

NATIONAL TRANSPORTATION SAFETY BOARD

# PIPELINE ACCIDENT REPORT

SOUTHERN UNION GAS COMPANY

EL PASO, TEXAS

APRIL 22, 1973

FOR RELEASE:  
6:30 AM EDT MAR 19 1974



NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20591

REPORT NUMBER: NTSB-PAR-74-2

NATIONAL TRANSPORTATION SAFETY BOARD  
Washington, D.C. 20591

SS-P-18

**PIPELINE ACCIDENT REPORT**

**SOUTHERN UNION GAS COMPANY  
EL PASO, TEXAS  
APRIL 22, 1973**

**ADOPTED: FEBRUARY 13, 1974**

E R R A T A

Make the following changes to subject report:

Page 1, last paragraph, second and third line - Change "absence" to "existence".

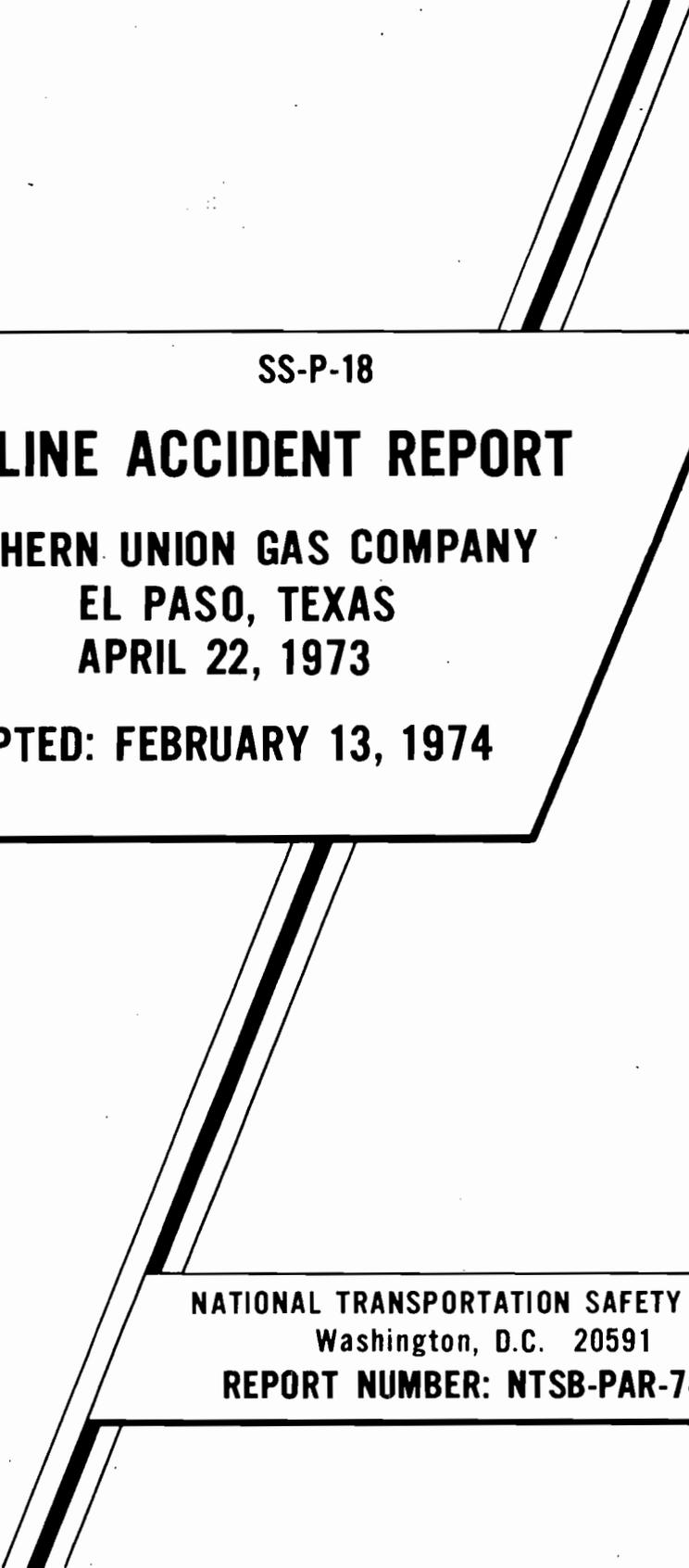
Page 6, change photograph caption to read -"Figure 6. Broken threads at the 2-inch valve."

Page 10, change the figure caption to read -"Figure 4. Accident site."

(These two figures were reversed during the printing process.)

March 7, 1974

**REPORT NUMBER: NTSB-PAR-74-2**



SS-P-18

**PIPELINE ACCIDENT REPORT**

**SOUTHERN UNION GAS COMPANY  
EL PASO, TEXAS  
APRIL 22, 1973**

**ADOPTED: FEBRUARY 13, 1974**

**NATIONAL TRANSPORTATION SAFETY BOARD  
Washington, D.C. 20591  
REPORT NUMBER: NTSB-PAR-74-2**

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. NTSB-PAR-74-2	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Pipeline Accident Report - Southern Union Gas Company, El Paso, Texas, April 22, 1973		5. Report Date February 13, 1974	
		6. Performing Organization Code	
7. Author(s)		8. Performing Organization Report No.	
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Surface Transportation Safety Washington, D. C. 20591		10. Work Unit No. 1244	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address  NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20591		13. Type of Report and Period Covered Pipeline Accident Report April 22, 1973	
		14. Sponsoring Agency Code	
15. Supplementary Notes  This report contains Pipeline Safety Recommendations P-74-10 through P-74-15.			
16. Abstract <p>This report describes and analyzes a natural gas explosion which occurred in El Paso, Texas, on April 22, 1973. The explosion destroyed 7 of 15 units in an apartment complex; 7 persons were killed, and 8 were hospitalized.</p> <p>The National Transportation Safety Board determines that the probable cause of the explosion was the ignition of an accumulation of natural gas which had leaked primarily from a broken cast-iron reducer and to a lesser extent from two corrosion leaks in the distribution main. The gas migrated beneath the concrete road surface, permeated the area, entered the apartment complex via the crawl space, and was ignited by an undetermined source. The uncovering and disturbing of the cast-iron pipe by the gas company in an unsuccessful search for a gas leak 6 days before the accident contributed to the failure of the reducer.</p> <p>The report contains recommendations to the U. S. Office of Pipeline Safety concerning regulations requiring the replacement or adequate protection of cast-iron pipe or fittings uncovered during construction or maintenance work and regulations requiring that gas company educational material for customers and the public be written bilingually in communities where a language other than English is commonly used. Recommendations are also made to the American Society of Mechanical Engineers, the American Gas Association, and the Southern Union Gas Company.</p>			
17. Key Words Natural Gas Explosion; Cast-Iron Reducer; Corrosion Leaks; Gas Migration; Public Awareness of Gas Emergencies; Pipe Support; Leak Search; Leak Followup; Removal of Pipe and Fittings.		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151	
19. Security Classification (of this report) UNCLASSIFIED	20. Security Classification (of this page) UNCLASSIFIED	21. No. of Pages 20	22. Price

## FOREWORD

The accident described in this report was determined to be a major accident by the National Transportation Safety Board under the criteria established in the Safety Board's regulations.

This report is based on facts obtained from an investigation conducted by the Safety Board. Cooperation during the investigation was received from the Office of Pipeline Safety, the Railroad Commission of the State of Texas, and the Southern Union Gas Company.

The conclusions, the determination of probable cause, and the recommendations herein are those of the Safety Board.

TABLE OF CONTENTS

	<u>Page</u>
I. SYNOPSIS . . . . .	1
II. FACTS . . . . .	2
The Accident . . . . .	2
Pipeline System . . . . .	5
Events Preceding the Accident . . . . .	5
Postaccident Activities . . . . .	9
Applicable Standards . . . . .	11
Metallurgical Analysis . . . . .	12
III. ANALYSIS . . . . .	12
Source of Gas . . . . .	12
Cast-Iron Fittings and Backfill Practices . . . . .	13
Leak Detection and Leak Location . . . . .	14
Gas Odorization and Public Education . . . . .	15
IV. CONCLUSIONS . . . . .	15
V. PROBABLE CAUSE . . . . .	16
VI. RECOMMENDATIONS . . . . .	16

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D. C. 20591

PIPELINE ACCIDENT REPORT

Adopted: February 13, 1974

---

SOUTHERN UNION GAS COMPANY  
EL PASO, TEXAS  
APRIL 22, 1973

I. SYNOPSIS

At 6:19 a.m., on April 22, 1973, a violent explosion destroyed 7 of 15 units in an apartment complex in El Paso, Texas. Seven persons were killed, and eight persons were hospitalized, two of whom were critically injured.

The El Paso fire department responded to the accident, shut off the gas supply to the apartments, and rescued the victims still trapped in the rubble. The police department aided in the rescue efforts, cordoned off the site, and rerouted all traffic from the area.

The Southern Union Gas Company arrived at 6:45 a.m. and found gas venting from the base of a telephone pole and from a recent street excavation. Gas at explosive levels was discovered at the curb line adjacent to the destroyed apartments and elsewhere in the area. Three leaks were discovered ultimately in the 20 psig, 2-inch gas main which served the area: Broken pipe threads in a cast-iron reducer at a 2-inch valve, a severe corrosion leak in the 2-inch main 21 feet away from the reducer, and a smaller pin-hole leak still farther away.

The National Transportation Safety Board determines that the probable cause of the explosion was the ignition of an accumulation of natural gas which had leaked primarily from a broken cast-iron reducer and to a lesser extent from two corrosion leaks in the distribution main. The gas migrated beneath the concrete road surface, permeated the area, entered the apartment complex via the crawl space, and was ignited by an undetermined source.

The uncovering and disturbing of the cast-iron pipe by the gas company in an unsuccessful search for a gas leak 6 days before the accident contributed to the failure of the reducer.

Contributing to the loss of life and the property damage were the failure of the gas company to locate or to confirm positively the absence of a leak, and the failure of both the tenants and the apartment superintendent to notify either the gas company or the fire department of the gas odors which had been detected previously.

## II. FACTS

### The Accident

At 6:15 a.m. on April 22, 1973, a violent explosion occurred in an old, single-story apartment building at the intersection of East San Antonio Avenue and Piedras Street in El Paso, Texas. Seven of the fifteen apartments in the complex were demolished, and seven persons inside the dwellings were killed. (See Figures 1, 2 and 3.) The explosion blew the floors of the apartment upward and many of the victims, who were still in bed at that hour, were blown up against the ceilings. The ceilings and the roof then collapsed on top of them. The walls were blown outward into the backyard and into the street. The explosion was heard and felt for blocks. Eight persons were removed from the rubble and taken to hospitals for treatment of burns and other injuries; two of these persons were critically injured. Other persons were treated for cuts and abrasions and then released.

Police officers in a patrol car cruising in the area received a radio report of the explosion at 6:22 a.m., and arrived at the scene at approximately 6:30 together with five fire department units. The officers at the scene asked the radio dispatcher at police headquarters to put out a call for as many ambulances as possible, to notify the gas and electric companies, and to send wreckers with crowbars to the site. The police dispatcher also contacted real-estate officials and requested the number and names of the apartment dwellers. Approximately 20 persons were taken to 2 hospitals where some were admitted and others were treated and released.

Upon their arrival at 6:30, the firemen closed the valve at the service regulator and the flow of gas to the entire 15-unit complex was shut off, but no other gas service was interrupted. The entire area was cordoned off and roadblocks were erected to divert traffic from the scene. Residents from one of the apartment houses across the street from the blast site were evacuated because of gas odors in the building and gas vapor indications along the west and south side of the building. At 9 p.m., after tests showed that no gas fumes remained, and after the line repairs had been completed, the evacuated residents were allowed to return to their apartments.

The Southern Union Gas Company (Southern Union), the gas-distribution utility which served the area, was notified of the explosion at 6:22 a.m.; their first service crew arrived at 6:45 a.m., and additional personnel and service crews arrived at 7:05 and 7:35. Gas was venting from the base of a telephone pole and from an area in the street where Southern Union had recently excavated. The odor of natural gas pervaded the devastated area. At 9:30 a.m. the gas company began digging to find the leak in the previously excavated area. At 10:20 a.m., after the leak was exposed and examined, gas was shut off in the main serving the affected

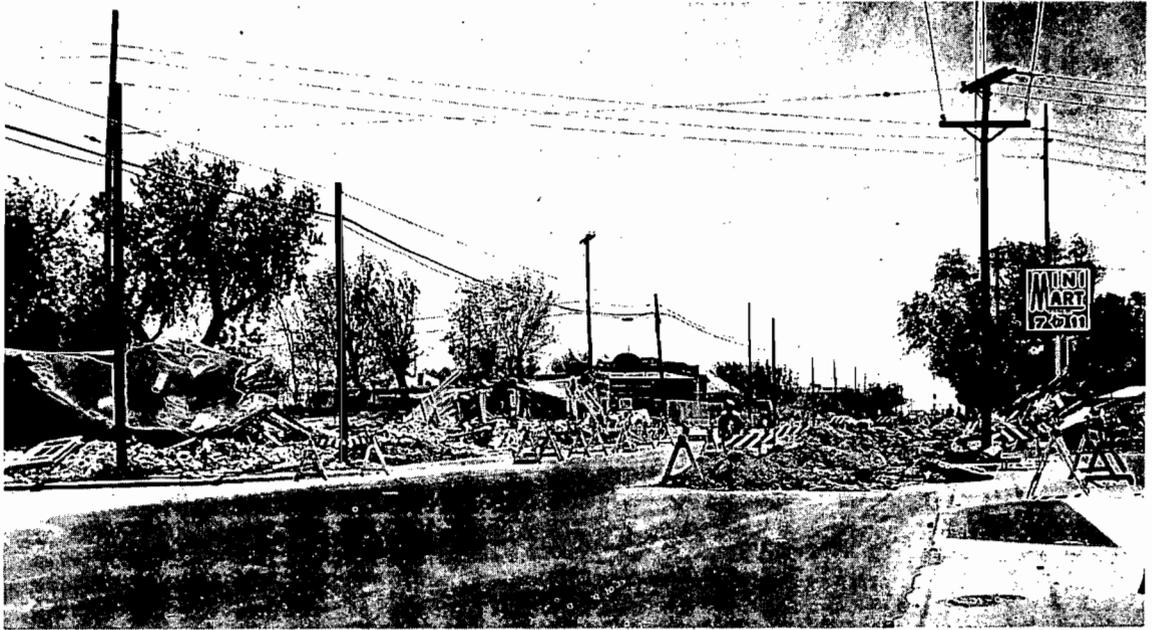


Figure 1. Accident site (picture taken facing south on Piedras Street).



Figure 2. The demolished apartments.



Figure 3. Approximate center of the blast.

area; 115 customers experienced service interruption. Service to most of these customers was restored later that evening.

#### Pipeline System

Southern Union operated a 6-inch cast-iron main which reduced to a 2-inch coated, wrapped and welded steel line to supply gas at 20 psig to this residential area, whose inhabitants included Spanish-speaking people. A 1½-inch service line carried the gas from the 6-inch portion of the main to the apartment house service regulator, where the pressure was reduced to approximately 1/3 psig. (See Figure 4.) From the service regulator a 1½-inch line carried the gas over the top of the apartment house and down the back where the line branched to the left and right. The line then extended above ground along the back of the L-shaped complex and was connected to gas meters at each apartment. The service line was neither installed nor owned by Southern Union.

The 2-inch steel line had been laid in 1946, whereas the 6-inch cast-iron main had been laid in 1957 as a replacement for a badly corroded steel line. A threaded cast-iron reducer connected the 6-inch main and the 2-inch line, and a 2-inch valve was screwed into the threaded end of the reducer. (See Figure 5.) Cathodic protection had been applied to this section of the distribution system in early 1973; readings of -1.10 milliamps were obtained on both sides of the leak area on the day of the accident. (Readings of -0.85 milliamps usually are considered adequate for pipeline protection.) At the time of installation, the 6-inch main and the 2-inch steel line had been pressure tested. The 2-inch line lay 24 inches below the pavement throughout the accident site.

Piedras Street, under which the gas main and steel line were installed, was heavily traveled. Construction had been going on south of the accident site, and trucks bringing supplies and equipment to the construction site passed southbound on Piedras over the gas main. The hole which had been dug up and backfilled 6 days before the accident had been beaten down by the traffic. Otherwise, the soil underneath the road at the accident site was composed of loosely compacted sand mixed with river silt from a nearby canal.

The apartment complex, reportedly built more than 50 years ago, had neither a basement nor a poured concrete slab for a foundation. Instead, the building rested on wooden beams laid on the ground, which created a closed-in air space underneath the building. The apartment had brown brick siding and a flat roof with individual chimneys for each family unit. The gas main on Piedras Street was about 50 feet from the front of the apartments. (See Figure 4.)

#### Events Preceding the Accident

Several tenants had smelled gas the day before the accident. One person didn't pay much attention to it, because he was on his way to

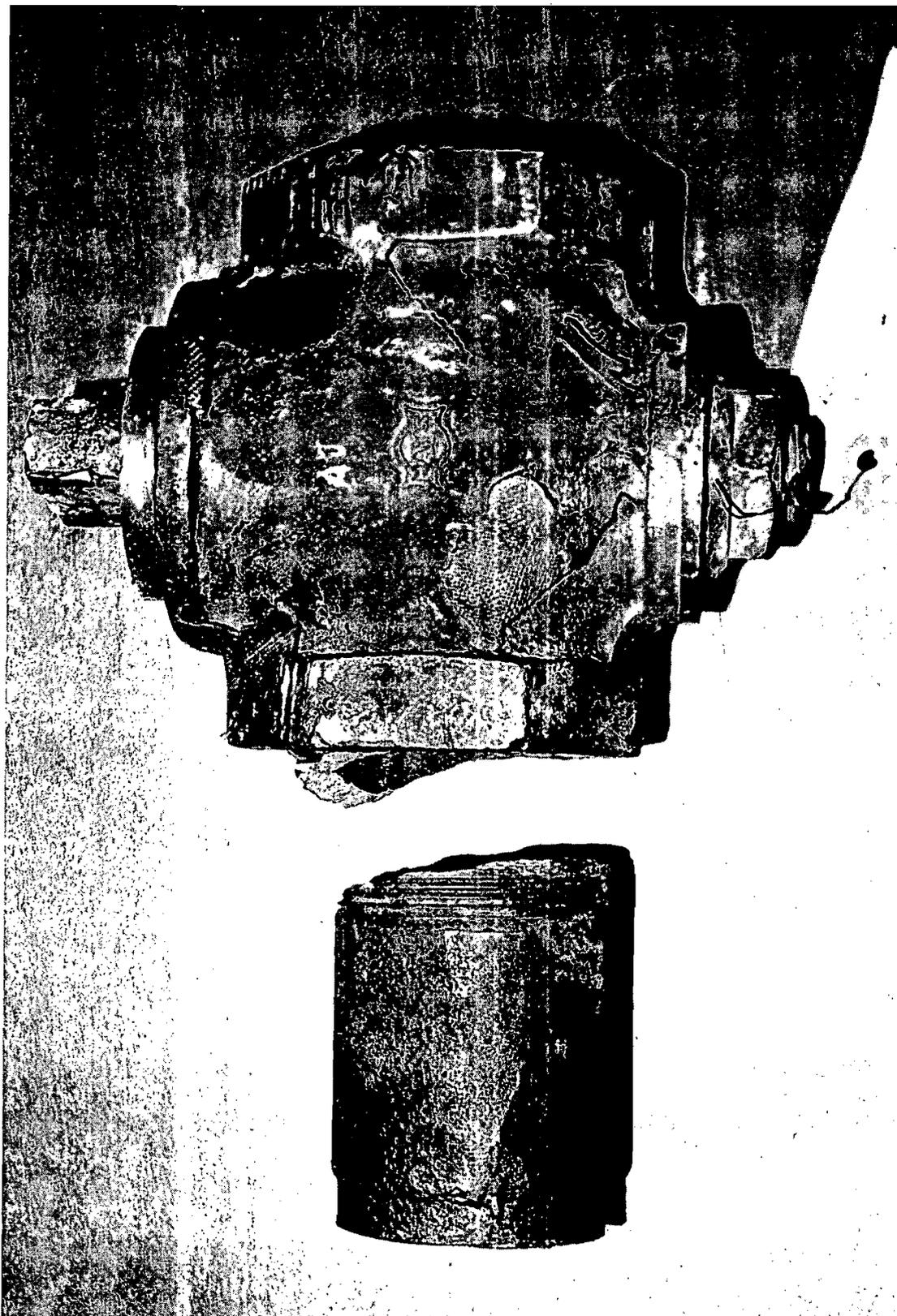


Figure 4. Accident site.

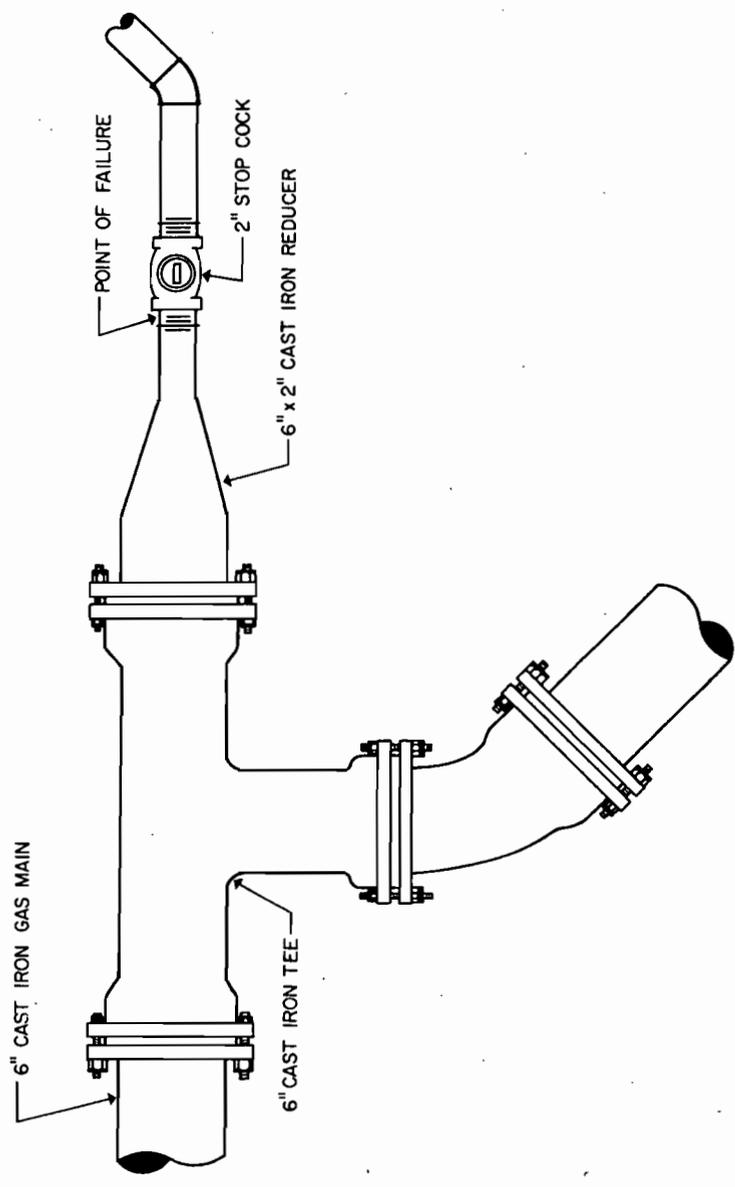


Figure 5. Diagram of failed pipe section.

work. Another informed the apartment superintendent but did not advise the gas company. The superintendent did not notify the gas company nor did the company receive any other complaints from the accident area until after the accident.

A tenant in one of the apartments had awakened about 6 a.m. to a strong smell of gas. He checked all the valves on the gas stove in the kitchen, found that they had been turned off, and then opened the front and rear doors to air out the rooms; as he returned to his bed the apartment exploded.

A gas leak survey of Piedras Street undertaken by Southern Union on March 9, 1973, showed that a gas leak did exist in the accident area. On Friday, April 13, 1973, 9 days before the accident, a construction and maintenance (C&M) crew was dispatched to the area to make a routine search for the leak. Test bar holes were made through the pavement at 10- to 20-foot intervals along the gas main. At the point of highest reading on the gas detector, the asphalt pavement was opened and the gas main was excavated. The deeper the excavation, the less gas was encountered; when the hole was left to air out the gas indication fell almost to 0. No leak, however, was discovered and because of a leak emergency in another sector of the city, the C&M crew backfilled the excavation and left to take care of the new emergency. No work was done in the accident area over the weekend, but on Monday, April 16, the site was opened up again and additional gas tests were made. The crew dug deeper and more fully exposed the 6-inch cast-iron main and reducer. In the process of fully exposing the reducer and the valve to check for leaks, the excavation was enlarged and deepened even further. As the digging continued, a second pipe was struck below the fittings. This created some confusion as to which was the active gas main. A check with the office showed that the lower pipe was the 6-inch steel line which had been replaced by the cast-iron main. There was some gas still left in the abandoned line, but this was not considered dangerous. Consideration was given to removing the abandoned line but it was decided that the line provided needed support for the cast-iron main. By this time a 17- to 20-foot-long hole had been dug, but only traces of gas were detected in the hole. The valve and reducer were soap tested for leakage but were found to be tight. The crew decided to look no further for the leak and proceeded to backfill the hole carefully. Dirt was tamped around and under the 8-foot unsupported pipe section, but no brace was placed under the piping. The rest of the hole was then filled, but the road surface was not paved. A leak report was sent into the Southern Union office with the notation "Unable to locate leak on 6" main." The crew foreman thought the gas came from the abandoned line and made no further effort to find the leak.

Weather. The weather in the El Paso area as recorded by the National Weather Service from April 18 through April 22 was clear and dry. The average ambient temperature for this period was 61.2°F. From

midnight through 7 a.m. on April 22 the temperature ranged between 49° and 51° F with 9- to 12-knot northerly winds.

Hazard warning to gas customers. In February 1972, Southern Union mailed a gas odorant sample folder with the gas bills to their customers in El Paso. In November 1972, another small folder was mailed to gas customers explaining what to do in the event of a gas leak. A small booklet, What Everyone Should Know About Natural Gas Safety, was distributed by Southern Union in 1971 and 1972 to approximately 22,000 customers. All of the material was printed only in English, and neither the two small folders nor the booklet contained any telephone numbers to call in the event of a gas leak.

#### Postaccident Activities.

Initially Southern Union personnel were not permitted in or near the destroyed apartment complex until its structural integrity was determined. Later the gas-company personnel used gas detection instruments and surveyed the entire area for gas indications. Bar test holes were drilled at intervals for 260 feet south along Piedras Street from its intersection with East San Antonio. Readings taken in these drilled holes at 9 and 10 a.m. ranged from a high of 40% near the intersection, to 0% at the canal. Additional bar test holes were drilled at intervals east along East San Antonio Avenue for 140 feet. Gas indications ranged from 60% near the intersection to 0% at the east end. Across the street from the explosion, bar test holes were drilled alongside a 6-inch gas main which extended in a southwesterly direction across Palm Street. Readings along this main ranged from 4% to 20%, 150 feet away from the leak. Gas indications of between 4% and 30% were obtained at the rear of an evacuated, but undamaged apartment house more than 200 feet from the leak. A test hole in the ground at the center of the destroyed apartment showed gas indications of 40% and 83%. At 2, 4, and 7 p.m., additional readings were taken in most of the test holes. Readings higher than those in the first check were obtained at the corner of Piedras and East San Antonio, and lower readings were obtained farther away. Natural gas in varying concentrations was still present 12 hours after the accident in the soil and beneath the street and the sidewalk for more than 300 feet in an east/west direction and 200 feet in a north/south direction. (See Figure 4.)

Southern Union excavated the 6-inch gas main and the 2-inch steel line for more than 100 feet through and beyond the hole dug earlier by the C&M crew. Three gas leaks were found: One, where the pipe threads had been broken on the cast-iron reducer at the point where it screwed into the 2-inch valve (see Figure 6); another, 21 feet south of the reducer, where corrosion had eaten a 1/4- to 3/8-inch diameter hole through the 2-inch steel line; and a third, still farther south, where a small pin-hole leak existed. The test bar holes made earlier by the C&M crew straddled the 1/4-inch corrosion leak. The test holes had been

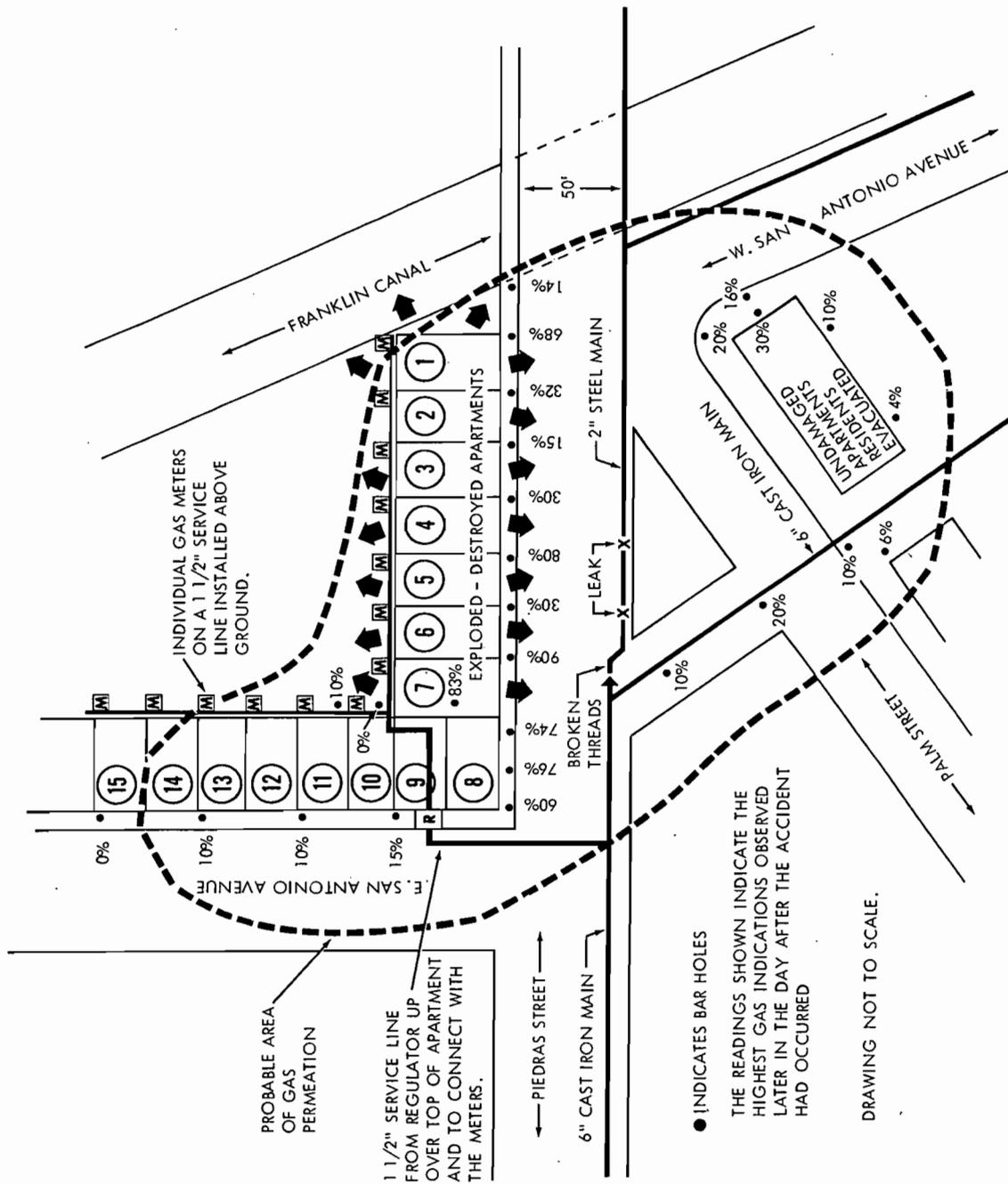


Figure 6. Broken threads at the 2-inch valve.

made about 10 feet on each side of the leak. The soil around the corrosion leak was whitish and was quite dry. The soil at the broken thread leak was not discolored and still had some moisture in it.

Both the large and small corrosion leaks were clamped, and the cast-iron reducer was removed and sent to an independent laboratory for analysis. The excavation was left open and additional equipment was brought in to aid in clearing the gas which had permeated the area. At a later date, Southern Union replaced 281 feet of the old 2-inch steel line through the affected area.

In addition to the three leaks found in the gas main, the low-pressure customer service line which lay aboveground behind the destroyed apartments was found to be badly pitted on the bottom. When this piping was removed during the cleanup, it buckled and broke.

#### Applicable Standards

Federal regulations. In 1946, when the 2-inch steel line was laid; and in 1957, when the 6-inch cast-iron main was laid, no Federal pipeline safety regulations existed. Current Federal regulations, included in 49 CFR 192, in effect at the time of the accident, cover the design, construction, testing, operation and maintenance of gas distribution systems. Certain requirements which are pertinent to the accident are cited below:

"Section 192.613 Continuing surveillance.

- (a) Each operator shall have a procedure for continuing surveillance of its facilities to determine and take appropriate action concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions.
- (b) If a segment of pipeline is determined to be in unsatisfactory condition but no immediate hazard exists, the operator shall initiate a program to recondition or phase out the segment involved, or, if the segment cannot be reconditioned or phased out, reduce the maximum allowable operating pressure in accordance with 192.619 (a) and (b)."

\* \* \* \* \*

"Section 192.615 Emergency plans.

Each operator shall

\* \* \* \* \*

- (d) Establish an educational program to enable customers and the general public to recognize and report a gas emergency to the appropriate officials."

\* \* \* \* \*

"Section 192.703 General.

- (a) No person may operate a segment of pipeline unless it is maintained in accordance with this subpart.
- (b) Each segment of pipeline that becomes unsafe must be replaced, repaired, or removed from service.
- (c) Hazardous leaks must be repaired promptly."

Metallurgical Analysis

The cast-iron reducer which had broken at the point where it screwed into the 2-inch valve was analyzed by an independent laboratory to determine the existence of any defects in the broken cast-iron reducer and to determine the type of failure.

Analysis showed that the reducer had been cracked in the thread root area at the point of contact with the 2-inch plug valve. The internal fractured surface was free of ordinary casting defects and a microscopic examination showed no casting defects that could have been the initiation point of the failure.

Physical and mechanical measurements of the reducer showed no physical or dimensional anomalies which would have caused the failure.

Macro and micro photographs were taken of the fracture surface, but no indications of segregation, porosity, inclusions, shrinkage, or metallurgical notches were observed.

Ultrasonic inspection of the metal adjacent to the fracture surface, which employed detailed microscopic scanning, showed no hidden defects. The reducer was also inspected for striations or indications of progressive or stepped-type failure, but neither was apparent.

The cast-iron reducer had sustained a brittle-faceted cleavage failure of a sudden abrupt type. Examination revealed that the origin of the failure was recent.

III. ANALYSIS

Source of Gas

Which of the three gas leaks was the major source of the gas that migrated and accumulated under the apartment house could not be determined. However, a number of events seem to point toward the broken cast-iron reducer rather than the corrosion leaks as the major source. Since the reducer had a relatively large open area, the circumferential crack at the threads in the reducer would have permitted considerably more gas to escape from the main than would the 1/4-inch-diameter corrosion leak. In addition, while the corrosion leaks must have existed for some time before the explosion, no odor of gas was detected at the apartment house

until 5 days after the cast-iron reducer was uncovered. The reducer is therefore considered to have cracked during that 5-day period.

The broken thread leak, which was recent, may have vented a portion of its gas up through the new and unpaved backfill. Much of the gas, however, migrated at 20 psig through the soil underneath the road pavement. Some gas also could have flowed alongside the service line of the demolished building, and some could have traveled along the outside of the 6-inch cast-iron main to the undamaged apartment house which fronted Palm Street. Although the thread break might have been only a few days or hours old, gas at 20 psig can and often does travel many feet quickly underground. The National Transportation Safety Board has pointed out this phenomenon in many of its recent Pipeline Accident Reports. 1/

The corrosion leak 21 feet south of the thread break was a second source of escaping gas. This was probably the leak which had been detected by Southern Union's leak survey crew more than a month before the accident. Gas from this 1/4-inch corrosion hole probably had been leaking at 20 psig for at least a month. This leak, unlike the thread failure, had been completely capped by the asphalt road pavement and the concrete sidewalks, but because the leak was smaller than the broken pipe more time was required for gas to accumulate. The gas had to permeate the surrounding area until it found a path of escape. One path of escape could have terminated under the apartment house, where gas could have accumulated in the open space and entered the building.

This leak may not actually have been a 1/4-inch hole while the line was in service. Hard corrosion products may have constricted the flow of leaking gas. Such constriction is a common phenomenon. These products would have been disturbed when the pipe was uncovered and cleaned after the accident, and the full hole thus would have been exposed.

#### Cast-Iron Fittings and Backfill Practices

The fact that the reducer was cast-iron, a material more brittle than steel, was a factor in the thread failure. If the reducer had been made of steel and thus had been more ductile and malleable, it might have

1/ For a more detailed discussion of the problem concerning gas migration see the following reports previously issued by the Safety Board: Washington Gas Light Company, Natural Gas Explosions at Annandale, Virginia, March 24, 1972, NTSB-PAR-72-4; Northern States Power Company, Lake City, Minnesota, October 30, 1972, NTSB-PAR-73-1; Lone Star Gas Company, North Richland Hills, Texas, October 4, 1971, NTSB-PAR-72-3; Lone Star Gas Company, Fort Worth, Texas, October 4, 1971, NTSB-PAR-72-5; and Atlanta Gas Light Company, Atlanta, Georgia, August 31, 1972, NTSB-PAR-73-3.

yielded without failing. The excavation of the cast-iron pipe and adjacent fittings and subsequent backfilling was a critical operation. Because the line had to be exposed completely and examined carefully to check for leakage, digging under the pipe was necessary. Once the pipe, which had been buried for years, was disturbed, it was difficult to replace and repack the soil under and around it to reproduce exactly the same support. An alternative would have been to replace the cast-iron fitting with a section of pipe of more ductile material; however, the need for such a precaution is difficult to judge on the spot.

Because the backfill in the excavation was not paved or temporarily covered by a steel plate, impact forces were transmitted to the piping by vehicles which traveled over the uneven interface between the permanent paving and the backfill. The magnitude of each impact would depend on the speed and weight of the vehicle and unevenness of the interface.

Neither Federal regulations nor ASME guidelines recommend that a pipeline operator replace or retain disturbed cast-iron piping. These repair procedures are left to the discretion of the individual pipeline companies; there is no technical source of accepted and approved practices. Recently backfilled areas contain voids into which the soil will ultimately settle. If pipe in these areas is not strengthened from below or protected from above, then the vibrations from traffic will be transmitted unabsorbed to the pipe, which will create a stress condition where perhaps none had existed before. This subject was discussed in detail in the Board's report of the Atlanta, Ga., pipeline accident of August 31, 1972. 2/

#### Leak Detection and Leak Location

Although the existence of a leak in this area had been detected a month earlier, it had not been located. The leak was probably the result of the 1/4-inch-diameter hole in the 2-inch steel line, and the indication that it gave was small. Leaks of this variety and in locations such as this are often difficult to locate. Southern Union should have followed up the report that the leak could not be located with an immediate investigation to determine the source of the leak, as required by 49 CFR 192.703(c). If the corrosion leak had been discovered at its location 21 feet south of the reducer before the excavation was made, it could have been repaired without disturbing the 6-inch main and the cast-iron fittings, and probably no thread failure then would have occurred. Most gas companies when confronted with a leak under a paved surface in a congested area continue to search for that leak until it is found. A more concerted leak search along the gas main in Piedras Street before any excavation was begun would probably have pinpointed this leak.

2/ Report No. NTSB-PAR-73-3.

### Gas Odorization and Public Education

Gas odors had been detected by some tenants at least a day before the explosion, but either through ignorance or indifference to the potential danger no one had alerted the fire department or the gas company. In the past, Southern Union had distributed gas educational material to their customers, but had not included a telephone number to call in the event of a leak. This omission could be the cause of a considerable delay on the part of someone who is trying to report a gas leak. In addition, the safety messages went only to customers and did not reach all persons who might be exposed to leaking gas.

The explosion occurred in an area where many Mexican-Americans resided. This should have alerted the gas company to print the gas educational material in Spanish as well as English. It is difficult to evaluate, however, whether this precaution would have helped in this particular case. Multilanguage advertising is conducted by other pipeline operators when significant segments of the community served speak and understand languages other than English. The problem of customer and public warnings was also discussed in the Board's report of the Annandale, Va., accident of March 24, 1972. 3/

#### IV. CONCLUSIONS

The National Transportation Safety Board concludes that:

1. The gas which accumulated under the apartment house floors had leaked primarily from a broken cast-iron reducer and to a lesser extent from two corrosion leaks in the gas main.
2. The cast-iron reducer failed in the threaded section because of lack of adequate support from below and repeated shock loads delivered by the heavy traffic above.
3. Southern Union did not properly follow up the report of its construction and maintenance crew that the reported leak could not be located.
4. Southern Union personnel failed to locate or to determine absolutely the absence of a leak in this area before they left the scene.
5. The tenants and the apartment superintendent who had smelled gas odors failed to report the condition to either the gas company or the fire department.

3/ Report No. NTSB-PAR-72-4.

6. The El Paso Fire Department and the Police Department combined effectively to evacuate the dead and injured, to reroute traffic in the area, and to maintain order.

7. 49 CFR 192.615(d) does not specifically require pipeline operators to use languages other than English in their customer education program.

8. Neither the Federal regulations nor industry standards provide guidance to pipeline operators concerning replacement or protection of disturbed cast-iron piping.

#### V. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the explosion was the ignition of an accumulation of natural gas which had leaked primarily from a broken cast-iron reducer and to a lesser extent from two corrosion leaks in the distribution main. The gas migrated beneath the concrete road surface, permeated the area, entered the apartment complex via the crawl space, and was ignited by an undetermined source.

The uncovering and disturbing of the cast-iron pipe by the gas company in an unsuccessful search for a gas leak 6 days before the accident contributed to the failure of the reducer.

Contributing to the loss of life and the property damage were the failure of the gas company to locate or to confirm positively the existence of a leak, and the failure of both the tenants and the apartment superintendent to notify either the gas company or the fire department of the gas odors which had been detected previously.

#### VI. RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The Office of Pipeline Safety of the Department of Transportation:

(a) Amend 49 CFR 192 to require that cast-iron piping or fittings uncovered during construction or maintenance work in such a way as to weaken their support from below be replaced or reinforced to protect against outside forces which could cause failure. (Recommendation No. P-74-10)

(b) Amend 49 CFR 192.615(d) to require that educational programs intended to enable customers and the general public to recognize and report gas emergencies be printed in English and in other languages which a significant portion of the community served speak and understand. (Recommendation No. P-74-11)

2. American Society of Mechanical Engineers Gas Piping Standards Committee develop guidelines for pinpointing the location of reported gas leaks. These guidelines should include procedures to determine the degree of hazard that exists as a result of the reported leak. (Recommendation No. P-74-12)

3. The Southern Union Gas Company:

(a) Instruct the maintenance crews concerning the hazards of inadequate support during the filling of recently excavated piping facilities. (Recommendation No. P-74-13)

(b) Improve followup procedures to assure that all reported leaks are located. (Recommendation No. P-74-14)

(c) Initiate a program of instruction for gas customers and the general public concerning the potential hazards of natural gas. This program should include mailing flyers to customers which include names and telephone numbers to be used in emergencies and placing educational material in the news media. This program should, where applicable, be bilingual to reach both the English and non-English speaking communities within the distribution systems. (Recommendation No. P-74-15)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED  
Chairman

/s/ FRANCIS H. McADAMS  
Member

/s/ LOUIS M. THAYER  
Member

/s/ WILLIAM R. HALEY  
Member

Isabel A. Burgess, Member, was absent and did not participate in the adoption of this report

February 13, 1974