st d not to exceed the penalty provided above or 10 times the amount of additional excavation or demolition costs which such person could have incurred when in compliance.[29] Provisions are provided which stop or prevent negligent or unsafe excavation or proposed excavation work.

The National Association of Regulatory Utility Commissioners' Gas Committee is also preparing a composite statute based on proposed and existing State laws and on the OPS model statute.

V. CONCLUSIONS

Pipeline accidents caused by excavation and construction activities, including blasting, can be prevented. Although new technological advancements and new concepts should be developed, the hardware and the knowledge currently available in many parts of the country can be used to reduce the number of excavation-damage acci-

The major effort must come on the local

The operators of all underground systems must work together with local government officials, contractor associations, individual contractors, State officials, planners, and developers. The first step in achieving cooperation is generally the formulation of a Utility Coordinating Committee in a local area. In many instances, these committees will need guidance and a background of local and State laws and regulations to assist them in preventing damage during excavation activities.

Guidance and assistance could come from statewide coordinating committees and even a national organization of Utility Coordinating Committees, which could help distribute information concerning the latest techniques and methods of preventing damage. Regulatory measures should require notification of excavation work and should be sufficiently flexible to permit the operators of underground systems to establish convenient methods of receiving

ification. Penalties should be adequate to deter potential violators and to encourage cooperation by all parties concerned.

Regulatory measures alone will not prevent damage. The OSHA regulations, if complied with by the excavators, might be all that are needed. Statutes and regulations must be augmented by on-going damage-prevention programs of the pipeline operators. These programs must be given priority and must provide the rapid service that the excavator needs to avoid damaging an operator's facilities. The assistance of the excavator and his machine operator in determining methods of and cooperation in avoiding damage should be enthusiastically sought. They should be educated as to the damage and loss of life which they can cause and should be given as much assistance as necessary to help them avoid hitting a pipeline. On the other hand, both contractors and machine operators should be licensed and have their licenses revoked if they will not cooperate and if they continue to cause accidents. A concerted effort by all parties involved can drastically reduce the number of excavation accidents.

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 and 49 CFR 195 to require each pipeline operator to establish a program for the prevention of excavation-type damage to its underground facilities.[5] (Recommendation No. P-73-12)
   (b) Revise its methods of summarizing the reports of individual gas pipeline leaks and failures to show clearly those accidents resulting from excavation activities. (Recommendation No. P-73-13)

[5] This recommendation is similar to Recommendation 1(a) in the Burlington, Iowa, pipeline accident report (See Reference 3)

(c) Amend CFR 192 and 49 CFR 195 to require that consideration be given during the design of pipelines to prevention of damage to them in the future, especially in locations where later excavation might be expected. (Recommendation No. P-73-14)

2. The American Public Works Association:
   (a) Encourage its local chapters to establish Utility Coordinating Committees in all urban and suburban communities where effective committees are not currently in operation. (Recommendation No. P-73-15)
   (b) In regard to Recommendation 2(a), develop guidelines that will assist communities to develop systems, procedures, and organizational arrangements for coordinating and regulating the activities of all parties working near underground facilities. (Recommendation No. P-73-16)
   (c) Encourage its local chapters to adopt standards which show the desired locations for all facilities installed below ground. (Recommendation No. P-73-17)
   (d) Develop standard colors for identifying underground facilities to be used for temporary marking and staking by operators of such facilities, and urge local chapters to support adoption and use of these standard colors. (Recommendation No. P-73-18)
   (e) Coordinate, with support from the groups which participated in the Safety Board's April 18, 1972 symposium, the establishment of a national organization of Utility Coordinating Committees. (Recommendation No. P-73-19)

3. The National Association of Regulatory Utility Commissioners:
   (a) Urge its member commissions to encourage the establishment of local and statewide Utility Coordination Committees where non exist. (Recommendation No. P-73-20)
   (b) Urge its member commissions to propose and support legislation that will help prevent damage. (Recommendation No. P-73-21)
   (c) Urge its member commissions to propose and support legislation requiring persons planning to excavate, and operators of excavation equipment to be licensed. (Recommendation No. P-73-22)

4. The American Society of Mechanical Engineers Gas Piping Standards Committee:
   (a) Develop guidelines that can be followed by gas pipeline operators during design and installation of piping systems, with emphasis on prevention of future excavation damage. (Recommendation No. P-73-23)
   (b) Develop guidelines to assist gas pipeline operators in establishing excavation damage prevention programs. (Recommendation No. P-73-24)

5. The American National Standards Institute Section Committee for Liquid Petroleum Transportation Piping Systems (ANSI B31.4) include in its standards the requirement that consideration be given, during design and installation of liquid piping systems, to avoiding future excavation damage. (Recommendation No. P-73-25)

6. The American Petroleum Institute develop guidelines to assist liquid pipeline operators to establish excavation-oriented damage prevention programs. (Recommendation No. P-73-26)

7. The American General Contractors of America and the International Union of Operating Engineers develop guidelines to be used by contractors and machine operators prior to and during construction,

'h emphasis on prevention of damage to derground facilities. (Recommendation No. P-73-27)

8. The American Gas Association and the Independent Natural Gas Association of America design a standard gas pipeline marker that can be utilized by all gas pipeline operators to mark the location of their transmission pipelines. (Recommendation No. P-73-28)

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 not present and did not participate in the adoption of this report.

June 7, 1973