

Indoor Environment CONNECTIONS

The Newspaper for the IAQ Industry

www.ieconnections.com

Excerpted from Volume 9, Issue 6 · April 2008

The Deadly Consequences of Poor Kitchen Exhaust Maintenance

By Jonathan Miller

An internal investigation into the deaths of two Boston firefighters during a response to a restaurant's kitchen fire on Aug. 29, 2007 has divided the public, driven wedges between the firefighters' union, the fire commissioner and city government, and led to accusations of cover-up and finger-pointing. All sides involved, though, agree that the blaze reached its deadly apogee because of a faulty kitchen-ventilation system.

The union's board of inquiry released on Feb. 22 its final report, in which it stated "the substandard construction, installation and maintenance of the kitchen hood, duct and exhaust system, along with the degradation of the ductwork were the underlying factors involved in this fatal fire incident."

But those factors – poor construction, improper maintenance and degraded materials – are not unique to Boston's tragedy. Two days before the union's report was released, a Hardee's restaurant in Hampton, Va. was evacuated because, as reported in the *Virginian-Pilot*, "firefighters ... found that the fire was confined to the ventilation system lead to the roof from the kitchen." Fire Marshal Anne-Marie Loughran said, "There was a lot of grease up in there that caught fire." On the same day, a Wal-Mart in Muhlenberg Township, Pa. was evacuated, according to WFMZ-TV News, "because of a fire in the ventilation system."

Fires of this sort are "incredibly problematic," according to Tim Shaw, executive director of the International Kitchen Exhaust Cleaning Association. The fire in Boston, he noted, was directly caused by "improper cleaning ...

compounded by a separation in the ductwork that had never been properly repaired or noted on the service report."

"The general public," Shaw said, "are at great risk in many cases and local jurisdictions are burdened with an overwhelming number of [facilities] to inspect and too little staff and funding to do so. ... No one who eats a meal in a restaurant is aware that the restaurant could catch fire at any time."

"To many restaurateurs and facility managers, getting the exhaust cleaned is at the bottom of their priority list and budget. They often contract the lowest bidder ... to clean a substantial system. The contractor cleans what the manager can see and cashes the check, leaving the grease building up in the ductwork and into the [system's] fan assembly. ... Grease travels the length of the system, reacting with all the particulates in the exhaust, and becomes a match head sitting on a striker."

Boston

Such was the case in Boston on Aug. 29, when firefighters Warren J. Payne and Paul J. Cahill died "in an inferno after a kitchen grease fire exploded into a 2,000-degree fireball" inside Tai Ho Mandarin and Cantonese Restaurant, as reported by the *Boston Globe*.

By the *Globe's* account, Cahill was killed when a "massive plume of carbon monoxide enveloped him as he fought the fire inside the restaurant's kitchen." Payne was "killed by a massive fireball created when pent-up flammable gases found an ignition source and detonated, engulfing him in flames that incinerated him in second." The fire, according to the union's report, "had ignited and burned

for an extended period of time prior to fire companies being dispatched and arriving on scene. This extended burn time allowed the fire to 'feed' and increase in size within the restaurant's exhaust hood and ducts and ceiling areas directly in and over the cooking area ... Accumulations of grease along with the ceiling support framing and roof structure were ignited."

The union's report noted "considerable grease buildup and a separation in the ductwork that was made obvious by the observance of rust and severe degradation of the duct-to-hood connection in the plenum chamber. This separation in the duct was approximately 12 [inches] long and 1 [inch] wide." After the grease caught fire and smoldered, a sudden release of gas from a broken feed and created space within the ceiling, caused by a sudden drop of the HVAC unit thanks to weakened "structural members," led to the explosion.

"This incident is a cause-given fire, a failure to clean, with the severe grease buildup and the separation in the ductwork contributing to the rapid spread of the fire."

Poor venting of grease and the failure to adequately clean it were ongoing problems recognized by restaurant staff, at least tangentially. "The grease buildup in the ventilation system above the ceiling of the restaurant kitchen was so extensive," reported the *Globe*, "that workers had covered a stove with foil to catch falling grease and installed a pan to collect dripping grease in another part of the kitchen."

As IKECA president Bernard Besal said in a letter to *IE Connections*, "The exhaust duct that was concealed in the sub-ceiling was fabricated of non-welded,

light gauge sheet metal” and did not meet modern model building codes, an occurrence which “is greatest in older structures in large cities ... Unfortunately, the older structures are where combustible building material is most tender.”

“When kitchen exhaust ductwork does not meet these requirements,” Besal wrote, “several challenges exist. Non-welded exhaust ductwork likely will not be cleanable by any process involving steam cleaning or pressure washing due to leakage; manual scraping will be the only alternative to wash processes. In a fire condition, fuel load in horizontal non-welded exhaust ducts liquefies, leaks and ignites the ceiling areas.”

A Broader Problem

“Most of the kitchen hoods in the restaurants inspected did not meet the recommended flow rates specified,” reads the conclusion of the article “Kitchen Hood Performance in Food Service Operations” by Charles B. Keil, Hailu Kassa and Kenny Fent, which appeared in the Dec., 2004 issue of the Journal for Environmental Health. “Inadequate hood flow can create food safety and fire hazards by allowing grease fumes to spread throughout the facility and deposit on surfaces. In addition, these fumes pose a health risk to workers exposed at elevated concentrations.”

In response to the article’s opening questions, “Are hoods meeting quantitative operating guidelines [and do] qualitative inspections identify hoods that are not meeting guidelines,” the answers were “no.”

The article cited the environmental quality risks inherent to poor kitchen-exhaust function, but noted in particular, by citing a 1997 report by the National Fire Protection Association, that “properly operating kitchen hoods can capture fumes and prevent widespread grease contamination, reducing fire risks. Grease accumulation in hood systems can still present localized risk of fire, and proper maintenance and cleaning of these systems is need to keep fire risks low. If a fire does occur, a properly operating ventilation system can slow the spread of flames outside of the hood.”

But after assessing data on various hood types and their in-restaurant operations compared to product

guidelines based on standards set by the American Conference of Industrial Hygienists and the American Society of Heating, Ventilating and Air-Conditioning Engineers, the research team’s conclusions did not express optimism.

“Restaurant operators need to be more diligent about the operation of their kitchen ventilation units. ... Restaurants should be sure that contractors installing or working on ventilation systems are familiar with the published guidelines. ... [Units] should be periodically re-evaluated to detect any change in performance.”

Finding Solutions

Besal wrote, “The first line of defense in prevention of deadly kitchen-exhaust fires is hiring a ‘properly trained, qualified and certified cleaning contractor’ as required by NFPA-96 [the National Fire Protection Association’s Standard for Ventilation Control and Fire Protection].”

Secondly, “qualitative routine compliance inspections that are normally provided by a local authority,” can ensure proper exhaust operation.

But prevention goes beyond cleaning and inspection. “From the standpoint of serviceability, maintenance for kitchen exhaust systems begins with proper design and installation. The onus on the design architect and the mechanical engineer should be to eliminate any possible excuse for exhaust cleaning contractors to not clean any portions of exhaust systems,” Besal noted.

Governments, Shaw stated, tend to react to tragedies by making law “rather than taking obvious and often simple steps to prevent the incident altogether.” Those steps, according to Shaw, would begin with standardizing fire codes across jurisdictional boundaries. “In Boston, the local fire codes do not follow the same standards as those in the state,” which is “common everywhere in the U.S.” And while in some states, “local jurisdictions are beginning to require that exhaust cleaners be permitted in some fashion,” the lack of set standards results in “inexperienced and uncertified fly-by-night cleaners who have saturated the market and provide a low cost and high-

risk alternative to a proper exhaust cleaning.”

In addition to urging code unification, Shaw suggested adopting standards based on NFPA-96. “In Canada, there is a national standard based on NFPA-96.” However, he noted that “because of bureaucracy, they base their codes on the 2001 edition, even though there have been two revisions released since.”

“NFPA-96 requires areas of exhaust systems that are inaccessible or not cleaned be provided to the owner of the system on a written report,” Besal noted. “I do not believe this ever happened in [the Boston] case.”

Because “even legitimate cleaners [frequently] cannot properly clean and service the entire system” due to design, Shaw noted that a regular, proper maintenance regimen is key to the integrity of an exhaust system. He also suggested hiring exhaust cleaners who adhere to standards like NFPA-96 “as well as similar standards from the International Fire and International Mechanical Codes,” as do IKECA members.

Besal agreed. “Building codes must be taken as a united whole inclusive of construction and maintenance,” he noted. “Proper exhaust system cleaning must be a continuous program to operate with the level of safety intended by model codes.”

“The company that cleaned the exhaust system in Boston did not follow any of those codes,” Shaw said, noting that the company in question is not an IKECA member.

All sources agreed that proper kitchen-exhaust cleaning and maintenance are key to preventing tragedies. As Besal put it, “If the fuel is properly removed [from the ductwork] on a regular basis, there is no fire event.”

The Boston firefighters’ union made recommendations of its own in the board of inquiry’s report. Among its 60 points for preventing further incidents such as the one that took the lives of Cahill and Payne, the report calls for “legislation required to govern the installation/maintenance/cleaning/inspection of commercial cooking ducts/hoods/vent systems and affiliated equipment by licensed and insured contractors,” including the adoption of NFPA-96. ■