

however, so will the number of fatalities among older people. In addition, a person aged 65 or older is more than three times as likely as a 20-year-old to die from serious injuries of equal severity.

Steps to better protect an older population would include adoption of mandatory safety belt laws by all states, design of more comfortable safety belts, review of federal crashworthiness standards for automobiles, and encouragement of older drivers to buy automobiles equipped with air bags.

## **Licensing and Roadway Design**

Despite the growing need to expand license screening tests because of the increasing numbers of older drivers, the committee noted that some states are now using or considering reduced screening methods, such as mail-in renewals, as cost-saving measures. The committee advised states to continue to require in-person license renewals at least every 4 years. All states, it added, should require a corrected visual acuity of at least 20/40 and should screen for losses in peripheral vision that commonly occur with age.

Roadway improvements to better accommodate older drivers might include larger, more reflective highway signs, greater use of designated left-turn lanes and signals, and better maintenance of roadway markings.

Although improvements in roadway design will help, the committee predicted that an increasing number of older people who are unable to drive safely will live alone in their homes and require transportation. Individual communities should work to improve access to public transit, subsidized taxi service, maintained walkways, or other alternatives to driving.

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# **Protecting Public Safety Near Pipelines**

## ***TRB Study Makes Recommendations for Public Safety and Private Practice***

NAN HUMPHREY

**P**ipelines are currently one of the safest modes of transporting vital supplies of natural gas, crude oil, and petroleum products. However, maintaining and improving this safety record challenge industry and public officials alike as development expands near major long-distance transmission pipelines and increases the risk of failures from excavation damage, already the leading cause of pipeline accidents.

The National Transportation Safety Board highlighted these concerns in recent accident investigations and recommended that the Transportation Re-

search Board undertake a study of the adequacy of public policies to protect public safety near pipelines. In response to this request, TRB formed a committee of experts in pipeline operations, accident analysis, land use planning, and safety program management (see box on page 10), and funded a year-long study to examine measures for enhancing public safety near pipelines. Under the leadership of John W. Fuller, Professor of Economics, Geography, Urban and Regional Planning at the University of Iowa, the committee compiled a synthesis of measures used by government and industry to address the safety risks posed by development near

transmission pipelines and recommended ways to strengthen public policies and private practices.

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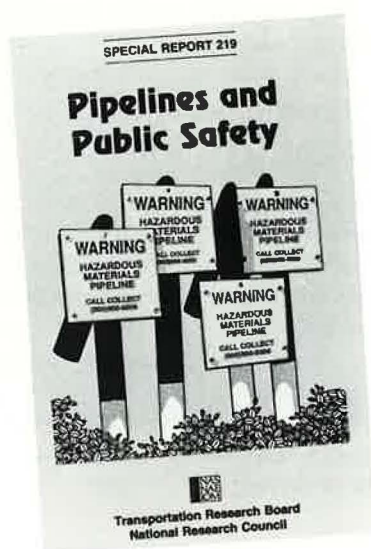
### **Safety Record of the Pipeline Industry**

The safety record of pipelines compared with that of other modes of transporting hazardous materials, such as rail and truck, is good, although the perception of risk is heightened by the severity of some pipeline accidents.

Between 1971, the first full year of federally required reporting, and 1986,

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operators of liquids and gas transmission and gathering pipelines reported 10,000 failures. Over this 16-year period, total reported failures resulted in estimated property loss of \$300 million (in 1986 dollars), commodity loss of nearly 5 million barrels of crude oil and petroleum products plus an unquantified amount of natural gas. A small fraction of these incidents resulted in injury or loss of life; 3 percent of reported failures accounted for all 770 injuries and 178 lives lost from pipeline accidents between 1971 and 1986.

The single largest cause of pipeline accidents (see Figure 1) is damage to the lines from outside forces, that is, from inadvertent excavation near the

lines (which accounts for more than two-thirds of these incidents) and, to a far lesser extent, from natural forces such as land subsidence. Corrosion is the second major cause of failure, followed by construction and material defects, and other miscellaneous causes.

Because development of residences, work places, and shopping areas near once-isolated transmission pipelines may increase the risk of damage to pipelines from excavation and construction activity, the study focused on ways to reduce human intrusion on pipelines, the leading cause of accidents, through damage prevention programs and land use measures. Because development would also bring more people and property in contact with pipelines, the study also addressed ways to mitigate the consequences of pipeline failures from all causes through emergency preparedness measures.

### Recommendations for Enhancing Pipeline Safety

A wealth of policies and practices are available to enhance public safety near pipelines but these measures are unevenly applied throughout the country by government and industry. Although the safety record of the pipeline industry does not warrant massive expenditures in new safety initiatives, opportunities were identified for improvements in safety commensurate with expected benefits. Recommendations for improving practice are highlighted in each of the three areas examined by the study.

### Damage Prevention and Public Awareness Programs

Government and industry have concentrated on damage prevention and public awareness programs as the primary tools for averting pipeline damage from excavation. The most common measures are (a) state damage prevention statutes that require contractors to notify pipeline operators and other affected utilities of intended excavation and (b) industry-sponsored one-call systems that provide a mechanism for coordinating notification and utility location. Thirty-eight states and the District of Columbia have passed damage prevention stat-

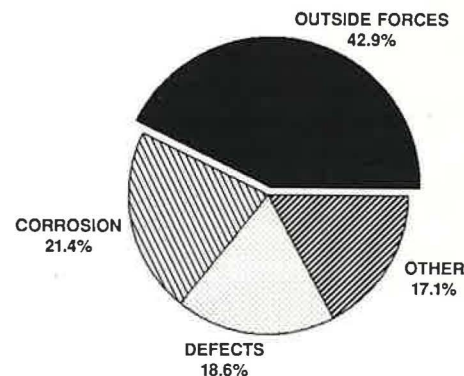


FIGURE 1 Distribution of liquids and gas transmission and gathering pipelines, 1971-1986. (Sources: Annual Report on Pipeline Safety, Office of Pipeline Safety, 1971-1985; and Hazardous Materials Information System, Research and Special Programs Administration, U.S. Department of Transportation, 1986.)

utes; approximately 100 one-call systems are operating in 47 states and the District of Columbia.

The committee concluded that damage prevention programs are a fundamentally sound strategy for addressing one of the leading causes of pipeline accidents, but recommended several measures to broaden the scope and strengthen the enforcement of existing programs, including

- Extension of existing federal regulations that require gas pipeline operators to develop damage prevention programs to liquids pipeline operators;

### Committee for Pipelines and Public Safety

JOHN W. FULLER, The University of Iowa, Iowa City, *Chairman*

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CAROLYN R. MANCHESTER, Fairfax County Office of Comprehensive Planning, Fairfax, Virginia

ROGER G. RYMAN, Shell Pipe Line Corporation, Houston, Texas

CEDOMIR M. SLIEPCEVICH, University of Oklahoma, Norman



- Federally required participation of pipeline operators in one-call operations, which would meet minimum standards, such as those already established by industry sponsors; and

- Universal enactments by the states of damage prevention statutes, incorporating measures for improving compliance and enforcement.

### Land Use Measures

Land use measures to control development near pipelines represent an important area for preventive action because development has not yet intruded on the majority of transmission pipelines. Currently, only about 16 percent of natural gas transmission pipelines and 13 percent of liquids pipelines are located in areas with high building densities.

The study suggested several measures for preventing land use conflicts near pipelines through

- Pipeline operator right-of-way protection and management programs and more active company consultation with local planning and development officials in rapidly growing areas.

- State and local statutes prohibiting the construction of structures on pipeline rights-of-way.

- Adoption of procedures that require pipeline operator review of development plans for all properties that have a pipeline easement (see Figure 2) and preparation of planning guidelines for safely integrating pipelines into development projects.

Developing uniform standards for building setbacks from pipelines and limiting specific land uses near pipeline rights-of-way were also considered, but the committee concluded that differences in local circumstances require local determination of appropriate standards.

### Emergency Preparedness Programs

Despite preventive action, pipeline accidents cannot be avoided entirely. The severity of pipeline accidents, however, can be mitigated by the timely and

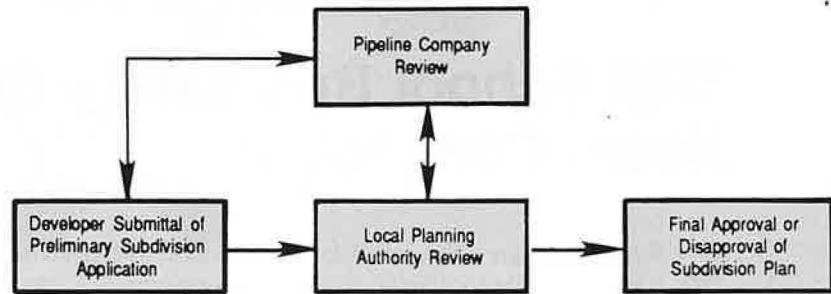


FIGURE 2 Typical review and approval process for subdivision plans that include pipeline rights-of-way.

informed response of local public safety officials working in cooperation with pipeline operators. An important gap in planning for pipeline emergencies is contact and coordination between the two parties. Federal regulations require pipeline operators to develop procedures for handling emergencies, but often the pipeline operator is not the first to identify or respond to an accident. Because pipeline accidents are infrequent, local governments are reluctant to devote limited resources to planning for a low-probability event.

Several measures were suggested for improving current practice, including

- More specific federal guidelines to assure that pipeline operators, at a minimum, provide emergency contact numbers as well as pipeline location and product information to local fire departments.

- A greater state role in coordinating the collection and distribution of this information and in establishing centralized or regional emergency communications systems for reporting and receiving information about pipeline accidents and appropriate response measures.

- More coordination with existing emergency planning and training programs to include information on handling pipeline accidents.

Widespread adoption of the recommendations contained in this study should improve communication among the key parties involved in preventing or responding to pipeline accidents and help ensure that the industry's good safety record can be maintained and improved in the future.