

ABS AND PB FAILURES IN CALIFORNIA

SCOPE OF REPORT

This report represents a preliminary survey of residential units with defective acrylonitrile-butadiene-styrene (ABS) and polybutylene (PB) pipe in the State of California. "Failure" of ABS and PB pipe is defined as leakage or breakage prior to warranty expiration. For the purposes of this report, the survey was conducted using available court records and telephone interviews with attorneys, plumbing and construction companies and local government officials. The findings are based on those installations of ABS or PB plumbing where there was readily available data on failure rates. The survey also attempted to determine the type of failure, as well as the costs and materials used for repair.

The data is by no means complete. Neither time nor resources permitted systematic investigation of installations of ABS or PB plumbing on a county-by-county basis. In some instances, restrictions imposed by pending or concluded litigation prevented data collection. Attorneys either fear the breakdown of settlement negotiations, or discussion is forbidden under the terms of a settlement agreement. In other cases, the unwillingness of developers, contractors or plumbers to publicly discuss failure rendered data unobtainable. They fear potential damaged business reputations and litigation.

SURVEY FINDINGS

This survey gathered data on two categories of failure: number of housing units or water distribution hookups and number of failures at those sites. Failures were found in each residential project and water district surveyed. Only in a few of the projects was it possible to obtain the exact number of units in which the PB or ABS pipe failed. In many instances, information on the number of failures was available but not the distribution of failure among the units. Still other housing developments are known to have failed, but the number of failure or the distribution of failures could not be determined.

In two counties, Sonoma and Tulare, failures of PB have occurred at housing developments, but no further information was available. There are more units served by ABS and PB pipe than this survey identified. In many cases it was possible to locate sites where failures occurred, but neither the exact number of failures or number of units were determined. Thus the number of failures listed on the following tables are minimums, even within housing projects that were surveyed.

Additional information about the nature of the failures, extent and value of damage, costs of repair type of material used to repair or replaced the failed plumbing, status of litigation, identity of the principal parties involved and installation to failure timing was also sought.

The following tables summarize the findings to date:

Table I: Instances of Residential ABS and PB Failure

ABS

Total units in survey	:	8,345
Minimum number of failures identified	:	5,842
Specific units identified with failures	:	944
Units, with some failures, information incomplete	:	1,838

PB

Total units in survey	:	6,149
Minimum number of failures identified	:	1,186
Specific units identified with failures	:	718
Units, with some failures, information incomplete	:	2,684

Table II: Performance of the Polybutylene Plumbing System

First Failures Increased Failures Service Life

Fittings:	1st year	4 - 5 years	-----
Pipe :	1st year	7 - 8 years	-----
System :	_____	_____	-----

Table III: Residential Projects with PB Failures by County

<u>County</u>	<u>Total Units</u>	<u>Units with Failures</u>
San Diego	650	198
Santa Clara	2,500	500

RATE OF POLYBUTYLENE FAILURE

First advertised and sold with a 50-year warranty, manufacturers of polybutylene plumbing, according to legal documents, reduced it to a 25-year warranty. Despite guarantees, polybutylene pipe and the fitting used in the systems have shown breakdown within a few years of installation. In some cases, including the North Marin Water District, polybutylene systems fail at 10 times the predicted rate for copper pipe.

The polybutylene plumbing systems succumb to excessive fitting and pipe failures. Failure of the PB pipe fittings increase significantly 4 to 5 years after installation. Massive PB pipe failures appear 7 to 8 years after installation. Although both types of failures develop within the first year of use, a significant increase is observed after a short but predictable period of time. Very few locations still have PB pipe or fittings in place after 8 years.

DISTRIBUTION OF POLYBUTYLENE FAILURES

The greatest concentration of interior residential installations discovered were in San Diego and Santa Clara counties. Applications include interior residential plumbing and main-to-meter hookups. The plastic pipe was installed in new homes and apartment buildings built between 1978 and 1984. In many cases, and in all the affected water districts, copper pipe is being used to replace polybutylene.

San Diego County (residential): Polybutylene plumbing systems were installed in 2,477 single family houses and apartments from 1978 to 1986. At least 477 failures were identified in 198 dwellings. These dwellings are in housing developments totalling 650 units. There are an additional 1,448 units with failures, of which the number of failures and the corresponding number of units in which they occurred was not determined. A minimum of 215 units out of 2,477 surveyed experienced failures. The minimum number of failures for these corresponding units is 580.

Santa Clara County (residential): Polybutylene plumbing systems were installed in 3,300 units beginning in 1974. Failures of PB occurred in 500 out of 2,500 residences surveyed. There was an additional 800 units for which the exact number of failures and the corresponding number of units in which they occurred is not known at this time.

Other counties (residential): Residential projects with PB plumbing were located in four additional counties: Kings, San Luis Obispo, Sonoma and Tulare. A total of 400 units were identified in housing developments with incidents of polybutylene failure in Kings and San Luis Obispo counties. The number of failures and corresponding units with failures was not available. Residential developments in both Sonoma and Tulare counties were reported to have failures. This survey did not secure figures for the number of units in the projects, the number of failures or the distribution of affected units.

Ventura County (main-to-meter): The Camrosa County Water District installed 3,000 polybutylene lines over a period of nine years beginning in 1974. There have been over 200 failures. In addition, 25% of polybutylene pipe developed cracks. The district is no litigating over the failures.

Marin County (main-to-meter): North Marin Water District installed 6,000 polybutylene lines between the years 1971 and 1985. 600 lines have failed. The district is now litigating over the failures.

Santa Clara County (main-to-meter): The City of Morgan Hill began installation of polybutylene lines in 1974. It experiences between 400 and 500 failures per year, more failures than it has service lines. The district is now litigating over the failures.

NATURE OF POLYBUTYLENE FAILURES

The problems with PB pipe have appeared in the pipe itself and in its fittings. Unlike copper, PB pipe appears to lose its strength at the standard residential hot water temperature of 140 degrees. In recirculating water systems, where the temperature is maintained at a constant level, a higher percentage of failures have been discovered.

Types of fittings failures include: oxidation, cracks, separation at an elbow, loose joints, crimp rings that do not expand and contract, and snapped "T" fittings. The greatest number of plumbing problems result from acetal copolymer fittings made from a Celanese resin called Celcon. Companies identified as extruders, manufacturers or suppliers of components of failed polybutylene systems include: Mobil, Witco, Shell, Wesflex, Orangeburg, Clow, Western Products, Celanese, ABNI, Delta, U.S. Brass, Vanguard, Admiral Marine and Qest.

Dramatic incidents of pipe failure have occurred. Splits have caused pipes to burst, causing property damage. Other lengths of failed pipe display pin holes, shearing, breaks at the fitting, radial cracks at the fitting, as well as longitudinal cracks. Pipe and fitting degradation has been found in both hot and cold water lines. In general, a higher incidence of failure is observed with the hot water pipes. Yet cold water main-to-meter installations from the mid-1970s through the mid-1980s have presented serious problems: the Camrosa County Water District reports an 8% failure rate. The City of Morgan Hill reports several failures for each installation.

Fittings usually show the first sign of weakness. Some sites have experienced failure before construction is completed or within the first year. Over time, an increasing number of leaks appear, often reaching a dramatic number during the 5th and 6th years. If the entire polybutylene system is not replumbed at that point, the acetal fittings are replaced with copper. Few problem-plagued residential systems have remained in place beyond this period. During the 7th and 8th years, the pipe shows an increased rate of failure. At this time, most units are replumbed with copper.

RATE AND DISTRIBUTION OF ABS FAILURES

Defective ABS pipe is installed in a wide geographical region, including Monterey, Kern and Los Angeles counties. The greatest number of installation failures were found in Los Angeles. Pipe manufactured in 1985 and 1986 is particularly prone to failure. The failed pipe is manufactured by at least three companies: Centaur, Phoenix and Colby. Yet because Drain, Waste and Vent (DWV) pipe is buried in the ground or under slab, it is difficult to detect imperfections quickly. Once discovered, problem-prone pipe reveals dramatic numbers of failures. One contractor repaired 4,000 failures in 800 housing units. Another development with 2,000 units exhibited 1,200 failures.

Examination of failed ABS pipe revealed a variety of problems. The actual point of failure is often located at the glue joint. This may appear as a fracturing or a breakdown of the pipe due to solvent. The solvent contains methyl ethyl ketone (MEK). Pipe manufactured since 1985 has been found to develop leaks which reveal fracturing along the length of the pipe and weeping of liquid through the porous foam core.

The Los Angeles City Plumbing Inspection Department detected impurities in pipe that came directly from the factory, along with splits on the inside of the product prior to installation. Although ABS is supposedly made of virgin materials, the independent laboratory for the City of Los Angeles also found, through random sampling of failed pipe, that some ABS pipe included PVC plastic in its blend.

All the products were marked with the American Society of Testing and Materials (ASTM) stamp of approval.

ABS AND PB REPAIRS AND COSTS

The repair and replacement costs due to failed ABS or PB plumbing vary considerably from unit to unit. Repair costs may address a limited aspect of the system such as fittings replacement with either plastic or metal. Other repair costs reflect a system replacement with either plastic or metal plumbing. In residential projects with failed polybutylene, two retained the polybutylene pipe and replaced acetal fittings with metal. All other developments replacing polybutylene did so with metal, usually copper. Costs of damages and or repairs varied significantly, from \$200-300 per unit up to \$10,000 per unit. Complete replacement of PB systems with copper in San Diego County at Hillside Colony and in San Diego itself cost between \$2,500 and \$7,500 for each home.

Costs associated with repairs or damages associated with ABS systems ranged from \$100-500 per unit to \$75,000 per unit. A

lawsuit in Bakersfield against Parkside Partners concerning 242 units built with ABS DWV pipe resulted in damages of \$2.1 million.

Water-to-main service is costly when the repair is an emergency. Both the City of Morgan Hill and the Camrosa County Water District report average repair costs of \$15,000 per line. North Marin Water District damages and repair cost is \$5,000,000.

CONCLUSION

Plastic fittings for the polybutylene system are a weak link in a defective system. The overall system fails to meet the manufacturers warranty. First the fittings fail. Later the pipe displays an increasing number of failures. When the pipe itself begins to fail, homeowners tend to replumb water systems with copper pipe. This survey could not find a system remaining intact beyond 15 years.

It can take many years for leaks to be detected in ABS pipe because of the location of DWV pipe. ABS pipe installed in 1985 and 1986 has extensive failures. Reports of failures of recently installed pipe suggest that the problems associated with ABS pipe are not restricted to 1985 and 1986.

Clearly both types of pipe are prone to excessive failure.