Schebler
CHIMNEY SYSTEMS

WHITEPAPER

GREASE DUCT SYSTEMS

Important Questions on Fire Safety

WHY ARE UNLISTED, UNTESTED GREASE DUCT SYSTEMS STILL INSTALLED IN MULTI-STORY, HIGH-OCCUPANCY BUILDINGS?

Pre-engineered, UL listed and labeled products have been exclusively used as chimney systems for decades. These products are used to vent exhaust from gas or oil-burning boilers, hot water heaters and engine-powered generators. Manufacturers of hydronic heating equipment require the use of UL listed products to retain the product warranty and to ensure safe operation.

These products provide cost-effective systems that ensure consistent quality, ease of installation and maximum safety due to the extensive testing required to obtain the appropriate UL listing. Site inspection with documentation from the manufacturer can also quickly verify the venting system's proper application and installation.

For grease duct systems, similar factory-designed and built products with a UL 1978 listing and a UL 2221 classification are code-compliant when applied properly. These products are accepted by virtually every local Authority Having Jurisdiction (AHJ).

For additional details on the design for code compliance of prefabricated grease duct systems, please view this video.

WHAT ARE THE RISKS OF FIELD-FABRICATING CARBON STEEL DUCTWORK FOR USE AS A GREASE DUCT SYSTEM?

Type 1 hoods used in commercial cooking produce grease-laden vapors. As a result, these hoods must use an exhaust ductsystem that can withstand a potential fire and guarantee that the grease vapors properly flow through the venting system. Despite improved hoods, filters and variable frequency drive fans, grease vapors still collect in the ductwork. This creates a potential fire hazard.

Grease is an excellent accelerant to start and fuel a fire. A small spark can initiate a fire inside the duct, with the grease facilitating its growth, generating extremely high temperatures. Anyone who has cooked on an outdoor grill knows how well grease from animal fat or frying oil fuels flames.

The high temperature generated by a grease fire forces extensive expansion of the exhaust duct system. This expansion places significant stress on the entire system causing any weak points in the system to leak or, even worse, cause a complete system failure. The grease accumulated in the duct turns back into a liquid, which can leak out through tiny openings. This will likely cause the fire to accelerate.

WHAT ARE THE VULNERABILITIES OF FIELD-FABRICATED CARBON STEEL DUCTWORK?

Potential points of system vulnerability include the duct profile, joints holding the sections together, welded seams, supports, and hangers.

Field-fabricated grease ducts are typically constructed of 16-gauge carbon steel, often in a rectangular profile. They are prefabricated in short sections and welded together at the construction site. A rectangular-shaped duct has straight sides with sharp corners, and code does not necessarily limit the grease duct's aspect ratio or its overall size. As a result, the duct may have considerably large, flat surfaces that can distort from the heat during a grease duct fire. This distortion may force the duct to collapse and/or drastically stress the supports holding the ductwork in place.

After the sections are welded together at the construction site, whether the sections are rectangular or round, they must be inspected for defects or pinholes to ensure the weldment is leak-free. This can be determined by a light test, a method that the IMC and NFPA accept. In this process, a light is placed inside the duct while a visual examination outside can determine if light escapes the joint, indicating a hole or gap is present. This simple test is often the only one done to verify weld quality that could be subject to significant stress during a grease duct fire. Other, more stringent testing processes such as dye penetration, x-ray or sample destructive testing cannot feasibly be conducted at a construction site. Field-welded ducts can also be troublesome to test because the weldments may be virtually impossible to inspect based on where they are located and where the duct is mounted in a building.

The support structure of the duct system is also critical for fire safety. If a fire starts inside the duct, the forces generated from thermal expansion must be properly handled by the duct supports and hangers. Since no notable codes outline the proper installation of grease duct supports, the system must be designed by a qualified engineer. In most cases, field-fabricated grease duct systems are supported with Unistrut and all-thread rods wherever they are easiest to hang. This is not typically an issue for many venting systems where the temperature of the exhaust is operating at lower temperatures compared to a duct with an active fire containing molten grease as the accelerant. During a fire, however, this condition could be a catastrophic vulnerability.

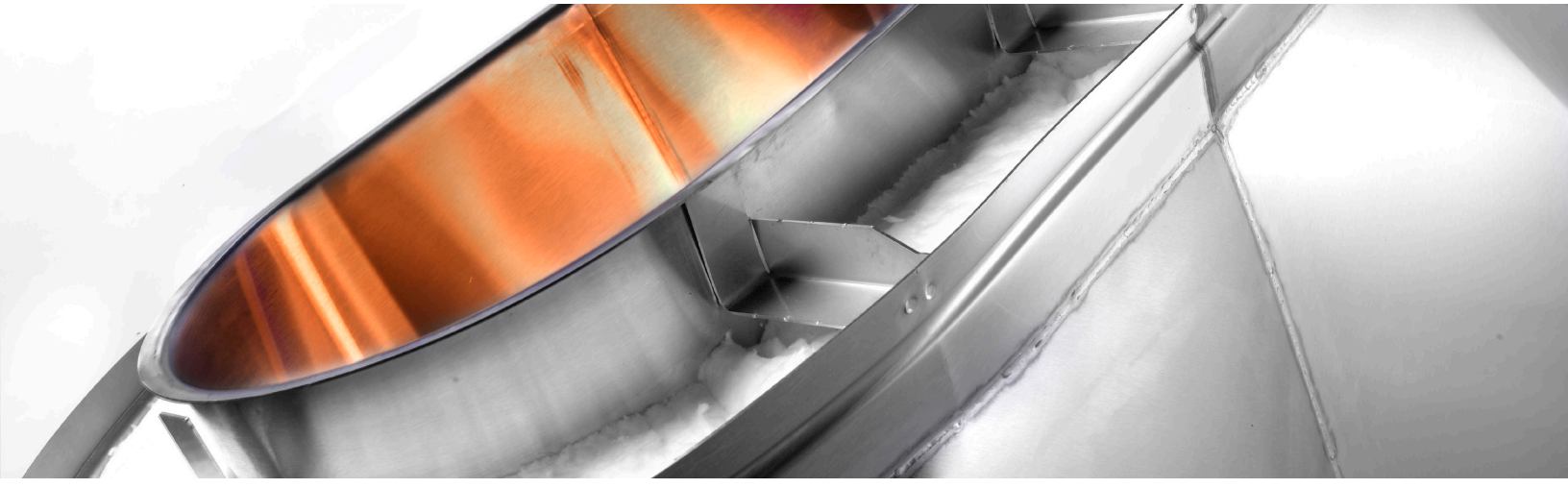
Insulation of field-fabricated duct systems is conducted after the carbon steel ductwork

is completely installed. Manufacturers of this insulation have gone to great lengths to obtain certifications and listings to allow these wraps to be considered code compliant and fire-safe. While the integrity of the insulation to provide a level of fire safety is not in question, the insulation's installation may not always maintain compliance.

Insulation manufacturers provide published detailed installation methods and processes. They have conducted lab tests to confirm that, if applied properly, the insulation will perform as specified. Since the duct is already assembled and installed, however, access to critical areas (such as ceilings and unrated shafts) makes it challenging, if not impossible, to apply the insulation properly. Inadequate application of the insulation is not an issue during normal cooking operations because the air temperature inside the duct is relatively low (most likely under 400° Fahrenheit). But during a grease duct fire, the extremely high temperatures expose poorly or improperly insulated areas, creating hot spots in the duct and increasing the clearance to combustibles that could cause nearby material to catch fire.

UL tested and listed products have been subjected to testing to simulate actual grease duct fires. Leakage tests are also performed by simulating a grease fire inside the duct to ensure the construction and design of the product can maintain integrity at high temperatures. This testing is conducted to ensure the ducts' structural integrity and guarantee that the supports and hangers can withstand any thermal expansion. The testing makes sure the duct system will stay in place and intact during a fire.

Multistory buildings, per code, require grease ducts to have a fire rating covered by UL 2221 classification. The rating guarantees that the grease duct system will not allow a fire to spread from the kitchen area to the rest of the occupied building. To be considered fire-rated, the structural integrity of the duct and proper insulation must be verified to ensure an adequate level of safety for the building occupants. As noted earlier, with no more than simple guidelines from IMC/NFPA and the installation instructions from the insulation manufacturer, the AHJ must inspect and determine that a field-constructed duct system is truly fire-rated. This type of inspection is not required on systems comprised of prefabricated UL listed products.



WHAT ARE THE COST IMPLICATIONS OF UTILIZING A SAFE UL LISTED AND LABELED PRODUCT VERSUS A FIELD-FABRICATED DUCT?

The answer to that question depends on the contractor involved and the specific installation.

Two types of contractors are usually involved in a field-fabricated grease duct system. The duct is typically fabricated and installed by a sheet metal contractor. Its insulation is then provided and installed by an insulating contractor. This is often a significant portion of the total system cost.

With a field-fabricated grease duct system, the insulation cost is typically combined with the total insulation cost for the entire project. This distorts the actual cost of the duct system, especially when asked to back this number out after the original quote.

To fairly evaluate the comparison, a system must be specified and quoted as UL listed and labeled duct. The specification needs to be clear on product design, UL listings, and classification for code compliance. Code compliance can be based on the building's number of floors, access doors for cleaning locations/spacing and all components required to complete the system. This will ensure the quote from the insulator does not include the grease duct on bid day, allowing a second number to be generated later for insulation, and providing a more accurate cost comparison.

Most sheet metal contractors prefer to use UL listed grease duct products instead of fabricating the ductwork on-site. The UL listed product, when specified accurately, allows them to control material costs. It also allows them to reduce their installation labor expense and eliminate the field-welding fire watch costs and inspection time required on most job sites. As a result, the total system cost of UL listed products is signficantly less than that for field fabricated systems.

THE CERTAINTY OF FACTORY-MADE

Field-fabricated duct systems are accepted by code but are not UL listed. While insulation has been tested and listed with some construction criteria per ASTME standards, the final product that is actually installed is not listed, so there is no way to ensure the duct system will be able to contain or stay securely mounted if a grease duct fire occurs. Prefabricated grease duct systems, however, not only enhance the safety and integrity of the installation, they provide a cost-effective alternative that delivers a superior return on investment.

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