

**The Golden Gate Chapter
American Society of Home Inspectors, Inc.**

Survey Reveals Inadequate Water Heater Seismic Bracing

Is your home at risk for catastrophic damage in the next strong quake? If your home is like over 50% of Bay Area homes, it contains a commonly overlooked hazard that could destroy it or lead to major damage. This hazard is your water heater. An inadequately secured water heater can tip over in a strong earthquake, breaking water pipes, gas pipes, or electrical connections and causing a fire or flooding. Over 20 years ago, the California Health and Safety Code declared, "There exists a serious threat of fire, explosion, or electrocution to the people of California from water heaters that overturn or experience damage to the plumbing or electrical wiring during an earthquake" and "that a large number of structures will suffer damage from water heaters due to the lack of adequate strapping or bracing."

The Code went on to mandate that by the year 2000, all water heaters in California must be braced, anchored, or strapped to avoid falling during an earthquake. A recent survey of water heaters throughout the Bay Area was conducted by members of the Golden Gate Chapter of the American Society of Home Inspectors® (Golden Gate ASHI®). The survey found that more than half of water heaters observed during the survey period (52%) were *not adequately strapped*. The survey was informal, not scientific, but findings strongly suggest that many Bay Area homeowners have not taken the simple and inexpensive steps needed to protect their homes and neighborhoods from needless disaster.

Golden Gate ASHI® encourages all Bay Area residents – both homeowners and tenants -- to inspect their water heaters. The survey identified a variety of bracing deficiencies, including loose straps, too few straps, or no straps at all; inappropriate strapping material; or inadequate attachment to the wall. The most common strapping defect, found in 38% of installations, was the presence of too much space between the water heater tank and the adjacent walls. This 'lack of blocking' allows a water heater to rock backward and forward during an earthquake, potentially resulting in failure of the straps and allowing the tank to fall. A fallen tank is likely to cause water damage, and is also a fire hazard in the event that the gas connection is damaged or broken.

Properly strapping a water heater is simple and inexpensive. Properly strapping a water heater is the best insurance against the potentially serious water or fire damage that will result if the water heater topples in an earthquake. There should be very little space between the water heater and the wall, or the straps should wrap completely around the tank. If there is any space between the tank and the wall, steel or lumber braces should be installed to prevent the tank from tipping back and forth in a quake, which loosens the straps.

A minimum of two straps should secure the tank. One strap should be located in the top third of the tank with the other strap located within the bottom third of the tank and a minimum of four inches above the water heater control valve. For greater safety, tanks of 50 gallons or more should have extra straps. Heavy-gauge metal strapping should be secured to the wall studs using 1/4" x 3" or longer lag screws with oversized washers. Drywall and deck screws should never be used as they are brittle and can fail under stress. If the straps are secured into concrete, 1/4" expansion bolts should be used in place of lag screws.

To test existing straps and braces, grab the tank near the top and give it a gentle shove. If the tank moves at all, it is not properly braced. To see if the straps are adequately secured, grasp the strap near the connection to the wall and pull strongly. Bolts will often pull free, indicating they are secured only to drywall and not into the wall studs.

What's the fix? If a water heater is not adequately strapped, the simple solution is to purchase and install a strapping or bracing kit from a local home improvement store. Purchase only those kits certified by the State Architect, and follow the installation instructions precisely. Kits may not contain fasteners suitable for your situation, but structural screws and anchors are also available in most stores. In most cases, only a basic set of tools is needed: a hammer, drill, and wrench, pliers, or a driver for the fasteners. If the water heater has an insulating blanket, remove it before starting. If the blanket is not in good condition, this is a good time to upgrade it. Golden Gate ASHI also recommends replacing rigid pipe connections with appropriate flexible gas and water connectors to prevent breakage during seismic activity. For those not equipped to take on the DIY project, a licensed plumber or other licensed contractor can strap the water heater according to requirements of the local building jurisdiction.

Water heaters provide a source of potable water in emergencies. A properly strapped water heater is likely to remain standing in the event of a strong earthquake, and is a valuable source for potable water. In the event that public water supplies are disrupted, there will be no water pressure to push water from the tank to the faucets, but the water in the tank can be accessed using the drain valve at the bottom of the water heater tank. The drain valve is intended to allow a homeowner to annually flush sediment from the tank and to drain the tank when necessary. Opening this valve allows water to drain from the tank. In some cases, it may also be necessary to open a faucet to release pressure in the plumbing system before water flows. The drain valve often fails to close completely once opened, and every drop of water will be precious during an emergency. Storing a cap for the drain valve at the water heater to stop dripping in the event the valve does not properly reset is recommended.

Chimneys and vents can also pose a safety hazard. The recent survey conducted by members of Golden Gate ASHI also found that the vent (the pipe at the top of the water heater that carries flue gases to the exterior) was improperly installed or not serviceable on almost 37% of water heaters observed. A malfunctioning flue is a potential health hazard as it can allow carbon monoxide to enter the house, and carbon monoxide exposure can be deadly. California homeowners will be required to install carbon monoxide detectors starting in July 2011 under a bill recently passed by the legislature that is intended to prevent deaths and injuries caused by poisoning from the odorless, colorless gas. The California Air Resources Board says an average of 30 to 40 "avoidable deaths" occur in California each year from carbon monoxide poisoning. The Carbon Monoxide Poisoning Prevention Act of 2010 (*Cal. Health & Safety Code §13260 et seq.*), signed into law last year, requires carbon monoxide detectors to be installed in every 'dwelling unit intended for human occupancy.' Golden Gate ASHI strongly encourages the installation of carbon monoxide detectors in every residence for safety.

Contact JMC Building Inspection for further information, or a review of your existing water heater.