



NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20594

Safety Recommendation

Date: August 23, 1993

In Reply Refer To: P-93-7 and -8

Mr. John E. Mack, III
Chairman of the Board and
Chief Executive Officer
Central Hudson Gas and Electric Corporation
284 South Avenue
Poughkeepsie, New York 12601

A natural gas explosion destroyed a house at 26 Liberty Street in Catskill, New York, on November 6, 1992, about 7:54 p.m. eastern standard time. The two-story wood-frame house had not had active gas service since 1969. The explosion killed a woman in the house, seriously injured her daughter, and slightly injured two children in a neighboring house.¹

Almost immediately after the explosion, Central Hudson Gas and Electric Corporation personnel checked the nearby buildings for gas-in-air readings. Three of the six houses abutting the 4-inch cast iron main on the east side of Liberty Street had readings of 1 to 3 percent (the explosive range of natural gas is 4 to 14 percent).

A Central Hudson crew then drove holes (barholes) into the pavement and inserted a gas-in-air measuring device (combustible gas indicator) to test the subsurface atmosphere for the presence of natural gas. Because several readings taken above the main were 100 percent, the crew started to excavate it. At 10:15 p.m. the crew found a semicircular crack, extending from the 3 o'clock position to the 9 o'clock position, in the main 55 feet from the house that had exploded.

Under New York State Public Service Commission (NYSPSC) supervision, Central Hudson did more barhole tests to find the path along which the gas had migrated to the demolished house. The barhole tests and readings taken inside a manhole indicated the gas had escaped

¹This accident is also discussed in Pipeline Accident Brief DCA93FP002.

from the crack in the gas main and followed a sewer main to a manhole on the east side of Liberty Street. The readings taken in a straight line from the manhole to the northeast corner of the house were between 5 and 30 percent.

When the crew excavated along the line of high readings, it found a sewer lateral of tile pipe that was covered by sandy soil that had been used as fill. The rest of the soil in the yard was clay, which was less permeable than the fill. The sandy soil bordered by the clay made a likely conduit for the migration of gas into the house.

The Safety Board believes that the gas from a crack in the main followed a sewer main to a manhole, went through the soil used as fill above a sewer lateral, entered the house through its stone foundation, was ignited by one of the many sources within the house, and exploded.

Metallurgical testing of the gas main performed under Safety Board supervision revealed graphitic corrosion in as much as 2/3 of the pipe's wall thickness and a fracture that began at the bottom of the pipe and ran upwards. The main was under excessive bending stress for two reasons: it had been undermined and lacked support from below, and it was under a downward load imposed from above by backfill.

About a month before the explosion, nearby sewer work had exposed and undermined the main. From September 28 through October 2, a Catskill Department of Public Works (DPW) crew had worked on Liberty Street to repair ground subsidence (settlement of the earth) caused by the collapse of a sewer main. Before the excavation, a Central Hudson gas mechanic had marked out the gas line where the DPW crew intended to excavate. From September 28 through September 30, the DPW crew excavated along Liberty Street between the sidewalk and the curb.

From September 30 through October 1, the DPW crew excavated across Liberty Street (perpendicular to the main) in a westward direction. Members of the crew stated during the investigation that they had undermined the main by hand and that the DPW superintendent had told Central Hudson that the main was exposed and undermined. (The gas main was about 3 1/2 feet deep, and the sewer main was about 10 feet deep and laterally near, but not directly under, the gas main.)

On October 1, a New York State Labor Department Safety and Health inspector arrived on the scene and told the crew that they had to shore up the trench (reinforce the sides with retaining walls) or get a private contractor to finish the construction and backfill the trench. The inspector stated that over 36 inches of the main was exposed.

Later on the same day, a Central Hudson gas mechanic observed the main and told the crew to support it with a 4 (inch) by 4 (inch) wooden beam and rope. The crew nailed two 2 by 4s together, laid them parallel to the road and across the trench, and tied a rope around the support beam and the main.

The gas mechanic returned to the Central Hudson office before 4:30 p.m. He wrote a note reporting that the main on Liberty Street needed to be replaced, and he left the note on the desk of his supervisor, the gas and electric foreman. The foreman, however, had left for vacation at 2 p.m. and was not scheduled to return until October 6.

The foreman's supervisor, the Catskill operating district distribution superintendent, assumed the foreman's duties. He testified, however, that when he assumes the foreman's duties he does not normally clear the foreman's desk of paperwork and further stated that he did not read the note that the gas mechanic had left on the foreman's desk. The company's procedure for the replacement of exposed cast iron piping requires written notification to the foreman when a gas streetman observes a situation where replacement may be required. Consequently, the superintendent's practice of not attending to the foreman's paperwork prevented timely and effective response to a hazardous situation.

On October 2 and 3, the contractor hired by the DPW at the instruction of the State health and safety inspector finished the sewer work and backfilled the trench. He stated that he had left the support on the main until he had finished backfilling the trench and that he had "tamped" the soil on both sides of the main at least twice during backfilling. He then cut the rope and removed the beam.

On October 6, when the foreman returned to work, he read the note that the gas mechanic left him on October 1 and threw it away. According to the foreman, the note said that some cast iron gas main was exposed, that there was work to be done, and that the job had been shut down. He said that after reading the note he wrote in his book "Liberty Street main replacement possible." He also said that he was not sure that more than 36 inches of main had been exposed. He did not investigate further, even though procedures required him to do so.

Central Hudson's Gas Operating and Maintenance Procedure No. 360 addresses the replacement of cast iron pipe 8 inches in diameter or less, exposed and undermined by a third-party excavation 36 inches or greater in width. The procedure requires that gas streetmen note those situations where replacement may be required, obtain information on the excavator's work plan when possible, and submit a Possible Cast Iron Exposure Report (Form CI) to the gas foreman at the end of the work day. In the events leading to this accident, the gas mechanic who observed the exposed cast iron pipe did not prepare a Form CI. He did, however, leave a note for the foreman that conveyed essentially the same information as is required on a Form CI. The gas foreman's responsibility is to schedule appropriate followup inspections and, if required, prepare a replacement work order. (The pipe is to be replaced immediately or kept under surveillance with an open vent hole until it is replaced.) The procedure further specifies that "on the day of inspection, all Form CI reports shall be reviewed by district supervision who will verify the safety integrity of gas facilities during construction activities." The procedure makes no provision, however, for actions to be taken in the absence of the gas foreman or other responsible supervisory personnel.

Central Hudson's gas operating and maintenance procedures are almost identical to those required by NYSPSC regulations. Both Central Hudson's procedures and the NYSPSC's regulations required Central Hudson to replace the cast iron pipe or maintain daily surveillance with an open vent hole until replacement was complete.

More than 20 years before the accident, Central Hudson had replaced much of the cast iron main on Liberty Street and the surrounding streets with welded steel. It had not, however, replaced 310 feet of cast iron main on the northern end of the street. (After the accident, Central Hudson replaced the 310 feet with plastic pipe.) The main runs under the east side of Liberty Street, and in the 8 years before the accident, the people in the six houses on the east side had complained nine times about gas odors, although only three of the homes had gas service.

November 6, 1992, was not the first time a crack in the gas main was discovered in front of 26 Liberty Street. On January 3, 1984, a repair clamp was put on a crack in the gas main within 20 feet of the break that occurred on November 6, 1992. The clamp was attached after Central Hudson employees measured 4 percent gas-in-air readings (the explosive range of natural gas is 4 to 14 percent) inside 26 Liberty Street in response to a gas odor complaint. At this time, Central Hudson missed an opportunity to examine this cast iron main for corrosion and/or test it for deterioration. Title 49 Code of Federal Regulations (CFR) 192.459 states that whenever an operator has knowledge that any portion of a buried pipeline is exposed, the exposed portion must be examined for evidence of external corrosion if the pipe is bare, or if the coating is deteriorated. If external corrosion is found, remedial action must be taken to the extent required. Both in 1984 and in October 1992, when the 4-inch cast iron main was clamped, Central Hudson has no record of checking for corrosion.

The Pipeline Safety Act of 1992 (Public Law 102.508) requires the U. S. Department of Transportation (DOT) to survey operators with cast iron in their systems for "the extent to which each operator has adopted a plan for the safe management and replacement of cast iron." The DOT is to survey "the elements of the plan, including the anticipated rate of replacement and the progress that has been made." The Safety Board hopes that these actions will result in the systematic replacement of cast iron as recommended to the Research and Special Programs Administration (RSPA) in Safety Recommendation P-91-12, which was issued in August 1991 as a result of the Safety Board's investigation of a 1990 natural gas accident in Allentown, Pennsylvania:

P-91-12

Require each gas operator to implement a program, based on factors such as age, pipe diameter, operating pressure, soil corrosiveness, existing graphitic damage, leak history, burial depth, and external loading, to identify and replace in a planned, timely manner cast iron pipe.

In October 1991 the RSPA responded to this safety recommendation, stating that it had sent a safety alert notice to each operator of a gas pipeline facility and to each State pipeline safety representative. The notice mentioned the safety recommendation and said that each pipeline operator should have a program to identify and replace any cast iron pipeline that might threaten public safety.

In June 1992 the RSPA sent out a second safety alert notice. It was more strongly worded and pointed out that 49 CFR 192.613 of the DOT's regulations, entitled "Continuing Surveillance," applies to cast iron. This section requires each operator to maintain continuing surveillance of its pipeline facilities, to identify problems, and to take appropriate action if corrosion, leakage, or failure is found.

The RSPA's safety alert notices did not prompt Central Hudson to adopt a formal program for monitoring and systematically replacing cast iron pipe. During the investigation, the Safety Board received a letter from Central Hudson's gas manager of engineering services stating that Central Hudson had no formal program for the systematic replacement of cast iron pipe but was in the process of creating one.

As a result of its investigation, the National Transportation Safety Board recommends that the Central Hudson Gas and Electric Corporation:

Develop and implement an amendment to Central Hudson's Gas Operating and Maintenance Procedure No. 360, "Replacement of Exposed Cast Iron," that will ensure the continuity of supervisory responsibility, even in the absence of the regularly assigned supervisor, for the timely and effective verification of the safety integrity of exposed cast iron pipe. (Class II, Priority Action) (P-93-7)

Implement a program, based on factors such as age, pipe diameter, operating pressure, soil corrosiveness, existing graphitic damage, leak history, burial depth, and external loading, to identify and replace in a planned, timely manner cast iron piping systems that may threaten public safety. (Class II, Priority Action) (P-93-8)

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-93-7 and -8 in your reply. If you need additional information, you may contact Larry Jackson in the Office of Surface Transportation Safety at (202) 382-6620.

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.

A handwritten signature in cursive script, appearing to read 'C. W. Vogt', written in black ink.

By: Carl W. Vogt
Chairman