



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: April 29, 1992

In reply refer to: P-92-1 through -5

Mr. E. H. Kamphaus
President
Oklahoma Natural Gas Company
100 West 5th Street
Tulsa, Oklahoma 74103

At 7:02 p.m. central standard time on July 5, 1991, at Tulsa, Oklahoma, high-pressure gas entered a low-pressure, single-family customer-service line connected to a gas meter and regulator in a buried concrete box near the customer's front property line. Gas at 40-psig pressure was supplied to the regulator and meter at 3805 East 98th Street from a 2-inch-diameter plastic gas main and a 1 1/4-inch-diameter plastic service line. The high-pressure gas entered the gas fuel lines and appliances resulting in the escape of gas into the house. There were no injuries, but the gas escaping from the furnaces and the water heater ignited and fueled fires that destroyed the multilevel house. Property damage was estimated by the Tulsa Fire Department at \$540,000.

Before the accident, a teenage girl was alone watching television in the family room on the main level of the house when she heard a loud noise. She believed that someone was breaking in when the security alarm system sounded because a door slammed shut and a smoke detector went off. She was unable to turn the alarm off, so she opened the utility room door to investigate and saw the flames reflecting on the opposite wall. She closed the door and reported the fire by telephoning 911. As she left the house, she saw fire and smoke throughout, including on the cedar shake roof.

After arriving at the scene, the Tulsa Fire Department closed a 2-inch aboveground gas valve on the customer-owned line where it entered the residence and then began extinguishing the fire. At 8:25 p.m., the fire department notified the Oklahoma Natural Gas Company (ONGC) dispatcher about the incident.

At 8:37 p.m., a customer service technician arrived, and the fire marshal told him that the 2-inch gas valve at the house was shut off. The service technician went to close the meter valve in the buried concrete box, but he was unable to find it because it was covered with several inches of soil and sod. Using a steel bar, the service technician probed the soil until the bar struck the steel-plate meter box cover. After clearing and opening the cover, the technician saw that it was filled with soil, covering both the gas regulator and meter. He removed enough soil to expose a 1-inch

valve between the regulator and meter and then closed that valve to shut off the gas flow from the Fisher type 733A gas service regulator to the American Ironcase type 25B gas meter assembly.

The technician remained on standby until the fire marshal gave him permission to enter the residence to test the gas fuel lines in the house for leaks. He closed all of the gas fuel line valves at the gas appliances and capped a furnace fuel line that had been severed during the fire.

The next morning, the ONGC crew installed a 100-psig gauge on the fuel piping at an outside Rheem gas furnace. The 1-inch valve downstream of the regulator and inside the concrete meter box was opened to supply natural gas for the test. The gauge registered 40-psig pressure, which was the same as the pressure in the gas main. The ONGC customer service foreman concluded from this test that the regulator was faulty and reported this to the fire marshal.

The foreman then told the senior meter and regulator technician to clear the soil from the regulator and meter and to check the gas pressure at the regulator inlet and outlet. Both the inlet and outlet pressures were 40 psig. Next, when the underground meter box was cleared of soil, the regulator vent cap was found to be missing from the regulator vent line. Soil was also removed from the inside of the 1/4-inch regulator vent line, and the technician read the regulator inlet and outlet pressures once more. The inlet pressure was 40 psig, and the outlet pressure was 1/4 psig. The regulator and meter were removed and taken to the ONGC Service Center for further examination.

The Safety Board examined the gas meter and examined and pressure tested the service regulator. The glass cover over the American Ironcase type 25B meter dial was broken, but no internal damage to the meter was found. Examination of the Fisher 733A gas service regulator revealed that the built-in safety relief valve for the regulator was adjusted to the closed position, the wax seal was missing from the relief valve spring adjustment hole at the bottom of the safety relief valve body, the aluminum die-cast safety relief valve cover was corroded and heavily pitted, and the metal upper diaphragm support within the regulator contained stains indicating a previous presence of water and soil.

The Safety Board's review of ONGC's gas service operating and maintenance practices and records revealed the following:

- o ONGC's records are inadequate to determine the manufacturer or type of service regulator installed on gas service lines.
- o ONGC's procedures call for employees to conduct a visual check of the gas service regulator vent "at every occasion that a company employee is working on the property to see that it is free and open and not in a position that rainwater will enter the regulator," and the company's records indicate that the meter at 3805

East 98th Street had been read during the previous months. However, the employees that read the meter had not been trained in these procedures and had not visually checked the regulator or reported the broken meter dial glass or soil that was accumulating in the meter box.

- o ONGC does not require regulator relief valves to be tested when maintenance tests are performed or when service regulators are reconditioned.

The investigation indicates that the Fisher type 733A gas service regulator failed to reduce the gas delivered to 3805 East 98th Street to a safe pressure. This most likely occurred because water and soil from the underground meter box entered the regulator through its vent line, soil accumulated on top of the regulator diaphragm, and over time, soil sealed the regulator vent hole. The added weight on the diaphragm was sufficient to prevent the regulator from closing fully when the desired downstream pressure had been reached. Although the regulator had an internal relief valve to prevent excess pressure from entering the customer-service-line segment, it could not operate because it had been adjusted to the closed position. Most likely the relief valve had been adjusted to the closed position before installation because the adjustment screw could not be readily accessed after the regulator had been installed.

The ONGC does not have a policy on the use of excess flow valves. It did install a few excess flow valves as a pilot program during the late 1960s and early 1970s, but it has not formulated a policy on the use of these valves or performed an assessment of the current, improved generation of excess flow valve designs since that early effort. Had an excess flow valve been installed in the gas service line at the gas main before this accident, it would have rapidly stopped the flow of gas that fueled the fires after the gas appliance and fuel line failures. The elimination of natural gas as a fuel source may have reduced the extent of the fire damage and reduced the spread of fire within the residence.

The National Transportation Safety Board determined that the probable cause of the accident was Oklahoma Natural Gas Company's failure to ensure that the gas service regulator safety relief valve was adjusted properly and operating as designed before being installed and that the regulator relief vent line was not obstructed after being installed. Contributing to the extent of fire damage was the lack of an excess flow valve on the gas service line, which would have rapidly stopped the flow of gas into the house after the customer's appliance and fuel lines ruptured.

As a result of its investigation, the National Transportation Safety Board recommends that the Oklahoma Natural Gas Company:

Periodically inspect all gas service regulators installed underground to determine whether the vent lines are obstructed and correct deficient conditions identified.
(Class II, Priority Action) (P-92-1)

Conduct a one-time inspection of Fisher type 733A and other gas service regulators with adjustable relief valves to determine whether the relief valves are properly adjusted to protect downstream gas piping from excessive pressures and correct deficient conditions identified. (Class II, Priority Action) (P-92-2)

Train all employees responsible for viewing service line regulator installations to conduct visual inspections of regulator vents as specified in ONGC procedures and instruct them on actions to take when deficient conditions are identified. (Class II, Priority Action) (P-92-3)

Require service regulator technicians to test regulator relief valves when performing maintenance tests or reconditioning regulators to determine that these valves operate according to the manufacturer's specifications. (Class II, Priority Action) (P-92-4)

Install excess flow valves on new and renewed single-customer residential high-pressure services that have operating conditions compatible with the rated parameters of at least one model of commercially available excess flow valve. (Class II, Priority Action) (P-92-5)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations P-92-1 through -5 in your reply.

COUGHLIN, Acting Chairman, and LAUBER, HART, HAMMERSCHMIDT, and KOLSTAD, Members, concurred in these recommendations.



By: Susan M. Coughlin
Acting Chairman