

and given management a chance to correct them before the accident occurred.

The systematic approach can be carried through for the total operational life of a pipeline system since it can be used during the design stage and in the operation and maintenance of existing systems.

VII. RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The American Society of Mechanical Engineers Gas Piping Standards Committee develop guidelines for the use of systems analysis by gas distribution and gas transmission pipeline operators. These guidelines should serve a similar function for gas pipeline systems as the Military Standard, *Requirements for System Safety Program for Systems and Associated systems and Equipment* (MIL-STD-882),

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s for military systems. These guidelines should cover the full life cycle of a gas pipeline system and be applicable to the design of new pipelines as well as to the operation and maintenance of existing pipelines. This work should be undertaken with the cooperation of the American Gas Association.

2. Each gas pipeline operator review his operation with a view toward instituting a more systematic and authoritative approach to understanding and controlling hazards, not only for new projects, but for day-to-day operations and maintenance. The guidelines developed by the Gas Piping Standards Committee should be used to set up individual system safety programs.

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3. The American Petroleum Institute develop guidelines for the use of system safety by liquid pipeline operators. These guidelines should serve a similar function for liquid pipeline systems as

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the Military Standard, *Requirements for System Safety Program for Systems and Associated Subsystems and Equipment* (MIL-STD-882), does for military systems. These guidelines should cover the full life cycle of liquid pipeline systems, and be applicable to the design of new pipelines as well as to the operation and maintenance of existing pipelines. This work should be undertaken with the cooperation of the American National Standards Institute Section Committee for Liquid Petroleum Transportation Piping Systems (ANSI-B31.4).

4. Each liquid pipeline operator review his individual operations with a view toward instituting a more systematic and authoritative approach to understanding and controlling hazards, not only for new projects, but for day-to-day operation and maintenance. The guidelines developed by the American Petroleum Institute should be used to set up individual system safety programs.

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5. The Office of Pipeline Safety of the Department of Transportation encourage the use of the systematic approach to safety by gas pipeline operators, in general, especially in their compliance with Title 49, Paragraph 192.605, *Essentials of Operating and Maintenance Plan*, of the Minimum Federal Safety Standards - Transportation of Natural and Other Gas by Pipeline.

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6. The Federal Railroad Administration encourage the use of the systematic approach to safety by liquid pipeline operators, in general, but especially in their complying with Paragraph 195.402 of the Title 49, Transportation of Liquids by Pipeline. This paragraph requires written procedures for ensuring safe operation and maintenance of pipeline systems during normal operations and during abnormal and emergency situations.

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