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## The Dishwasher Exploded

Ron Cook



That's the call a fire department received last winter from a base-housing inspector. The inspector had been doing normal bimonthly checks of vacant units when this happened.

The inspector's usual procedure was to run the cold water in the kitchen sink, turn on the dishwasher, go upstairs to flush the commode, and run the water in the bathroom. About three minutes after she started the dishwasher, it exploded. The blast propelled the dishwasher (which was installed under the kitchen counter) across the kitchen. The cabinets, plumbing and walls were damaged.

The concussion splintered the face of the rear door to the housing unit and blew it open, destroying the lock. Pieces of the dishwasher and cabinets were scattered over 20 feet. The access panel to the attic on the second floor was dislodged, and the front door was blown open and damaged.

At first, investigators thought water in the "s" trap had evaporated, allowing sewer gas to seep into the dishwasher and explode. The next day, Navy Occupational Safety and Health (NAVOSH) technicians tested all kitchen-sink drains in vacant units for signs of sewer gas. The results were negative. During the course of the investigation, a maintenance worker in the housing department pointed out a paragraph in the dishwasher-owner's manual to the NAVOSH specialist. It read, "...under certain conditions, hydrogen gas may be produced in a hotwater system that has not been used for two weeks or more. If the hot-water system has not been used for such a period, before using the dishwasher, turn on all hot-water faucets and let the water flow."

The safety specialist returned to three of the vacant housing units and ran the hot water to test for emission of hydrogen gas. The meter readings went off scale in these units. Then he ran hot water in three occupied units and got zero readings. When he ran hot water in an upstairs bathroom in the unit where the dishwasher exploded, he got an extremely high reading. After NAVOSH personnel made several calls to the Frigidaire Company about the incident, a person from their legal department returned his call and told him that Frigidaire was sending two engineers to investigate the exploding dishwasher.

The engineers and NAVOSH personnel tested hot water in two vacant units. They placed clear garbage bags over the faucets to sample for gas contents. The first test resulted in the bag filling with

about one to two quarts of water and a cubic foot of gas. They suspected the bulk of the gas was a combination of hydrogen and oxygen, which was generated by electrolysis in the hot-water heating systems. One of the engineers explained that there is no way to stop hydrogen gas from forming in hot-water heaters because of the metals used in constructing the tanks. Hydrogen gas isn't soluble in water, so it remains in the water-heater plumbing system as a gas under pressure. In most homes, the gas will migrate to the upper levels of the house, where it harmlessly is expelled from water faucets there. However, occasionally, it can end up trapped in the plumbing lines. In that case, when a lower level faucet (or dishwasher) is turned on, the gas is pushed through the outlet rather than finding its way to the upper level.

Hydrogen gas has one of the broadest flammable ranges of any gas. Just about any mixture will be enough to result in an explosion. The engineer theorized that the gas was forced through the dishwasher, and the timer or starter relay had enough heat to ignite the gas. However, the dishwasher was destroyed, which made it impossible to determine the exact source of ignition. The engineer said this was the first time he had heard of a dishwasher exploding, but he had heard stories of small fires at faucets because people had cigarettes in their hands when they opened a hot-water faucet that had not been opened for some time. Later, in a telephone conversation, he told the NAVOSH person that he had talked to a few old-timers in the water-heating industry, and one of them had reviewed a mishap about a washing machine blowing up in the '60s.

### What This Means to You

When you move into a house or apartment that has been vacant, hydrogen gas may have built up in hot water lines, which could cause an explosion. The same is true when you return home from a vacation or open up a vacation home that has been shut.

### ORM Lesson

Appliance manufacturers can do nothing to prevent this type of thing from happening again, but you, as a resident or housing inspector, can do a short ORM assessment to prevent such a recurrence. You need to know that hydrogen gas can accumulate in hot-water systems that have not been operated for a period of time. You figure the risk of something going wrong when you turn on a dishwasher to either check it or operate. If you have been using it daily, there is hardly any risk. When you go to start the dishwasher, ask yourself how long the unit has been vacant. If it's more than a couple of weeks, you need to think about getting rid of the gas before you turn on the dishwasher. If you suspect hydrogen gas may have built up in the hot-water system, flush it by turning on all hot-water faucets in the building and letting them run for several minutes. **And don't smoke while you're doing it.** Make it a habit of doing this every time you inspect a building. If you live in the home and are away for a vacation, do this every time you return home.

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