National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 18, 2000

In reply refer to: P-00-7 and -8

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The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the adequacy of the safety and emergency procedures used by Cable Constructors, Inc., (CCI) crews when working in the vicinity of underground facilities. The recommendations are derived from the Safety Board's investigation of the December 11, 1998, accident in St. Cloud, Minnesota,[1] and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued 13 safety recommendations, 2 of which are addressed to the Power and Communications Contractors Association. Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

About 10:50 a.m. on December 11, 1998, while attempting to install a utility pole support anchor[2] in a city sidewalk in St. Cloud, Minnesota, a CCI communications network installation crew struck and ruptured an underground, 1-inch-diameter, high-pressure plastic gas service pipeline, thereby precipitating a natural gas leak. About 40 minutes later, while utility workers and emergency response personnel were taking preliminary precautions and assessing the situation, an explosion occurred. As a result of the explosion, 4 persons were fatally injured; 1 person was seriously injured; and 10 persons, including 2 firefighters and 1 police officer, received minor

[1] National Transportation Safety Board. 2000. *Natural Gas Pipeline Rupture and Subsequent Explosion in St. Cloud, Minnesota, December 11, 1998*. Pipeline Accident Report NTSB/PAR-00/01. Washington, D.C.

[2] The anchor was a steel rod, 5 feet 6 inches long and 3/4 inch in diameter, with a closed-loop eye at the top and a spoon-like helix, cut at an angle, at the bottom. The helix acts as a bit during installation.

injuries. Six buildings were destroyed. Damage assessments estimated property losses at $399,000.

The National Transportation Safety Board determined that the probable cause of this accident was the lack of adequate procedures by CCI to prevent damage to nearby utilities when its anchor installation crews encountered unusual conditions such as striking an underground obstacle. Contributing to the severity of the accident was the delay by CCI in notifying the proper authorities.

Before installation was begun, the CCI crew foreman measured the distance from the planned anchor site to the marked location of a gas pipeline owned by Northern States Power Company (NSP) and used to provide gas service to Book Em's Bar. Because this distance from the marked location of the pipeline to the drill site was more than 2 feet, he determined that the installation of the anchor could proceed.[3]

The workers used a jackhammer to break about a 9-inch-diameter hole in the concrete sidewalk. They then placed an auger known as an "anchor cranker" (a gasoline-powered earth auger that had been specially modified to install anchors) on top of the anchor, and the crew began using the machine to auger the anchor into the ground. According to the workers, when the anchor had bored to a depth of 1 1/2 to 2 feet, it hit something hard. The object impeding the anchor's travel was later determined to be a large granite slab about 18 inches wide, 90 inches long, and 8 inches thick.

The crew removed the auger and struck the top of the anchor with a sledgehammer in an attempt to break up what crewmembers thought was a rock or rocks in the anchor's path. The crew then reattached the auger to the anchor and all four men recommenced the attempt to screw the anchor into the ground. They stated that the anchor then appeared to proceed normally, with no further unusual resistance, and they believed the anchor had broken through the obstacle or been deflected to the side of it. They said that "everything went fine, just as normal" until the top of the anchor was about 12 to 18 inches from the surface. At that point, they noticed dirt blowing out of the anchor hole and immediately began to smell gas. They then stopped the auger and released it. At that point, according to the foreman, "it [the auger] just laid over towards the [utility] pole."

The Safety Board noted that installation of the anchor was begun some 38 inches from the marked location of the underground gas line. This distance was 14 inches beyond the 2-foot margin provided for in CCI procedures and Minnesota State law to allow for a possible error in the marking of the location of the gas line. But while this 38-inch distance appeared to be adequate to ensure a safe installation, the length of the anchor was about 66 inches. At this length, the anchor could easily span the distance from the entry point to the pipeline if it were installed at an angle rather than vertically.

[3] The distance from the marked location and the anchor site was later determined to be 38 inches. Had the distance been less than 2 feet, CCI policy and Minnesota State law would have required that the crew expose the utility line before beginning installation of the anchor.

The CCI crew stated that they intended to install the anchor vertically, and no evidence was found to indicate that the anchor did not enter the ground vertically. But when the anchor struck the buried granite slab, the crewmembers followed their customary practice and struck the top of the anchor with a hammer until they perceived that the anchor had broken through the obstacle or had deflected off to its side. As the investigation later determined, the anchor had not broken through but had bent and deflected. The anchor apparently continued to bend as the four men applied pressure to the anchor cranker in their attempt to complete the installation. The investigation determined and postaccident excavation revealed that the anchor bent and followed along the upper surface of the buried granite slab until the cutting helix on the anchor tip dropped off the end of the slab, thus striking and rupturing the pipeline.

CCI procedures for protecting underground utilities did not address the risks associated with abnormal conditions underground that could render normal precautions inadequate. The Safety Board found no evidence that anchor installation crews were made aware that even if installation is begun at a safe distance from a buried utility, safety can be compromised if the anchor is allowed to assume an angled path underground. Such a deflection could endanger an underground utility and present a risk to the public. The Safety Board concluded that CCI's anchor installation procedures were inadequate in that they did not address steps to take under unusual circumstances (such as striking a significant underground obstacle) to ensure that buried utilities were protected during the entire installation process, including the underground portion.

In its investigation of a July 21, 1997, accident in Indianapolis, Indiana,[4] the Safety Board found that adequate controls were not in place to prevent damage to an underground pipeline that occurred during directional drilling, even though indications above ground were that an adequate safety margin was being observed. In the view of the Safety Board, excavation procedures are inadequate if they do not account for the possibility that unusual conditions could negate otherwise effective attempts to protect buried utilities. The Safety Board therefore believes that the Associated General Contractors of America, the National Utility Contractors Association, the Power and Communications Contractors Association, the American Public Works Association, and the National Cable Television Association should advise their memberships to review and revise their anchor installation procedures as necessary to ensure that safety margins around buried utilities are absolutely observed not only above ground but throughout the installation process.

Within 1 minute of striking the gas line, the CCI crew foreman, following the procedures his company had established for such an emergency, informed his supervisor of the incident. But the supervisor did not immediately notify emergency response agencies. About 15 minutes elapsed before another individual, not associated with the construction project, notified emergency responders. The CCI supervisor did eventually call NSP, the owner of the gas line, but not until about 30 minutes after the line was struck. By this time, two NSP employees (a gas technician specialist and a utility locator technician) were already on the scene, the company having been notified by the fire department dispatcher.

[4] National Transportation Safety Board. 1999. *Pipeline Rupture and Fire, Indianapolis, Indiana,* July 21, *1997.* Pipeline Accident Brief PAB-99-02. Washington, D.C.

Had either the crew foreman or his supervisor immediately called 911, responders could have been on the scene within minutes. For example, a fire department vehicle and four firefighters were on the scene within about 2 minutes of being notified, but because of the delayed notification, they arrived some 18 minutes after the rupture and about 21 minutes before the explosion.

The NSP gas technician specialist and the locator technician arrived on the scene about 11:16 a.m., which was about 26 minutes after the pipeline was ruptured. Witnesses stated that the NSP gas technician specialist entered Book-Em's Bar, the building nearest the leak, at street level (the building did not have a basement). Inside the bar, he took readings on a combustible gas indicator and was overheard stating he obtained a reading of 7 percent.[5] Bar patrons said the gas technician specialist then left the building to look for an entrance to the basement of the adjacent building, which housed Bellanti's Pizza and Deli.

While the gas technician specialist was taking his readings, according to witness statements, the NSP locator technician was determining if the service line had been properly marked. He was also seen assisting with the movement of a vehicle from the secured area. According to radio and cell phone records, about 11:29 a.m., an explosion occurred that killed both the gas technician specialist and the locator technician, as well as one person in the Bellanti's building and a nearby pedestrian. At the time of the explosion, a three-person NSP construction crew, which had been dispatched to shut down the damaged portion of the line, was 2 blocks away from the accident site.

According to the report of the Minnesota State fire marshal, the explosion occurred in the basement of the building where Bellanti's Pizza was located. The basement walls were made of stacked stones and crumbling mortar. According to the fire marshal's report, gas collected in the basement of the building and was ignited by an unknown source. In the basement of the building were several potential sources of ignition, including gas water heaters.

With an earlier start to evaluating the risk of the situation, the gas technician specialist may have been able to determine that gas was, in fact, accumulating in the basement of the Bellanti's building. The gas company and emergency responders may then have decided to evacuate everyone from nearby buildings and out of the area. Additional steps may have been taken to eliminate ignition sources and ventilate the basement. In such an event, the explosion may have been prevented or, at a minimum, some of the people at risk could have been removed from the area.

The Safety Board concluded that had the crew foreman or his supervisor called 911 or the utility owner immediately after the rupture, emergency responders and NSP personnel may have had time to fully assess the risk and to take actions that could have helped either to prevent the explosion or to avoid the resulting loss of life.

[5] Although the gas technician specialist was killed in the explosion and the gas monitor was not recovered, because NSP employees were trained to use their monitors to measure gas concentration as a percentage of the lower explosive limit (LEL), the 7 percent probably referred to 7 percent of the LEL rather than to a 7 percent concentration of gas in the air.

Effective August 1, 1999, the State of Minnesota revised Minnesota Statute 216D to require any excavator who breaches a pipeline containing hazardous gas or liquid to immediately notify 911. The law states, in part:

> If any damage occurs to an underground facility or its protective covering, the excavator shall notify the operator promptly. When the operator receives a damage notice, the operator shall promptly dispatch personnel to the damage area to investigate. If the damage results in the escape of any flammable, toxic, or corrosive gas or liquid or endangers life, health, or property, the excavator responsible shall immediately notify the operator and the 911 public safety answering point...and take immediate action to protect the public and property.

The director of the Minnesota Division of Emergency Management told Safety Board investigators that State 911 emergency call centers had recorded no noticeable increase in calls to 911 since enactment of the law and that, in the opinion of the official, the law has ensured more timely notification of authorities after excavation damage.

In 1997, the Safety Board published a safety study that discussed industry and government actions to prevent excavation damage.[6] The study formalized recommendations aimed at further advancing improvements in excavation damage prevention programs. One area given prominence was emergency procedures applicable when a utility is damaged during excavation. The safety study noted that while Federal regulations require pipeline operators to establish written emergency procedures, the regulations do not apply to excavators, even though "these are the very people that often have responsibility for first response at an excavation disaster." The study concluded that, at a minimum, "excavators should formulate an emergency response plan appropriate for the specific construction site and ensure that employees working at that site know the correct action to take if a buried facility is damaged."

The safety study referenced Safety Recommendation P-95-25, issued to the American Public Works Association (APWA) as a result of the Safety Board's investigation of a 1993 accident in St. Paul, Minnesota:

> P-95-25
> Urge your members to call 911 immediately, in addition to calling the gas company, if a natural gas line has been severed.

Safety Recommendation P-95-25 has been classified "Closed—Acceptable Action" based on the fact that the APWA revised its *Public Works Practices Manual* to include a chapter on utility coordination that addresses this recommendation.

Common Ground: The Study of One–Call Systems and Damage Prevention,[7] published in August 1999, provides guidance for saving valuable time in emergency notification should a

[6] National Transportation Safety Board. 1997. *Protecting Public Safety Through Excavation Damage Prevention*. Safety Study NTSB/SS-97/01. Washington, D.C.

[7] The *Common Ground* report was prepared by more than 160 individuals representing a wide range of interests, organizations, and viewpoints on preventing damage to underground facilities. The project was initiated by the U.S. Department of Transportation's Office of Pipeline Safety, an element of the Research and Special

natural gas line be damaged during excavation. The "best practice" statement for notification of emergency personnel is as follows:

> If the protective coating of an electrical line is penetrated or gases or liquids are escaping from a broken line which endangers life, health or property, the excavator immediately contacts local emergency personnel or calls '911' to report the damage location.

The National Utility Locating Contractors Association (NULCA) has developed guidelines for excavation practices and procedures for damage prevention. The NULCA guidelines, which were revised in September 1997, include a suggested procedure whereby excavators call 911 if excavation damage "involves a potential risk to life, health or significant property damage."

Both the *Common Ground* best practice and the NULCA guidelines suggest that a call to 911 be made only after an excavator determines that excavation damage has occurred that presents a hazard. Minnesota State law, on the other hand, requires that contractors notify 911 in the event of damage to buried utilities if the damage results in the escape of any flammable, toxic, or corrosive gas or liquid *or* endangers life, health, or property. The wording of the Minnesota law relieves excavators of the responsibility of determining whether damage represents a hazard before they call 911 and the utility owner. The Safety Board prefers this approach over that of the *Common Ground* best practice or the NULCA guidelines.

In the view of the Safety Board, the utility owner and 911 or other appropriate emergency notification number should be called any time a hazardous substance is released from a pipeline through construction damage, regardless of whether those on the scene perceive an immediate danger to public safety. Excavators are not all knowledgeable about what constitutes a hazardous situation. For example, they may not be familiar with the hazards of gas migrating underground, or they may not realize that a pulled pipeline could be broken in more than one place. Emergency responders can usually arrive at the scene quickly and are often trained and equipped to assess such hazards and take appropriate safety measures.

Strengthened requirements to notify utility owners immediately in the event of any damage to a pipeline can also increase safety. The sooner the experts from the operator are notified, the sooner they can apply their knowledge to reduce the public safety risks. Whereas some contractors may previously have waited until the end of the day to report damage to pipelines that did not appear to present an obvious threat, requiring immediate notification of operators could possibly help them prevent a minor problem from developing into a major hazard. Some damage may not result in an immediate leak but may represent a hazard in the future. The pipeline operator can determine if corrective measures are needed to prevent a future failure. If an immediate pipeline leak does occur, the utility owner is in the best position to be aware of the hazards associated with the product in its pipelines and the appropriate safety countermeasures, and to be able to shorten the time until a leak can be stopped.

Programs Administration, in response to the Transportation Equity Act for the 21st Century, Public Law 105-78, signed into law June 9, 1998. The purpose of the year-long study was to identify and validate existing best practices performed in connection with preventing damage to underground facilities.

Additionally, in the Safety Board's view, strengthening the notification requirement will increase awareness on the part of contractors and other excavators of the importance of taking care not to damage utilities, and a reduction in the number of such incidents may be expected.

To help ensure that this issue is addressed on a nationwide basis, the Safety Board has made the following safety recommendation to the U.S. Occupational Safety and Health Administration (OSHA):

> P-00-2
> Require excavators to notify the pipeline operator immediately if their work damages a pipeline and to call 911 or other local emergency response number immediately if the damage results in a release of natural gas or other hazardous substance or potentially endangers life, health, or property.

In an April 24, 2000, letter to the Safety Board, the U.S. Department of Transportation's Research and Special Programs Administration (RSPA) outlined the agency's efforts to create a "self-sustaining private sector non-profit organization" that would "provide an effective forum for information sharing among all stakeholders in [excavation] damage prevention." These efforts, known as the "Damage Prevention: Path Forward" initiative,[8] are intended to continue the efforts begun with the *Common Ground* study and to address the issues involved in preventing outside force damage to the underground infrastructure. The Safety Board is encouraged by the promise of the Path Forward program and will follow the development of the program with interest.

Until OSHA can act on Safety Recommendation P-00-2, the Safety Board believes that the Path Forward initiative should be used to promote the immediate notification of the utility owner and emergency agencies whenever excavation damage to a utility result in a release of natural gas or other hazardous substance or otherwise presents a threat to public safety.

Therefore, the National Transportation Safety Board issued the following safety recommendation to RSPA:

> P-00-1
> Through the mechanism of the Path Forward initiative, take the lead in promulgating an industry "best practice" that advises excavators to notify the pipeline operator immediately if their work damages a pipeline and to call 911 or other local emergency response number immediately if the damage results in a release of natural gas or other hazardous substance or potentially endangers life, health, or property.

To further raise awareness of the early notification issue, the Safety Board believes the Association of General Contractors, the National Utility Contractors Association, the Power and Communications Contractors Association, the American Public Works Association, and the National Cable Television Association should publicize the circumstances of this accident to their memberships to make them aware of the dangers of damage to an underground utility and the

[8] A new nonprofit organization, the Common Ground Alliance, is being formed to continue the Path Forward initiative.

need to immediately call 911 or other appropriate local emergency response number when a natural gas leak or other hazardous condition occurs and to immediately notify utility companies when an underground facility has been damaged.

The National Transportation Safety Board therefore issues the following safety recommendations to the Power and Communications Contractors Association:

> Inform your membership of the circumstances surrounding the December 11, 1998, accident in St. Cloud, Minnesota, to make them aware of the dangers of damage to an underground utility and the need to immediately call 911 or other appropriate local emergency response number when a natural gas leak or other hazardous condition occurs and to immediately notify utility companies when an underground facility has been damaged. (P-00-7)
>
> Advise your membership to review and revise their anchor installation procedures as necessary to ensure that safety margins around buried utilities are absolutely observed not only above ground but throughout the installation process. (P-00-8)

The Safety Board also issued safety recommendations to the Research and Special Programs Administration, the Occupational Safety and Health Administration, the Associated General Contractors of America, the National Utility Contractors Association, the National Cable Television Association, the American Public Works Association, and the International Association of Fire Chiefs.

In your response to the recommendations in this letter, please refer to P-00-7 and -8. If you need additional information, you may call (202) 314-6170.

Chairman HALL and Members HAMMERSCHMIDT, GOGLIA, BLACK, and CARMODY concurred in these recommendations.

Original Signed

By: Jim Hall
Chairman