the air being introduced into the kitchen area

When the makeup air system is shut off to save energy, the exhaust system simply draws the air into the space from adjacent rooms and places the building under negative pressure, drawing unconditioned and unfiltered air into the building as its makeup air. This situation is easy to recognize when walking into a building with a kitchen, with the exterior door open, one will experience a "rush of outdoor air through the doorway into the building.

There are a number of energy conservation measures that may have acceptable return-on-investment (ROI) that the asset manager and/or facility manager may consider worth pursuing. Utility cost savings via:

- Energy recovery from exhaust hood air
- Certain kitchen hood applications can operate at reduced air velocity
- Type of hood, e.g., wall mounted hood requires less air quantity than an island hood open on 4-sides
- Custom design hoods requiring less exhaust air and less makeup air
- Demand-controlled kitchen ventilation
- Optimum heating and cooling set points
- Reduced exhaust air and associated duct velocity

RETRO-COMMISSIONING AND RE-COMMISSIONING

When a kitchen exhaust and makeup air system is engineered and installed in a building, it has become common practice these days to hire a third party commissioning agent to verify the engineer's design intent, as well as verify the installing contractor has complied with the contract drawings and specification and has met the design intent and design criteria. This includes the contractor demonstrating the system performance to the commissioning agent and the facility operation and maintenance staff. These tasks come under the title of "3rd party commissioning".

A year or more later when the building manager, asset manager, or the facility manager contracts the services of a commissioning agent to commission these systems again, the task is titled "re-commissioning". If the system was never commissioned and management wants to tune up the kitchen exhaust and makeup air systems, the commissioning agent's role is to "retro-commission" this kitchen exhaust and makeup air installation. For more on commissioning please refer back to our Asset Management columns: January 2020 and July 2020.

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