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SEISMIC SCIENTIST

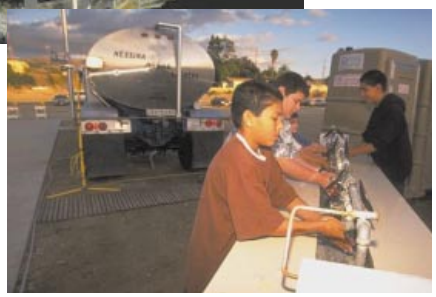
by Ron Meis-S.E., University of Nevada, Reno, Nevada and Drew Leander, Ford Meter Box

Pipelines transporting water, gas, or volatile fuels are classified as part of the infrastructure "lifeline" system and are critical to the viability and safety of communities. Disruption to these lifelines can have disastrous results, either in the threat they pose in the release of natural gas or flammable fuels, or in the restriction of needed water required for domestic use or to fight fires.

Scientists around the world have documented that pipelines have been vulnerable to damage from failure when subjected to seismic motions. Three of the last major world earthquakes that have been extensively studied include the Loma Prieta (San Francisco) earthquake in 1989, the Northridge (Southern California) earthquake in 1994, and the Kobe (Japan) earthquake in 1995. Scientists noted that a large number of pipeline failures were due to pull-out of unrestrained pipe joints. The use of commercially available joint restraint devices can greatly increase the pipe joint's capacity to resist pull-out and decrease the probability of joint failure.

Property damage was wide spread throughout the area

Extensive damage to bridges caused severe traffic problems



Children clean up at a portable hand wash station

Northridge, California Earthquake damage - 1994
From Federal Emergency Management Agency / www.fema.gov

In an effort to better understand the dynamics of our lifelines during an earthquake, Ron Meis has been trying to break mechanical restraint devices to simulate earthquake damage. Ron is a structural engineer at the University of Nevada in Reno, Nevada.

Meis and his staff built a self-contained steel loading frame that allowed a hydraulic actuator to apply axial (straight) compression and tension load to the pipe and pipe joints. Strain gauges were attached to each end of the pipe to monitor force levels and displacements of the joints. The pipe was loaded with 4 psi of water to monitor when significant leakage occurred.

After applying the actuator to restrained and unrestrained pipe, Meis and his staff came up with some interesting results. Without any type of restraint, pipes came apart in as little as 1000 psi of axial movement. With restraint applied, this number was as high as 50,000 psi of axial movement. It was established that unrestrained joints have a very low capacity to resist tension pull-out and are vulnerable to pull-out failure from seismic motion. Restraining devices can significantly increase the joint's capacity to withstand pull-out failure and decrease the probability of joint failure. Meis sums it up this way; "Having some sort of mechanical restraint on pipe joints during an earthquake can be akin to brakes on a car. Having some brakes or bad brakes is much better than no brakes."

The Ford Meter Box Company/Uni-Flange offers a wide variety of mechanical restraints that are available from your Authorized Ford Meter Box Company Distributor.

The Ford Meter Box Company, Inc. P.O. Box 443, Wabash, Indiana, USA 46992-0443
Telephone: 219-563-3171 / FAX: 800-826-3487 / Overseas FAX: 219-563-0167 / Internet: www.fordmeterbox.com