

Log P-285



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: November 24, 1986

In reply refer to: P-86-16

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Association
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About 3:55 p.m., eastern standard time, December 6, 1985, a natural gas explosion and fire destroyed the River Restaurant at 268 Main Street in Derby, Connecticut. Gas escaping from a broken gas main at a pressure of about 1 pound per square inch had escaped, migrated into the restaurant basement, ignited, exploded, and burned. Of the 18 persons inside the restaurant at the time, 6 were killed and 12 were injured; 1 passerby and 1 firefighter were also injured. After the accident the street adjacent to the restaurant was excavated where a 24-inch diameter sewer system had just been installed; an 87-year-old, 3-inch diameter, cast-iron natural gas main was found broken. 1/

Although the failure of the 3-inch iron-cast gas main was not accompanied by the obvious, tell-tale signs such as loud hissing sounds of escaping gas, blowing dust and dirt, loss of service to downstream customers, or a sudden pressure drop in the gas system, there are certain known facts which help to determine the time and mode of failure. The examination of the earth around the broken pipe did reveal that the fracture and gas leakage were recent because the earth was neither dried out nor whitish in appearance both of which are typical of long-term gas leaks. The Safety Board's laboratory analysis of the failed pipe also showed that the fracture occurred very recently and very rapidly. Finally, the annual gas leak survey which had been conducted by an independent contractor on December 2 and 3, 1985, to comply with a regulatory requirement found no evidence of gas leakage over the area in Caroline Street where the break was later found to have occurred. Thus the break must have occurred between December 3 and December 6, 1985, within three days of the accident.

1/ For more detailed information read Pipeline Accident Report—"Northeast Utilities Service Company, Explosion and Fire, Derby, Connecticut, December 6, 1985" (NTSB/PAR-86/02).

On December 5, the contractor had installed, backfilled, and tamped the 24-inch concrete sewer pipe from the manhole at the intersection of Main and Caroline Streets to within 15 feet (north) of the aqueduct. In addition, the contractor had excavated up to the aqueduct, had cut into it, and had damaged an old brick sewer which began leaking effluent and sewage odors. That portion of the ditch was left open with traffic barriers around it and the sewer odors probably built up overnight because there was no activity or wind to dissipate the odors. Gas company personnel who had arrived earlier to identify some small diameter pipes claimed that they had not noticed any odor of natural gas. Also, no gas odors were detected or reported in the sewer system, the same system that had 100 percent gas readings after the accident. Up to this point, the gas main must have still been intact.

According to the Safety Board's metallurgical report, the force or forces that broke the cast-iron gas main were inflicted above the cast-iron main at about the 1:30 o'clock position looking north. A Hopac, which had operated close to and over the cast-iron gas main, had a bearing weight of only 5 pounds psi. This is not much more weight than a 200-pound man would exert (about 3.5 pounds psi) and not enough bearing weight to break the gas main, which had withstood truck traffic for 87 years without failure. However, the area close to the cast-iron gas main and its 87-year-old solid bedding had now been disturbed by the deep, unshored, sewer excavation. In addition, the heavy tamping forces of the Hopac were transmitted directly to the gas main via the stones and small rocks over the gas main. The backfill, had it been stone free, as it should have, might have helped cushion the Hopac blows instead of carrying the blows uncushioned directly to the gas main. The combination of the disturbed bedding, the backfill containing rocks, and the heavy forces transmitted by the Hopac, cracked the cast-iron gas main.

The contractor claimed that the 3-inch cast-iron gas main was neither uncovered nor undermined during the installation of the sewer pipe and that probably the gas main had been broken some days or weeks before the sewer construction had started. Several facts contradict this claim. During the careful excavation by the investigators, around the failed gas main after the accident, green grass and a paper cup were found immediately above and close to the gas main fracture. The grass and the cup would have had to have been buried during the recent backfill.

At the preconstruction meeting the gas company also reminded the contractor to use the one call system ^{2/} before excavating close to gas mains and to use proper backfilling procedures as this could affect the structural integrity of the gas main. The gas company specifically cautioned the contractor to be careful when excavating near its cast-iron gas mains. At the beginning of the job the contractor did use the one call system and requested gas main locations. Before the excavation was begun, the gas company located the position of its gas mains and service lines near the proposed sewer excavation and indicated their location with yellow paint on the road surface. Each of the other utility companies marked the location of their subsurface lines in the same general manner, each using a different color paint; the colors used were those universally accepted for the marking of underground utilities.

A survey taken after the accident showed that the pavement in Caroline Street above the gas main had been removed and, in the process, the yellow paint marks on the pavement locating the gas main also had been removed. This could explain why the Hopac

^{2/} One call system is a communication system established by two or more agencies or companies to provide excavation contractors, utilities, public agencies, and private citizens with one telephone number to call and notify operators of underground facilities for excavating, tunneling, demolition, boring, blasting, etc.

operator did not see any paint marks on Caroline Street and would also indicate that even if nothing more was excavated from the top or the side of the gas main, the protective macadam pavement had been removed and the gas main would have been more vulnerable to forces exerted from above, such as the force of the Hopac compactions.

This accident, which claimed the lives of 6 persons, injured 13 persons, and caused extensive property damage, could have been prevented had certain safety precautions been taken and had the contractor been more vigilant to his duties.

The contractor's superintendent knew that he was working close to a 3-inch diameter cast-iron gas main and at a preconstruction meeting, he had been cautioned to use care when working near cast-iron gas mains. The superintendent failed to alert his employees about the proximity of the cast-iron gas main and put a foreman in charge who was unaware of the existence, much less the proximity, of the cast-iron gas main and then left the construction site.

Either the contractor never fully understood the danger of working close to cast-iron gas mains or simply exercised poor judgment in his performance of the work in this area. Cast-iron gas mains are rigid, brittle, and will crack readily when subjected to external forces, but if the contractor had carefully shored the ditch (as was required by Occupational Safety and Health Administration (OSHA) regulations), and then confined the backfilling and compacting operations to within that shored area, the 3-inch cast-iron gas main probably would not have been disturbed and probably would not have been fractured. Finally, the contractor should not have given responsibility for the job to a foreman without first making him aware of the location of the cast-iron gas main and the precautions necessary for working close to the facility.

The resident engineer did not caution the contractor or alert his company that the OSHA requirements for shoring trenches were not being adhered to. If he had done so and if, as a result, the contractor had driven shoring in the soil near the cast-iron gas main, the gas main might not have been disturbed and the compaction would have been confined to the area directly over the sewer pipe, not over the cast-iron gas main.

The resident engineer, because he had attended the preconstruction meeting, knew the location of the 3-inch cast-iron gas main and was aware of the gas company's admonition to use caution. However, he did not alert or caution the contractor or the gas company about the proximity of the sewer work on Caroline Street to the cast-iron gas main.

The Safety Board believes that when a company is hired "... to provide further protection for the OWNER (municipality) against defects and deficiencies in the work..." it should be obligated to promote public safety. Apparently, this was not the case as the resident engineer was not explicitly required to and did not take any action to prevent this accident.

In this accident each of the three parties, the contractor, the gas company, and Genovese, apparently all assumed it was the other person's responsibility to protect the gas main. The contractor did not exercise sufficient care in supervising the operation and permitted the excavation, backfill, and compaction close to the cast-iron pipe without sufficient oversight and caution. The gas company did not take the steps necessary to protect its cast-iron pipe even though the pipe was one of the oldest in its system. The resident engineer, who knew the location of the cast-iron gas main and its proximity to

the sewer construction, neither cautioned the contractor nor alerted the gas company to the potential hazard. No on-site communication took place among the three parties and as a result, the gas main was broken.

Therefore, the National Transportation Safety Board recommends that the National Utilities Contractors' Association:

Notify its member companies of the circumstances of this accident and urge them to be sure, when conducting excavation operations near buried gas lines, that their construction crews are alerted to the existence and proximity of the gas lines. (Class II, Priority Action) (P-86-16)

Also, as a result of its investigation, the Safety Board issued Safety Recommendations P-86-17 to the American Gas Association and to the American Public Gas Association, P-86-18 to the city of Derby, Connecticut, and P-86-19 and -20 to the Northeast Utilities Service Company.

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 actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation P-86-16 in your reply.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER and NALL, Members concurred in this recommendation.

By: 
Jim Burnett
Chairman