

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



April 25, 2017

MATERIALS LABORATORY FACTUAL REPORT

Report No. 16-100

A. ACCIDENT INFORMATION

Place : Silver Spring, Maryland
Date : August 10, 2016
Vehicle : Washington Gas service pipe and gas regulators
NTSB No. : DCA16FP003
Investigator : Ravindra Chhatre O-RPH

B. COMPONENTS EXAMINED

Hot water heater from the accident location

C. DETAILS OF THE EXAMINATION

The hot water heater from the accident location was retained by on-scene investigators. It was examined by a fire investigator from the NTSB Materials Laboratory to assess the condition of the heater. The hot water heater was examined after it was removed from the accident scene. The heater is shown in Figure 1.

The hot water heater was a State commercial 81-gallon, natural gas water heater (Model No. Model# SBD81-199-NE). The heater installed at the accident location was manufactured in June 2012 and was installed in the basement of the accident location on July 2, 2012.

According to State Water Heaters operators manual, this model heater was equipped with intermittent electronic-ignition through the use of a solid-state ignition-control using a Honeywell ignition control module¹. The solid state ignition control ignites the pilot burner gas by creating a spark at the pilot assembly. Pilot gas is ignited and burns during each running (heating) cycle, leading to the ignition of the main burner flame. Pilot gas ignition is verified by the pilot sensor. In order for the pilot sensor to allow pilot ignition, the pilot flame must be stable for 1 to 3 seconds before the main burner will ignite and start heating. There is no continuously lit, standing pilot. The main burner and pilot gases are cut off during the OFF cycle which begins when the tank water temperature reaches the preset temperature set at the thermostat. Main burner ignition will not occur if the pilot sensor does not first sense stable pilot ignition. The pilot sensor will not allow pilot ignition for various reasons including changes in inlet gas pressure, negative air pressure into the ignition control module, or the presence of a corrosive material/environment. The presence of flammable vapors is not detected by the pilot sensor. Therefore, the pilot and main burner can initiate operation

¹ State Water Heaters is the manufacturer for the hot water unit. Honeywell is the manufacturer for the ignition control module installed within the hot water heater.

(ignite) and continue to operate in the presence of flammable vapors, in the installation space of the hot water heater.

The unit was found intact in the building debris. There is a U-shaped pattern of thermal damage covering nearly half of the outer surface of the heater. The thermal damage was located above the thermostat/controller unit of the heater unit as shown in Figure 2. The data and installation/operation instruction labels on the outside of the unit were illegible due to thermal damage. Some gouges and scuff marks were present in various locations on the exterior surface. The side of the unit opposite the location of the thermostat/controller had a large area that appeared undamaged by heat. There is no evidence of bulging or significant deformation on the outer cylinder of the heater unit. The gas controller located at the bottom of the heater unit was thermally damaged as shown in Figure 3. Due to the amount of damage, the position of the selector knob could not be determined.

The gas supply inlet for the hot water heater is provided by sections of 1/2 inch pipe. A manual shut-off valve was installed as shown in Figure 4. A pressure regulator is recommended by the water heater manufacturer and should be installed 3-8 feet from the heater unit. The maximum natural gas pressure allowed for operation of the heater unit is 14 inches water column (W.C).

A length of gas piping, shown in Figure 5, was still attached to the heater unit. The piping included the gas shut off valve. The valve handle was thermally damaged as shown in Figure 6. The valve position internal to the handle was not examined. All of the recovered piping was heavily oxidized. The oxidation is consistent with exposure to heat. All of piping connections were examined and found to be attached and threaded completely. The piping was undamaged with the exception of a full diameter, complete thickness fracture at the end of the attached section where the piping connects to the inlet on the thermostat controller of the heater unit. If a natural gas pressure regulator was used in the installation of the hot water heater, it was not recovered after the accident.

Nancy B. McAtee
Fire and Explosion Specialist
RE-30



Figure 1. Overall photograph of hot water heater on-scene.



Figure 2. Overall view of thermal damage to exterior of water heater.

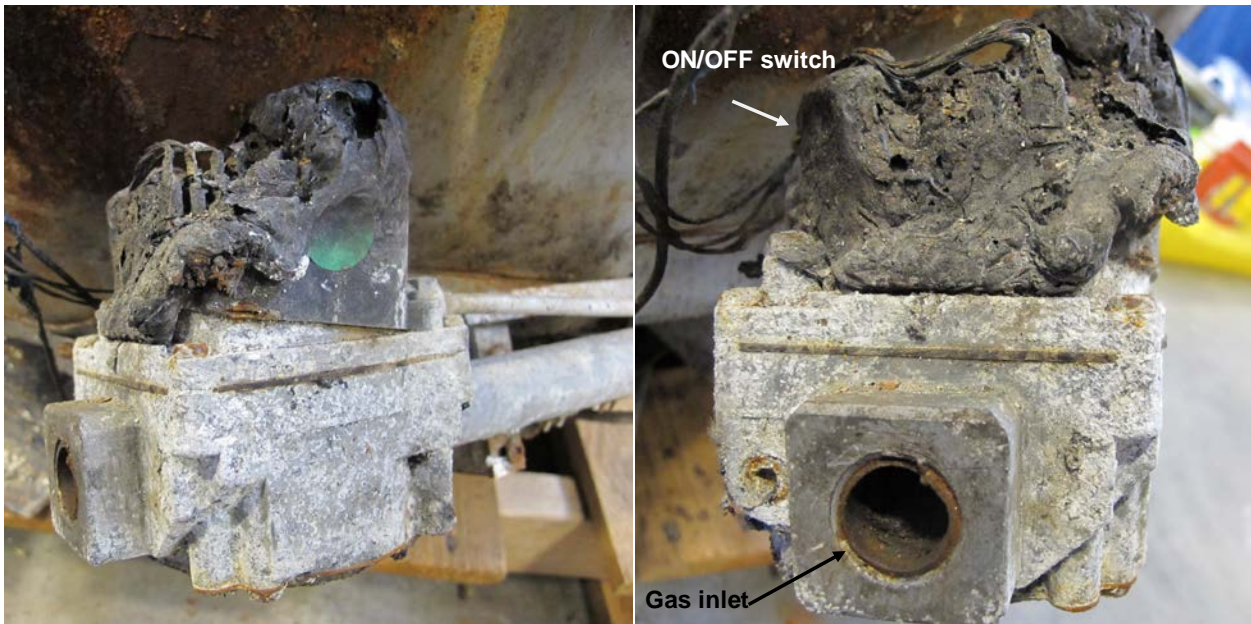


Figure 3. Gas controller for water heater.

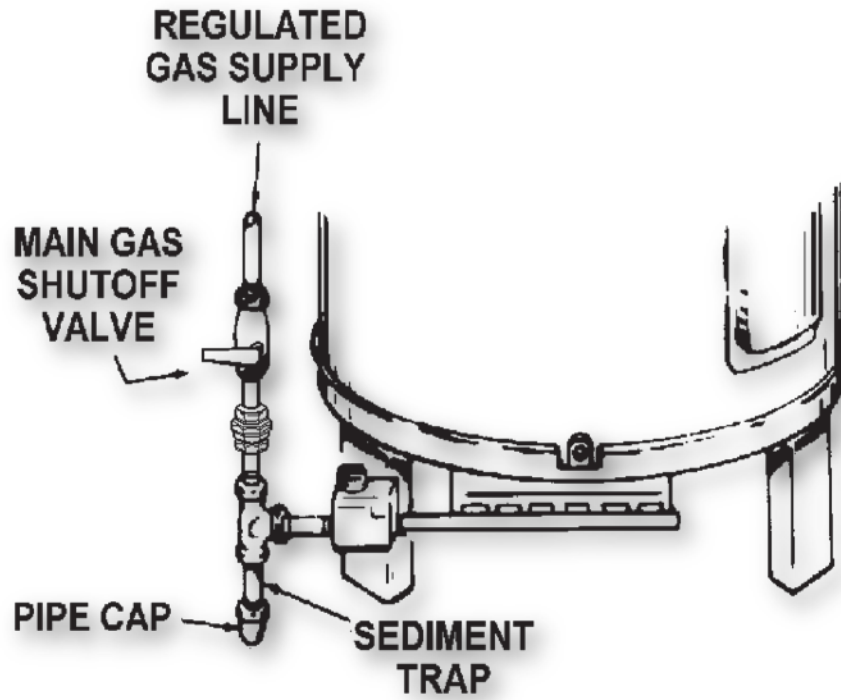


Figure 4. Gas piping diagram for water heater.

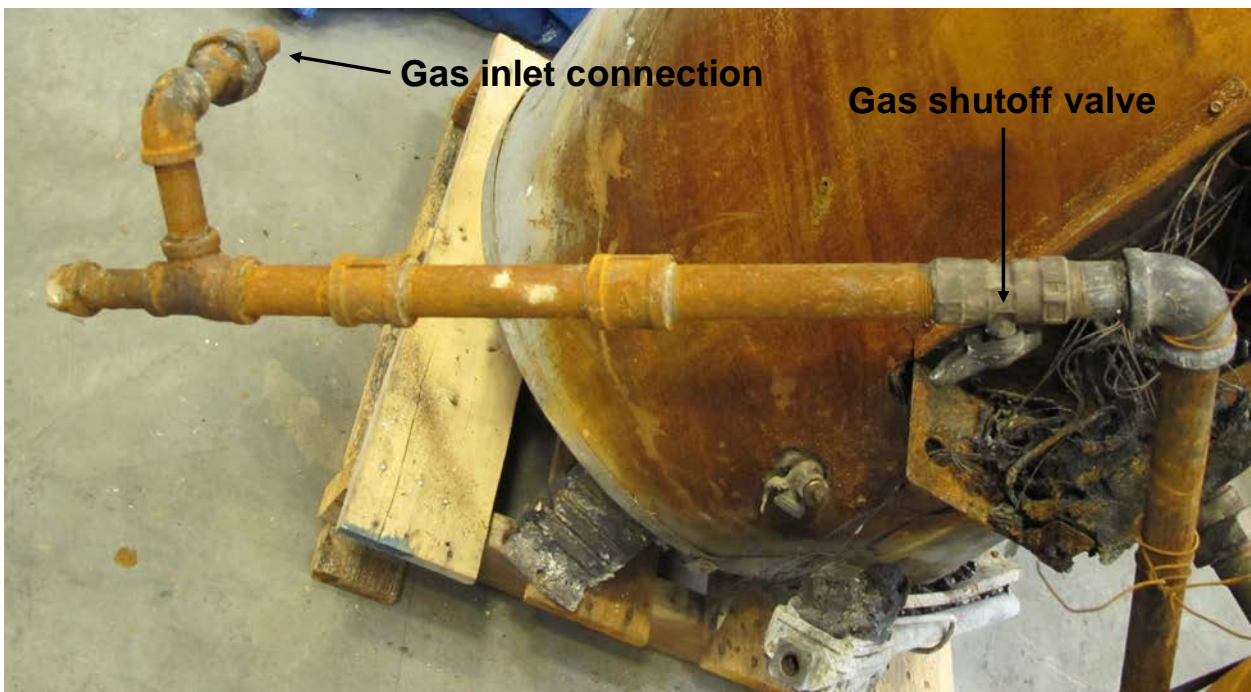


Figure 5. Overall photograph of recovered gas piping for water heater.



Figure 6. Close-up photograph of manual gas shutoff valve.