SP-20

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation P-294

Date: October 3, 1989
In reply refer to: P-89-7 and -8

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On August 31, 1988, a North Shore Gas Company (NSG) crew struck and ruptured a fitting on a 4-inch plastic gas main in Green Oaks, Illinois. While the crew was attempting to excavate a nearby valve to shut off the flow of gas, the backhoe struck an unmarked power cable. The gas ignited and four NSG employees were injured. 1/

On July 11, 1988, during its annual inspection of emergency shutoff valves, an NSG crew noted that the valve box and marker pole for a 4-inch valve (M4148) beside Buckley Road in Green Oaks, Illinois, had been struck and needed to be reset. On August 29, 1988, NSG notified JULIE, a one-call excavation notification system, of its intent to excavate on the south side of Buckley Road 580 feet east of its intersection with Saint Mary's Road. The local telephone and electric power companies responded to the notification.

On August 31, 1988, a two-person NSG crew--a distribution operator (DO) and a helper--received a valve inspection form, which also served as their work order for repairing the valve box and marker pole. The form reported the location of the valve, its number, when it was inspected, a description of the valve including its size, and remarks made by the initial survey crew.

Arriving at the work site on Buckley Road about 9:45 a.m., the NSG crew noted the marks made on the ground by the telephone company and the electric company, Commonwealth Edison, indicating there were no telephone or electric lines in the area of the planned excavation. Believing that the valve box to be repaired was on the 6-inch, east-west steel main that ran parallel to and adjacent to the south curb of Buckley Road, the DO did not

1/ For more detailed information, read Pipeline Accident/Incident Summary Report--"Green Oaks, Illinois, August 31,1988" (NTSB/PAR-89/01/SUM).

consult the gas system map carried in the service truck. The valve and valve box actually were located on a 4-inch plastic main about 5 1/2 feet south of its connection to the 6-inch, east-west main. Following standard practice, the DO and helper swept the area with a pipe locator. Because the DO believed the valve was on the east-west main, the sweep was made south from the edge of the road. During the sweep, the crew recognized an interference with the signal from the pipe locator. The DO assumed that an overhead electric power line was the cause and that the main extended east and west from the valve box. The DO decided to excavate with a backhoe to the depth of the line in an area south of and adjacent to the valve box. He planned to excavate with the backhoe no closer than 18 inches to the east-west main. About 10:30 a.m., after excavating to a depth of about 4 feet, the teeth of the backhoe struck and punctured a steel-to-plastic transition fitting on the 4-inch plastic gas main.

With gas blowing at 35 psi from the punctured 4-inch plastic main, the helper ran to the service truck to radio the crew's supervisor; the crew supervisor could not be reached. The DO went to the truck and radioed the distribution office; he reported they had punctured a line, were unable to contact the crew supervisor, and requested assistance. The distribution office connected the DO with the crew supervisor by radio, and the DO explained the situation. The crew supervisor advised that he was unable to respond to the site because he had to remain at another site until it could be made safe. While the crew supervisor attempted to radio another supervisor to request response to the scene, a third supervisor interrupted the radio transmission advising that he would respond. A two-person regulator crew in the area also heard the radio conversation and responded to the scene.

When the responding supervisor arrived, within 10-15 minutes, he reviewed the gas system map he carried. From his map, he identified the location where they were working, determined there was a 4-inch, plastic main south of the 6-inch, east-west main, and determined the valve box needing repair was on the 4-inch main. He stated that because he was unable to find emergency shutoff valves indicated on his map he decided the best action would be to finish excavating valve M4148 so it could be closed to stop the flow of gas from the north. He also sent a member of the regulator crew to the NSG shop for a tool to be used to squeeze closed the plastic pipe, which would stop the flow of gas from the south.

The crew supervisor arrived about 11:20 a.m., and then walked to the area of the valve to supervise the excavation. He sent the helper to locate and mark the plastic main on the south side of a dirt berm located between Buckley Road and a housing development to the south. Using the backhoe, the DO began removing the dirt adjacent to the valve while one of the regulator crew and the responding supervisor removed dirt from

the ditch with shovels. When the excavation had almost reached the level of the valve, the crew supervisor told the men in the ditch to get out so the backhoe could remove one more bucket of dirt. Kneeling at the side of the ditch, the crew supervisor instructed the DO where to place the backhoe bucket. As the DO retracted the backhoe bucket, it snagged an unmarked, underground electric line and broke it. The escaping gas then ignited.

Other gas company employees--including the general distribution supervisor--en route to the scene before the gas ignited, arrived and shut off gas to the area by closing emergency valves at the intersection of Saint Mary's Road and Buckley Road and at the intersection of Buckley Road and Oplane Road. The location of these valves were shown on a gas system map carried by the general distribution supervisor. All gas was stopped by 12:30 p.m. when the 4-inch plastic main was squeezed closed. Four persons--the two supervisors, the DO, and the second member of the regulator crew--received burns as a result of this accident; three were treated and released from the hospital and the fourth was hospitalized overnight for observation.

The National Transportation Safety Board's investigation of this accident revealed that the DO did not consult the gas system map he carried when planning how to perform the work. Rather, he relied on his memory of the location of the mains in the area. Had the DO consulted the map, he should have easily identified that the valve box needing repair was located on the 4-inch plastic main extending south from the east-west main. Although the map he carried did not identify the valve by number nor were any valves in the distribution system imprinted with numbers, there were no other valves nearby that he could have mistakenly selected as the one needing repair. In addition, the DO apparently did not note from the work order that the valve box needing repair was not the same size as the main on which he believed he was to work. This discrepancy should have alerted the DO that his assumption was probably incorrect and that he should check his map to confirm the configuration of the gas distribution system. With the correct information about the location of the valve, he then could have correctly planned and performed his excavation adjacent to the 4-inch, north-south main.

When employees of the NSG distribution department have a question about procedures, they have two sources of information: the employees' supervisor and the distribution department operating manual. When they cannot reach their supervisor, employees can refer to the manual, a copy of which is kept in each service truck. The section relating to work on or around gas mains was developed apparently in the early 1970s but is currently being revised: revision is expected to be complete in 1990. The manual, although dated, accurately reflects field practices for operations listed in the manual, and material from the manual is used to train NSG's operators.

In reviewing the existing manual, the Safety Board found that the manual provides step-by-step instructions for carrying out certain tasks expected of employees. Had the DO referred to the manual, however, he would have had no written guidance on precautions to follow when excavating near gas company facilities. The section on excavations provides guidelines only on shoring and supporting of trenches. No guidelines are included on locating buried facilities using gas system maps or pipe locators, on planning excavations, or on using mechanized excavation equipment adjacent to buried facilities. Because of the importance of the manual in NSG operations, the Safety Board believes that NSG should expand the excavation section during the current revision of the operating manual to provide procedures for and precautions to take when excavating near NSG facilities.

Investigation of this accident also revealed that two different types of maps were used by NSG employees when responding to this accident. The map available to the DO and the supervisors was the "main map." As the most basic map, it shows the mains and valves, emergency or otherwise, for an area. All field crews of the distribution department have in their service trucks a copy of the main map for their work area. The other map was a fault map. It was developed as part of NSG's emergency plan. This map shows the gas distribution system divided into fault areas, which can be shut down in the event of an emergency. The fault map is basically the main map with shutdown areas color coded and the emergency shutoff valves identified by a number.

Each fault area identified on the fault map is listed in a fault book provided to the distribution supervisors. The fault book identifies each fault area by number, provides a list of the valves to be closed to isolate a fault area, and identifies each valve by number and location. While the distribution supervisors have only the fault book, the general distribution supervisors and the dispatch center have both the fault map and the fault book. The fault book contains no diagrams to help distribution supervisors identify the fault in question unless they have the fault map. In an emergency, the responding distribution supervisor would be referred to a particular page in the fault book and told to follow the instructions for stopping the flow of gas to the area.

The omission from the main map of the emergency shutoff valves contributed to the severity of the Green Oaks accident. The field crews of a gas company are the first to arrive at any gas emergency; it is essential they have accurate information about company facilities. Although other company personnel carry more complete data, waiting for such personnel could unnecessarily contribute to the severity of a gas accident. Had the main map shown the location of the emergency shutoff valves on the 6-inch, east-west main at St. Mary's and Oplane Roads, the responding supervisor likely would have had those valves closed

before continuing with the excavation. The Safety Board was unable to determine why the location of these emergency shutoff valves were missing from the main map. Because the locations were marked the on fault map, they possibly were dropped from the main map during a revision or were added to the fault map during one of the gas company's periodic reviews without being corrected on the main map. Thus, it is reasonable to believe that the location of emergency shutoff valves in other areas may also have been omitted from the maps.

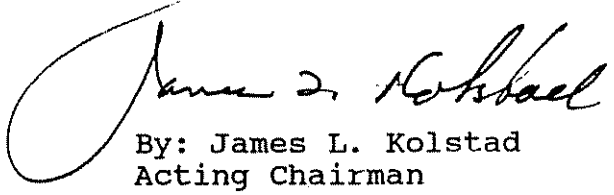
Therefore, as a result of its investigation of this accident, the National Transportation Safety Board recommends that the North Shore Gas Company:

> Compare the valve locations on its main maps to those on its fault maps and other appropriate records and correct any omissions or errors. (Class II Priority Action) (P-89-7)
>
> Revise the operating manual of the distribution department to include: (a) guidelines for employees in planning and safely performing excavations adjacent to the company's buried pipelines; (b) detailed procedures on when to use power equipment and when to hand dig; and (c) guidelines on using maps, pipe locators, and other means to locate lines prior to digging. (Class II, Priority Action) (P-89-8)

Also, the Safety Board issued Safety Recommendation P-89-9 to Commonwealth Edison.

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 recommendations in this letter. Please refer to Safety Recommendations P-89-7 and P-89-8 in your reply.

KOLSTAD, Acting Chairman, BURNETT, LAUBER, NALL, and DICKINSON, Members, concurred in these recommendations.



By: James L. Kolstad
Acting Chairman