

ALASKA LEGISLATURE COMMITTEE FILES 1985-1986 86/2

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339

were probably standard water pipe gaskets, not one of several specialized impermeable gasket materials which are available (8). For unjointed pipe, the toluene permeated PVC pipe within six weeks. Hexane and 1,1,1-trichloroethane did not permeate the unjointed PVC pipe during the 42 day test period. A summary of the results of these studies cited is presented in Appendix I along with the results of our investigation.

C. Study Objective

Several types of plastic pipe are used throughout the American System. PVC pipe is used occasionally for mains, and both PE and PB tubing are used in many locations for service lines from the main to the meter or curb. It is quite likely that all types of plastic pipe, i.e. PVC, CPVC, PE and PB are used in the System for customer service lines. Because of concerns over the permeation of service line by organic chemicals, the Materials Management Committee requested that System Water Quality conduct a research investigation.

The objective of the study was to determine the extent and nature of permeation of several different organic compounds through the types of service line material in use in the American System. Service lines were examined, rather than mains, because the greater surface area to water content ratio in the smaller diameter service line will make the impact of any permeation more severe. Perhaps more significant, the daily static water conditions experienced in residential service line would magnify the impact of any permeation. Additionally, plastic pipe materials

are more widely used for service lines than for distribution mains.

SUMMARY OF RESULTS

1. Iron and copper pipes were not permeated by any of the organic contaminants (TCE, chlordane, and gasoline) in either the soil or the vapor environments.
2. PE pipe was permeated by TCE within 1 week in both the soil and vapor exposures. Gasoline permeation occurred within 1 day in the vapor and 3 weeks in the soil exposure. The chlordane did not permeate the PE pipe.
3. PB pipe was permeated by TCE and gasoline within 1 day and not by chlordane within 10 weeks. Results were the same in both the soil and vapor environments.
4. CPVC pipe was permeated by TCE within 1 day in the soil environment and not until 14 weeks in the vapor environment. Gasoline permeation occurred within 6 weeks in the soil environment and not at all in the 14 week vapor exposure. The chlordane did not permeate the CPVC pipe.

RECOMMENDATIONS

As a result of this investigation it is recognized that certain organic chemicals will permeate the plastic pipe materials used within the water works industry. Consequently the following recommendations are made:

1. As a follow-up to this investigation sampling for organic contamination should be carried out at multiple specific locations where plastic service lines are being used (Water Company and/or customer) and the potential for ground contamination is high, e.g. gasoline service stations. Sampling should also be conducted at industrial locations where organic vapors may permeate customer plastic plumbing.

The purpose of this work is to evaluate the susceptibility of plastic pipe in current use. The work could be carried out by System Water Quality at a selected company within the System.

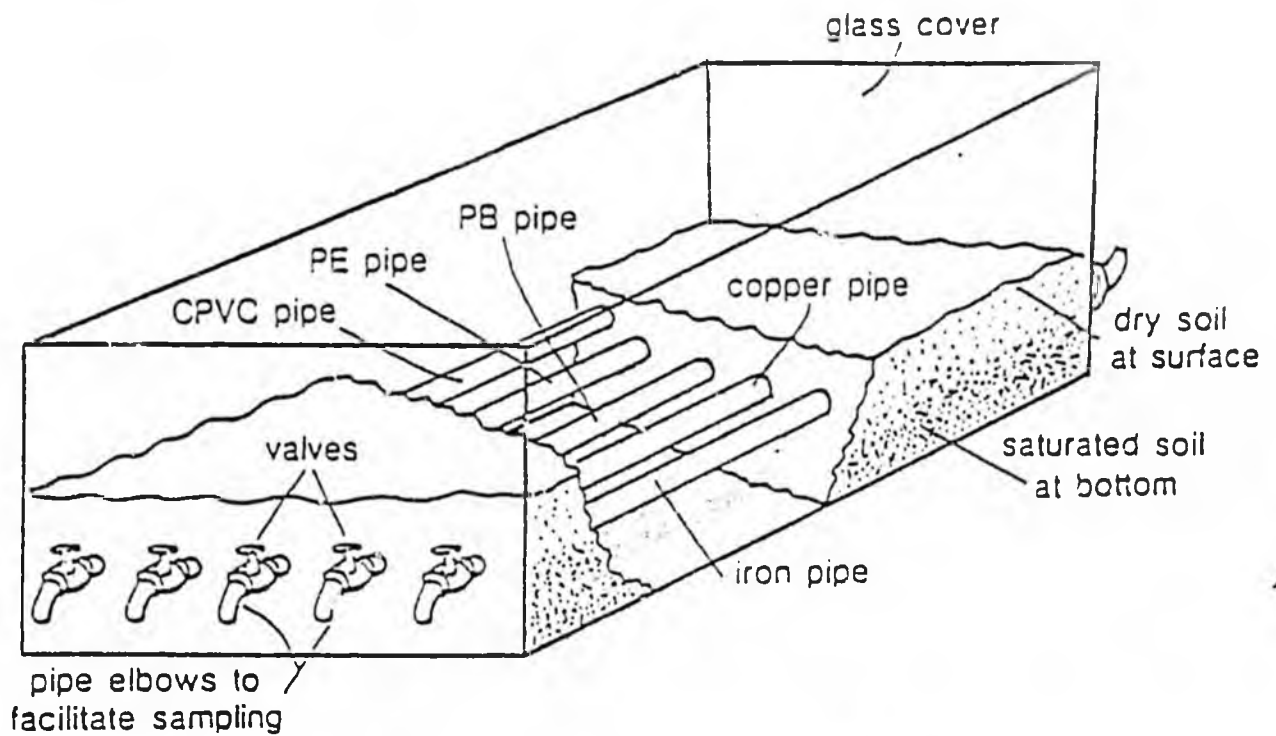
2. A policy concerning the use of plastic materials for service line should be developed for use within the American system. The policy should address the types of pipe used and any limitations on their use as a result of potential permeation or pipe damage from ground contamination.

EXPERIMENTAL

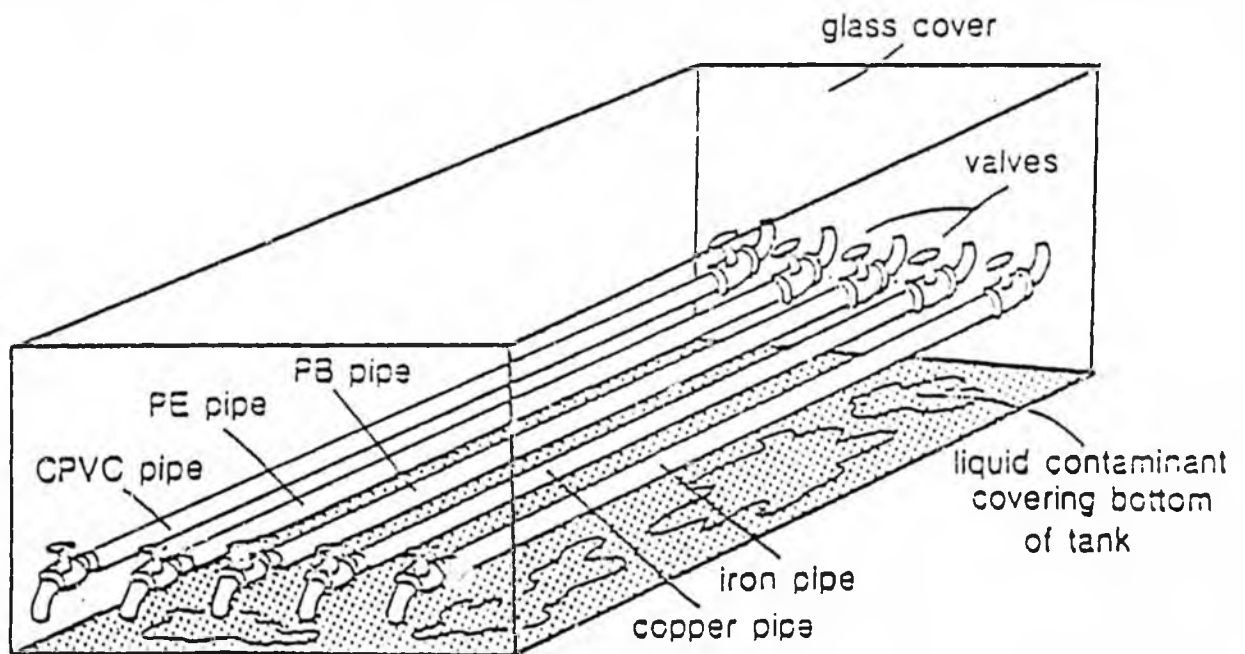
A. General Description

The objective of this study was to understand the extent and nature of the permeation of various organic chemicals through service line materials. The conditions of exposure were designed to simulate worst case field conditions. Because of concerns over the effects of industrial environments on plumbing materials two exposure tanks were used. One involved exposure of the five different pipe materials to a vapor environment. The second was performed separately but concurrently with exposure of the five different pipe sections to a moist soil environment to which sufficient contaminant was added so the pipe was above the saturated soil, yet still within the moist capillary zone. Three organic compounds (gasoline, trichloroethylene and chlordane) were investigated separately in each study. The contaminated environment (and the pipes) was contained in enclosed glass tanks, with the pipes extending through the end walls of the tanks (see Figure I).

Each phase of the project (gasoline, chlordane and trichloroethylene) lasted for a minimum 10 week exposure with water samples analyzed at 4 intervals during the exposure period. The pipe systems were all unjointed 3/4 inch lines filled with tap water. After each exposure interval the pipe contents were removed for analyses, and fresh tap water was again placed in each pipe for the next exposure interval. Plastic pipe materials were also used for controls by placing PB, PE and CPVC pipe sections



Soil Exposure Tank



Vapor Exposure Tank

Figure 1: Glass Pipe Exposure Tanks

outside the contaminated environment. These were sampled in an identical manner to the exposed pipes.

3. Pipe Materials

The following pipe materials were used for the study:

1. Iron, 3/4 inch galvanized.
2. Copper, 3/4 inch rigid.
3. Polyethylene, 3/4 inch, 100 psi pressure rating, standard dimension ratio 15, material:PE3408 meeting ASTM specification D2239.
4. Polybutylene, 3/4 inch, standard dimension ratio 13.5, 160 psi pressure rating, meeting ASTM specification D2666.
5. Chlorinated poly(vinyl chloride), 3/4 inch, standard dimension ratio 11, 100 psi pressure rating at 180 degree F, NSF approved for potable water, meeting ASTM specification 2846, manufacturers code 0283021E1.

The iron and copper pipes were flushed with hot tap water at the completion of each phase. The plastic pipes were replaced with new pipe for each phase of the study. Three control pipes (CPVC, PE and PB) were placed outside the tanks and sampled in an identical manner.

C. Exposure Tanks

The exposure tanks were 15 gallon capacity glass tanks with plastic frames. 5 holes were drilled 3 inches off of the bottom in each end to allow passage of the test pipes. The pipe holes were initially sealed with a latex caulk. A silicone caulk was used in the second (chlordanane) phase, and a "Permatex" caulk was used in the gasoline experiments after the silicone leaked. The tanks were covered with a glass top which was sealed with a rope caulk.

The soil exposure tank was filled with approximately 5 inches of native Illinois soil to provide approximately 2 inches of cover above the pipes.

D. Test Compounds

The compounds used in the investigation during the three phases were as follows:

Phase I - Trichloroethylene, 98% purity

TCE is a member of a family of unsaturated chlorinated aliphatic compounds. It is a solvent widely used in the industrial degreasing of metals. 1983 production was estimated at 130,000 metric tons per year. It is often used in small industrial operations and thus, combined with its relatively high occurrence in groundwater when compared to other synthetic organics, was the basis for its selection in this study.

Phase II - Grab Termite Control, 72.0% Chlordane.

Chlordane is a pesticide which, because of its toxicity, has had its registration cancelled for most applications. However, it

is still used commercially for termite control through subsurface injection into the soil. Because this use may place the compound in contact with customer service line it was selected for study.

Phase III - Gasoline, Super Shell Unleaded.

Gasoline is the most widely used organic chemical in the world. Commercial gasoline is a mixture of C₄ to C₁₂ hydrocarbons. Ordinary grades contain paraffins, olefins, naphthenes and aromatics, all in substantial concentrations. Leaking underground storage tanks and surface spillage make this the most likely organic compound to come into contact with underground potable water piping.

E. Exposure Tank Loading Procedure

The exposure of the pipe systems to the contaminants was intended to simulate environmental conditions. The intent in the soil system was to add sufficient contaminant to pass down over the pipe system and provide a saturated zone at the tank bottom and a moist capillary zone surrounding the pipes.

The vapor exposure tank, which was designed to simulate a worst case industrial environment, had sufficient contaminant added to provide a covering over the bottom of the tank, but still be well below the pipe sections. The table below shows the amounts of test compounds added to each tank.

Test Contaminant Added To Exposure Tanks

	<u>vapor</u>	<u>soil</u>
phase I - trichloroethylene	150 ml	1225 ml
phase II - chlordane	400 ml	1490 ml*
phase III - gasoline	1890 ml	1890 ml

* an additional 7500 ml of distilled water was added

In all phases there was sufficient test contaminant added to cover the entire tank bottom throughout the vapor studies. In the phase I and phase III soil studies the test contaminant percolated to the tank bottom leaving the desired capillary zone at the pipe level. In the phase II (chlordane) soil study the contaminant seemed to be adsorbed in the top 5 inches of soil, so an additional 7500 ml of distilled water was added in an effort to release the material to the tank bottom.

F. Sampling Procedures

The charging of the system and the sampling procedures were identical during each phase of the study. To charge the system each pipe was flushed, the end valve closed, then the system pressure end closed, thus leaving the pipe full of tap water at system pressure. No effort was made to maintain the system pressure. Previous efforts by East Bay MUD (1) and Battelle Laboratory had systems designed to maintain pressure, but internal pressure had no apparent effect on permeation. To remove the contents of the pipe after the exposure interval, the test system was elevated (using hydraulic jacks) at one end and the test pipes were drained. In order to facilitate complete draining of the pipes,

elbows (one up and one down) were fitted on the pipe ends (See Figure I). This was not successful in the plastic pipes due to some curvature, primarily in the PE and PB pipes. The PVC pipes also became distorted in some phases as a result of softening. Because of the pipe curvature the sample volume varied, however there was always sufficient sample volume to reach the desired detection limit.

The time interval of exposure varied slightly between phases as seen in the table below:

	<u>Exposure Day of Sample Collection</u>			
	<u>No. 1</u>	<u>No. 2</u>	<u>No. 3</u>	<u>No. 4</u>
phase I (TCE)	Day 1	Day 8	Day 39	Day 99
phase II (Chlordane)	Day 1	Day 8	Day 40	Day 70
phase III (Gasoline)	Day 1	Day 22	Day 44	Day 99

G. Analytical Methods

All analytical work was conducted at the AMWSCO., Inc., Belleville Laboratory. The analytical methods used during each phase of the study are described below:

Phase I - All samples were analyzed for TCE using EPA Method 502.1, "The Determination of Halogenated Chemicals in Water by the Purge and Trap Method". Analytical detection limit was 1 ug/L.

Phase II - All samples were analyzed for chlordane using Method 509-A, pp. 555-565, "Standard Methods for the Examination of Water and Wastewater", 14th Edition. Analytical detection limit was 1 ug/L.

Phase III - In order to quantify the extent of permeation, the major aromatic components in gasoline (xylene, ethylbenzene, benzene and toluene) were quantified in all samples using EPA Method 503.1, "The Analysis of Aromatic Chemicals in Water by the Purge and Trap Method". Analytical detection limits were 1 ug/L.

Selected samples were analyzed using Gas Chromatograph/Mass Spectrometry, EPA Method 624.

RESULTS AND DISCUSSION

The permeation by organic chemicals through plastic materials is well known outside of the water works industry. For example, permeation of polymer films (polyethylene) by oxygen is essential in the meat-wrapping industry. One study of polymer films used for landfill liners showed that the same chemical can permeate various film materials at different rates, and similarly different chemicals can permeate the same material at widely different rates. The study showed that acetone permeated low density polyethylene more easily than polybutylene, but that the opposite was true for xylene. Additionally the permeation by xylene was one hundred times greater through both materials than acetone (9). Before the waterworks industry was reporting plastic pipe permeation, there were laboratory observations that polyethylene sample containers could be permeated by laboratory solvents.

The permeation of organic chemicals through plastic pipe occurs in three steps; (1) sorption of the chemical into the pipe, (2) diffusion through the pipe, and (3) desorption from the pipe. The factors which will control the permeation are the concentrations of the chemical on either side of the pipe wall, the molecular size and activity of the chemical and the polymer (pipe) characteristics (10).

In this investigation we were primarily interested in determining the extent, if any, of permeation by certain specific organic compounds. The results are presented in three sections,

one for each contaminant exposure, TCE, chlordane and gasoline. Within each section the discussion of each pipe will address, (1) the physical characteristics during the exposure, and (2) the permeation results in both the soil and vapor exposures.

Analytical results are presented graphically in Figures II through X and in numerical detail in Appendix II. The control pipe data (PE, PB and CPVC) are presented along with the results from pipe of the same material. Lines connecting the data points in the Figures are presented for visual clarity, however in most cases they do not truly represent the level of permeant present at the corresponding day of exposure. The reason for this is that the entire pipe content was removed for each sample collection and replaced with fresh tap water containing zero permeant levels. Therefore the actual data line would drop to zero after each sampling point and rise up to the next data point. However, since the rate of rise was unknown, and the Figures are intended to be more qualitative than quantitative, the data points are connected for simplicity. In those cases where permeation did occur the rate of rise in the permeant level would likely approximate the initial breakthrough usually seen in the first and second samples.

Because of the wide range in the concentration of the permeating chemicals (<1 to 1,000,000 ug/L), the data is plotted on a log scale. This allows the difference in concentration at the low end of the range to be seen. The table below shows the

relationship of the log concentration as plotted on the Y axis in the figures.

<u>Log Concentration</u>	<u>Actual Concentration</u>
(ug/L)	(ug/L)
-1	0.1
0	1
1	10
2	100
3	1000
4	10,000
5	100,000
6	1,000,000

Data which were below the detection limits (1 ug/L) are presented midway between the -1 and 0 Log concentration lines.

A. TCE Exposure

The results of the TCE exposures are presented graphically in Figures II, III, IV and V.

Iron Pipe - There was no apparent physical impact in either the soil or vapor exposure. The analytical results of the samples withdrawn at the end of 1, 8, 39 and 99 days of exposure are presented in Figure II. There was no detectable TCE in any of the samples collected indicating that there was no permeation of the iron pipe.

Copper Pipe - The results of the copper pipe exposures were identical to the iron pipe and are presented in Figure II along

FIGURE IIA. TRICHLOROETHYLENE

PERMEATION OF IRON AND COPPER PIPE.

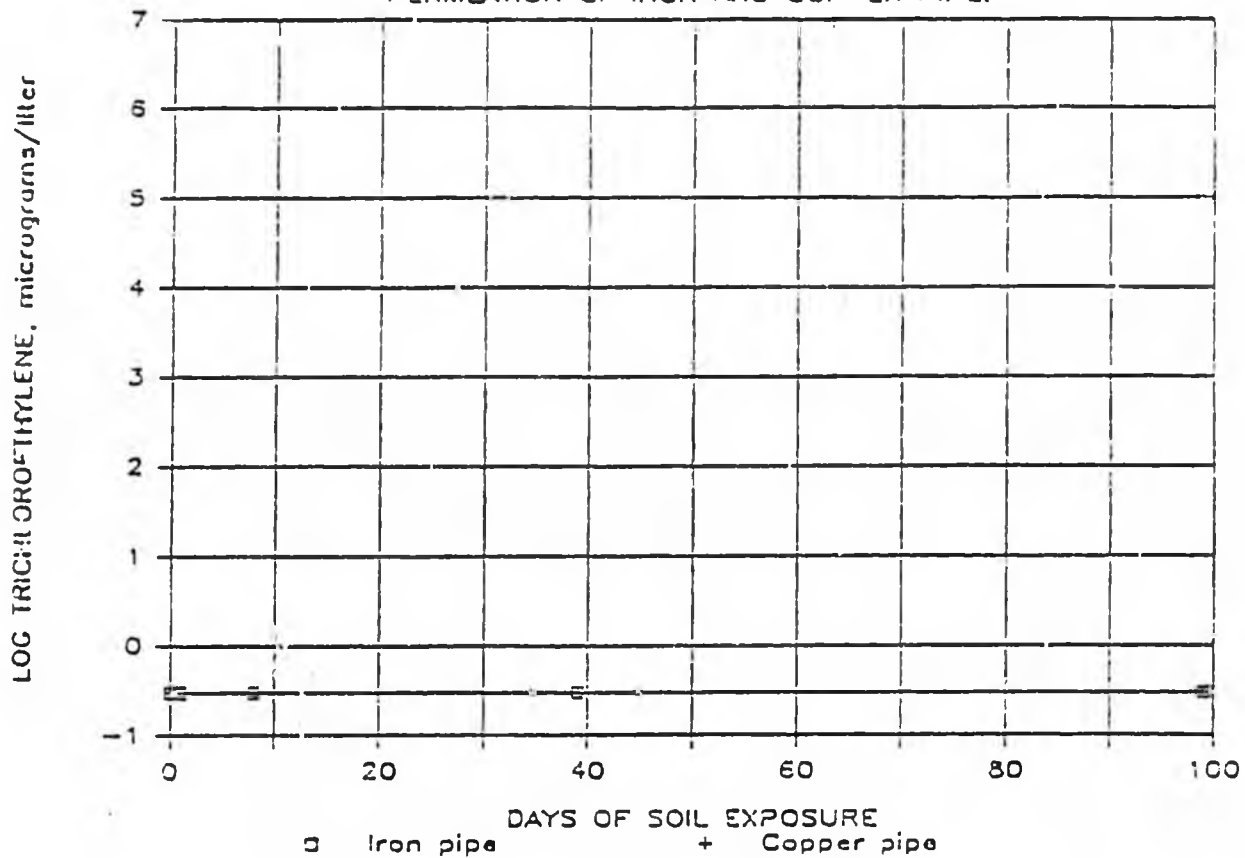


FIGURE IIB. TRICHLOROETHYLENE

PERMEATION OF IRON AND COPPER PIPE.

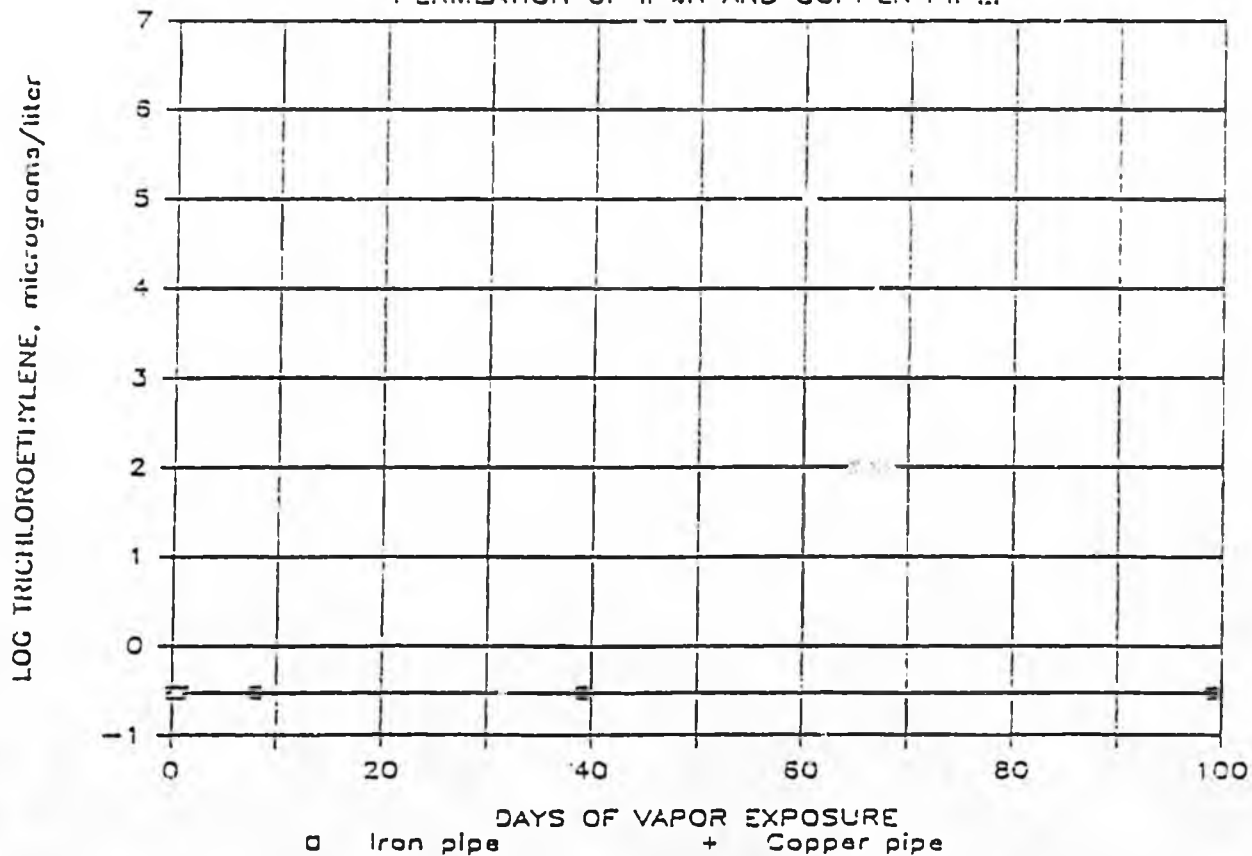


FIGURE IIIA. TRICHLOROETHYLENE
PERMEATION OF POLYETHYLENE PIPE

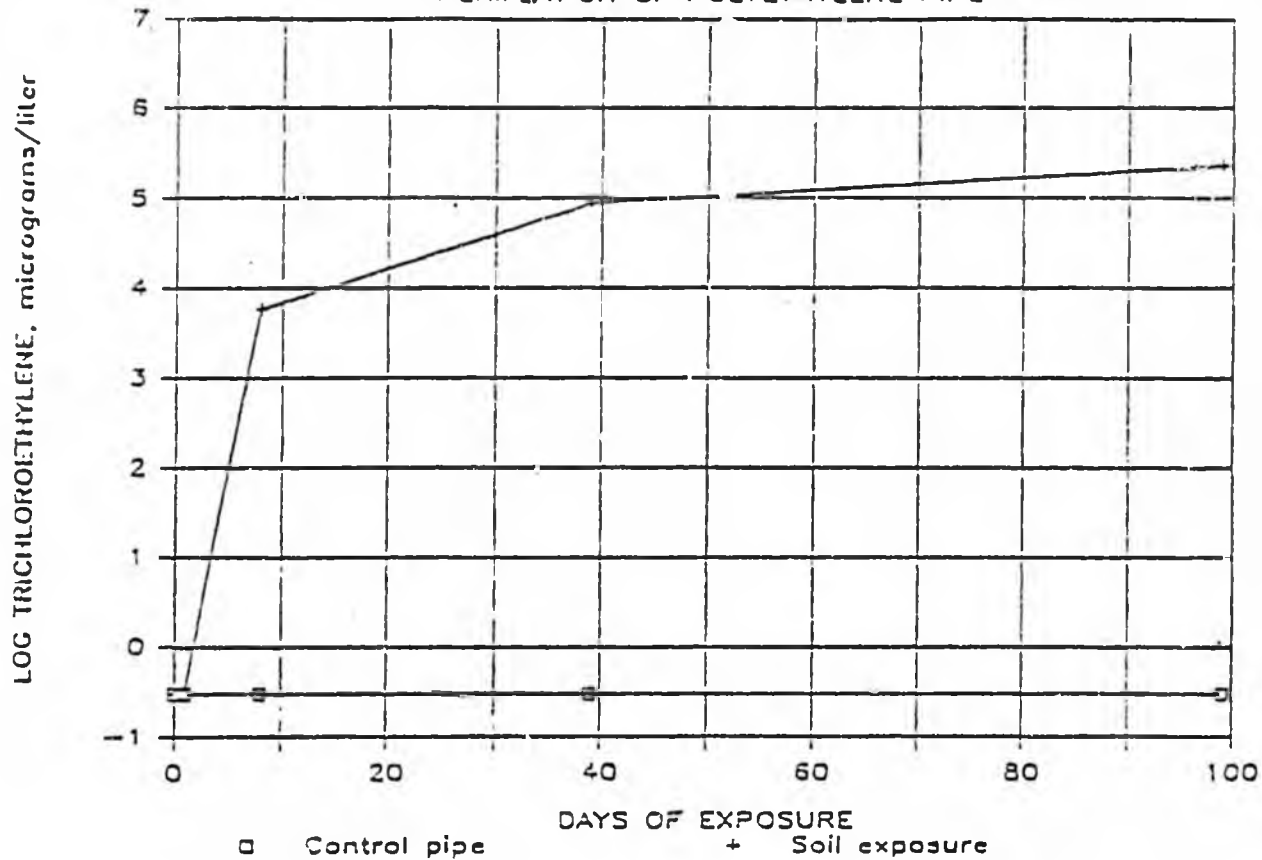


FIGURE IIIB. TRICHLOROETHYLENE
PERMEATION OF POLYETHYLENE PIPE

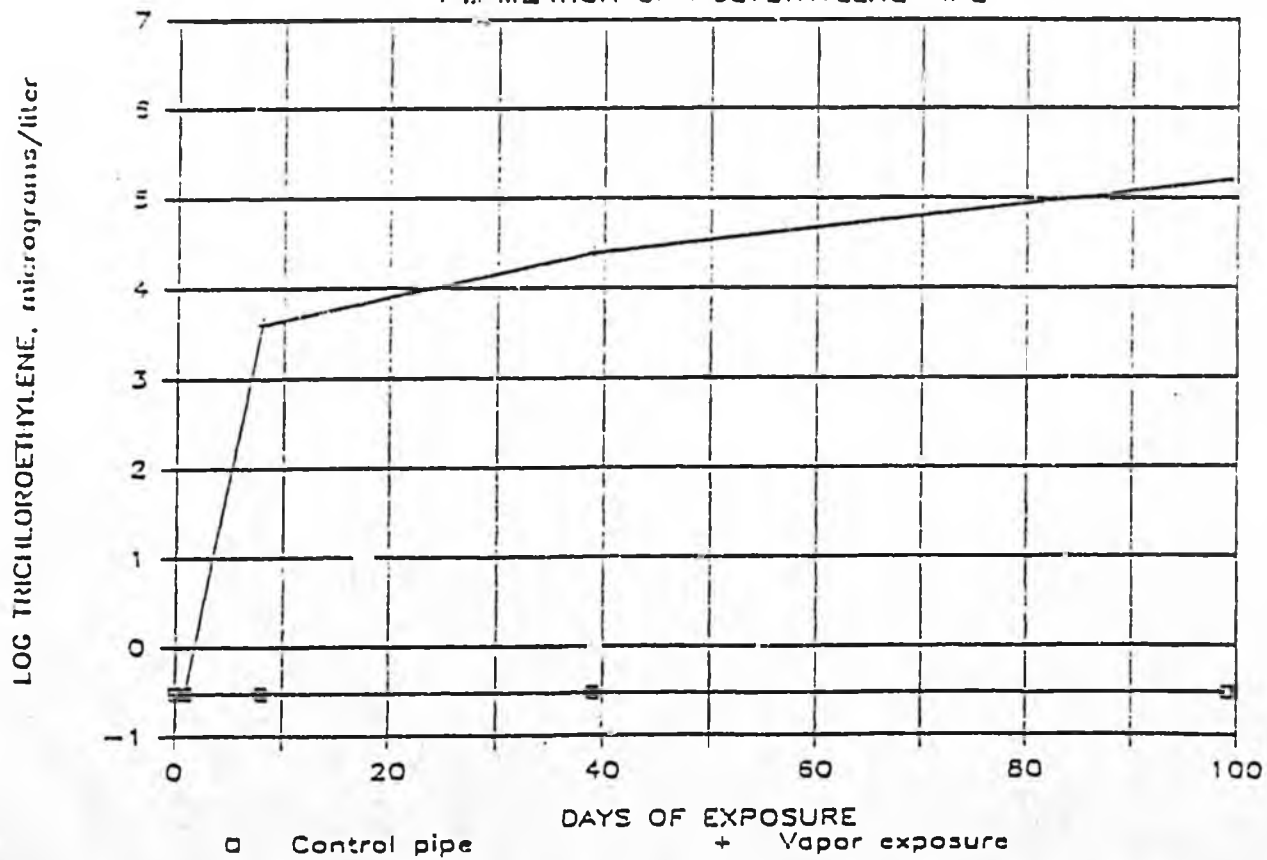


FIGURE IVA. TRICHLOROETHYLENE

PERMEATION OF POLYBUTYLENE PIPE

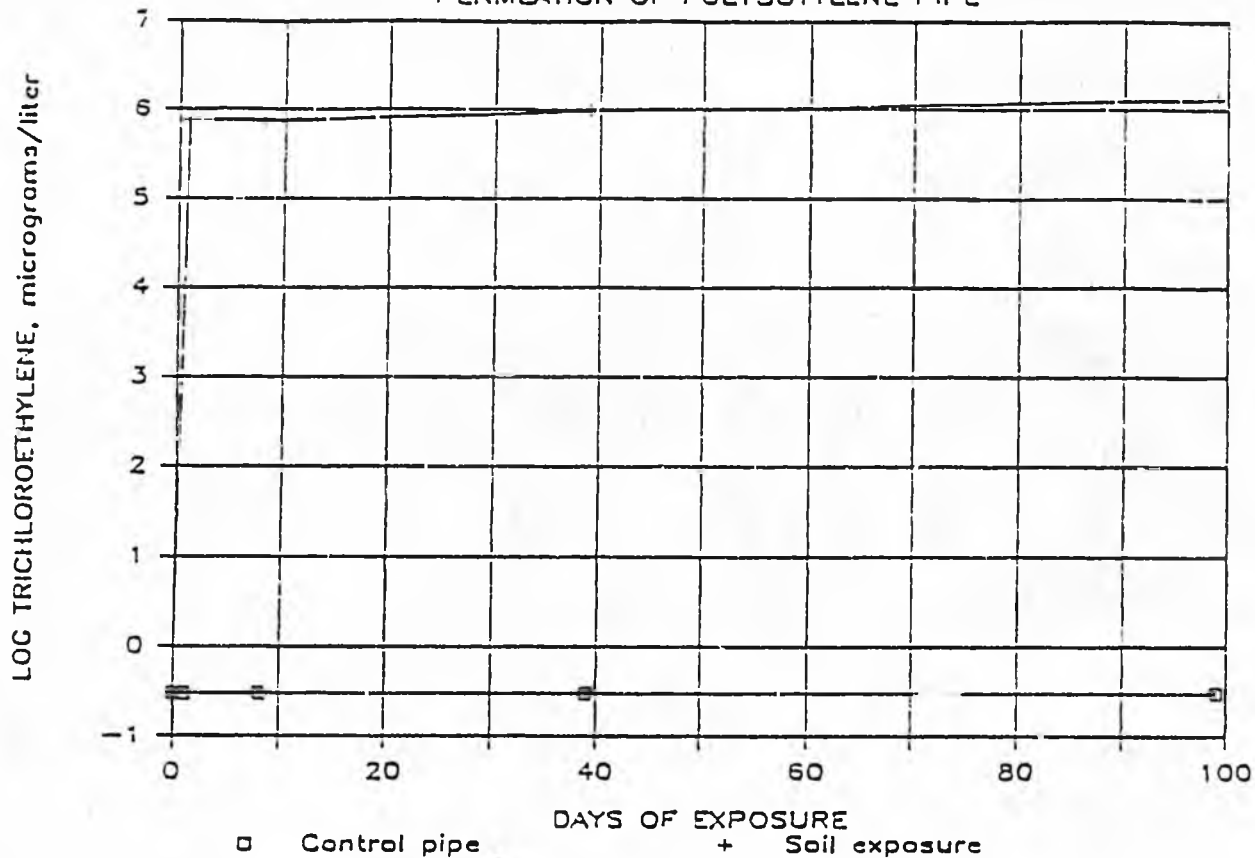


FIGURE IVB. TRICHLOROETHYLENE

PERMEATION OF POLYBUTYLENE PIPE

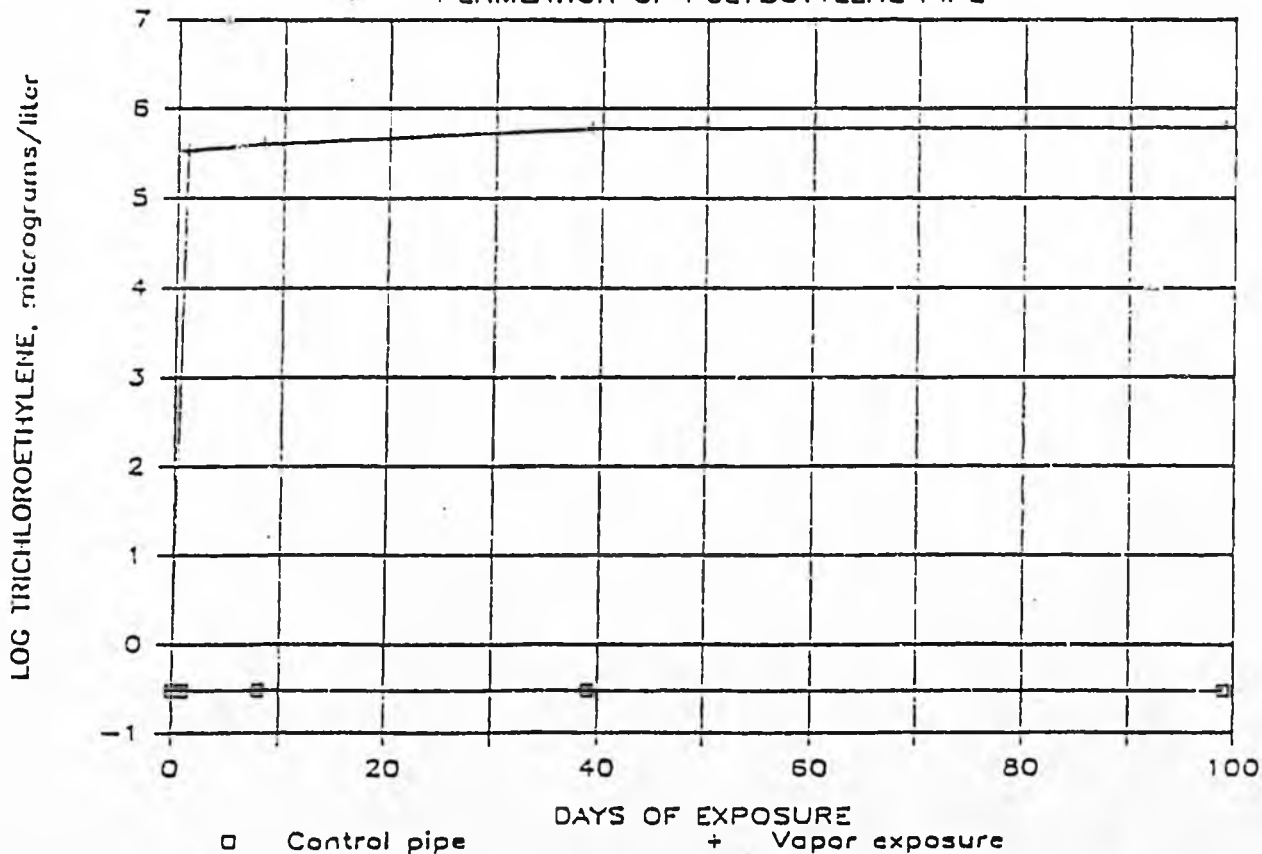


FIGURE VA. TRICHLOROETHYLENE

PERMEATION OF CPVC PIPE

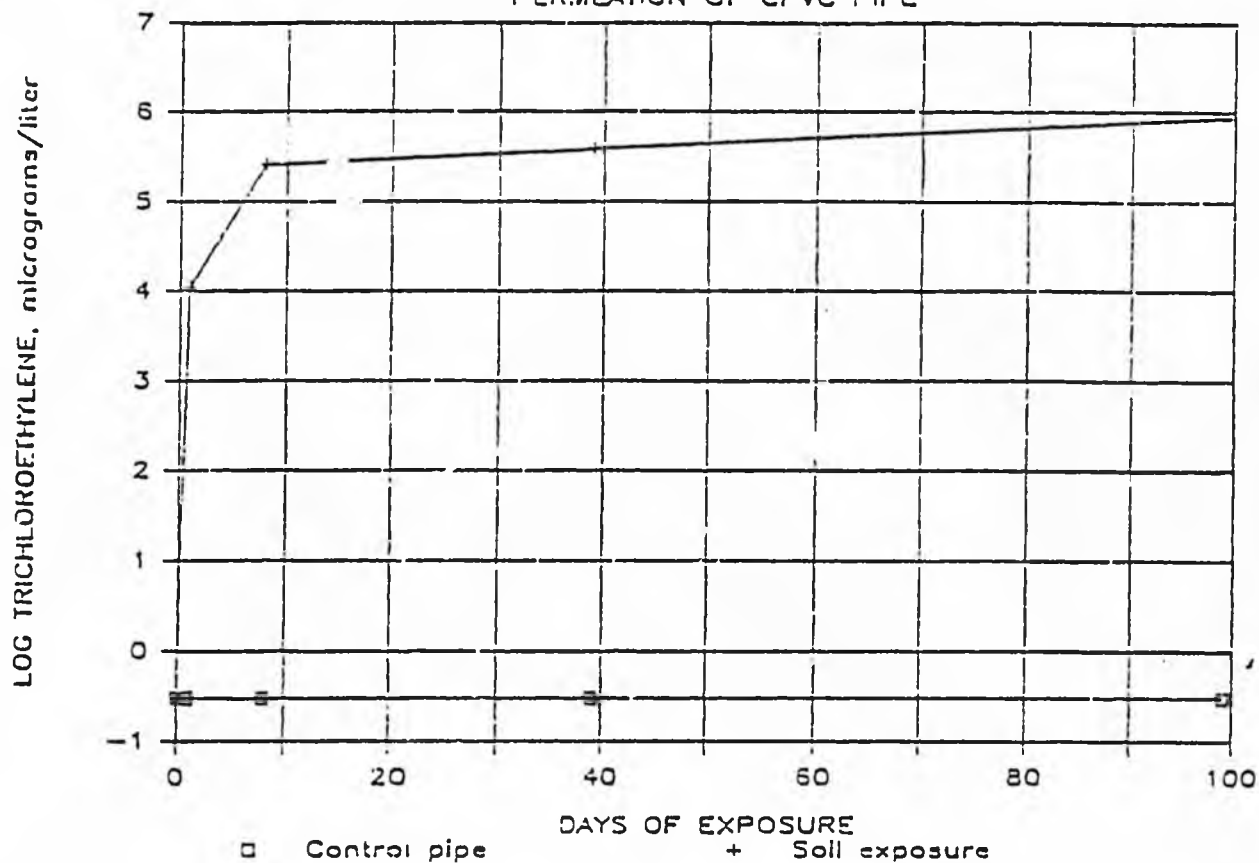
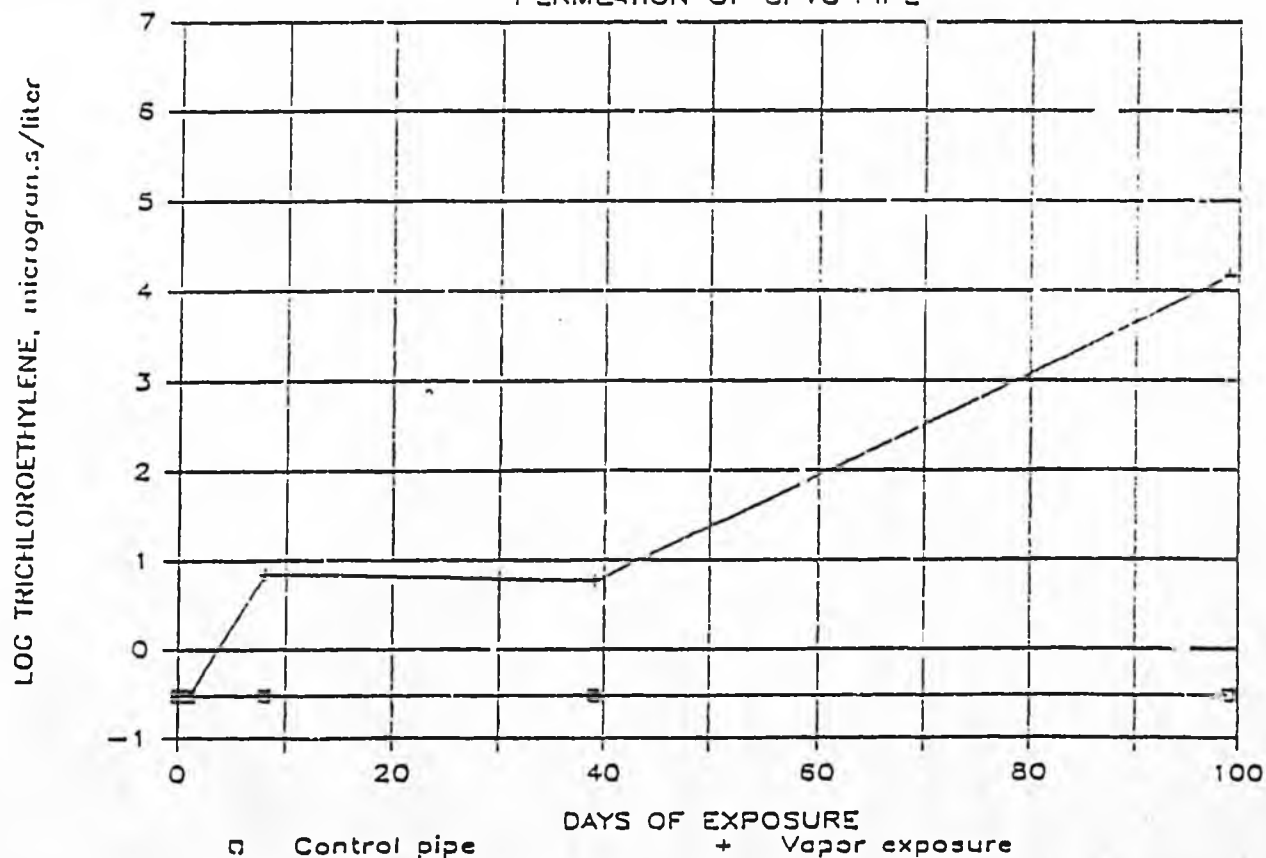


FIGURE VB. TRICHLOROETHYLENE

PERMEATION OF CPVC PIPE



with the iron pipe results. There was no detectable permeation of the copper pipe nor was there any noticeable physical change in the pipe as a result of the exposure to TCE in either the soil or vapor tanks.

Polyethylene Pipe - There were no apparent physical changes in the PE pipes as a result of the TCE exposures. The analytical results of the exposed pipe samples and the control pipe samples are presented in Figure III which shows no detectable TCE found in any control samples during the entire 14 week test. Similarly, there was no detectable TCE found in the 1 day exposure samples. However, there was significant TCE (>1,000 ug/L) found in the 3 day samples from both the soil and vapor exposures, indicating breakthrough had occurred at that point. There was very little difference in the permeation of the PE pipe in the soil and vapor tanks, both exceeding 100,000 ug/L in the samples collected after 14 weeks of pipe exposure.

Polybutylene Pipe - The PB pipe had no apparent physical change from either the soil or the vapor exposures. The analytical results of the exposed and control pipe samples are shown in Figure IV. The permeation through the PB pipe was extremely rapid with levels in the water exceeding 100,000 ug/L in less than 24 hours. The TCE levels in the water samples did not increase significantly during the 14 week exposure, indicating that the system reached equilibrium in a short time. Samples from the control pipe were negative.

Chlorinated Poly(Vinyl Chloride) Pipe - The CPVC pipe was physically impacted by the TCE exposure in the soil tank, but not

in the vapor tank. The pipe in the soil tank softened after 4 days such that the ends of the pipe extending through the tank wall drooped downward. The CPVC pipe in the vapor exposure tank could be flexed but never softened to the point that it drooped either inside the tank or at the pipe ends. At the termination of the exposure when the soil exposure tank was disassembled, the CPVC pipe was soft and pliable. Battelle Laboratories reported a similar softening and ballooning of PVC pipe when exposed to concentrated toluene, but not from exposure to hexane or 1,1,1-trichloroethane. In Battelle's experiment the pressure was maintained at 40 psi and the pipe was buried in sand. This would explain why the pipe ballooned until the soil resisted the pressure. In our study the pressure was not maintained in the pipe so a slight pipe expansion would relieve the pressure on the softened pipe. Under actual field conditions where system pressures could be maintained at high levels, structural failure of the pipe might be expected.

The analytical results of the exposed and control pipe samples are presented in Figure V. The TCE permeated the CPVC pipe in the soil exposure such that the water contained in excess of 10,000 ug/L within 24 hours. The 8, 39 and 99 day samples from the soil exposure were all in excess of 100,000 ug/L. In the vapor exposure the permeation was much slower which is consistent with the lack of physical deterioration in the CPVC pipe in the vapor tank compared to the soil tank. TCE in the vapor exposure samples was not measured above 20 ug/L until the 99 day sample when it measured more than 10,000 ug/L. The CPVC control samples

all contained non-detectable levels. If permeation is defined as occurring when the exposed pipe samples contain levels at least 100 times (2 orders of magnitude) higher than the controls, then permeation occurred sometime between 6 and 14 weeks.

Summary of TCE Exposure - The TCE permeated most readily through the PB pipe, attaining levels in both the soil and vapor exposure samples of over 100,000 ug/L in less than 24 hours. The TCE also permeated the PE pipe in both the soil and vapor exposures although none was detected in the 24 hour samples. However, the 8, 39 and 99 day samples from the PE pipe in both exposures were more than 1,000 ug/L, 10,000 ug/L and 100,000 ug/L respectively, the levels increasing with increasing duration of exposure. The CPVC pipe in the soil exposure was permeated rapidly at a rate between the PE and PB soil exposure rates. However, the vapor exposure was much slower with no significant permeation measured until the 99 day sample. The plastic control pipes (PE, PB and CPVC) and the iron and copper pipes in both exposure tanks never showed any detectable TCE.

TCE is capable of permeating all plastic pipes tested, most easily through PB, followed by PE, and then CPVC. The TCE also physically affected the CPVC pipe, softening and swelling the pipe to the extent that pipe failure might be expected under conditions of continuous high pressure.

B. Chlordane Exposure

The results of the chlordane exposures are presented in Figure VI. There was no permeation of chlordane detected in any of the pipe systems in either the soil or vapor exposures, even

FIGURE VIA. CHLORDANE

PERMEATION OF ALL PIPE TYPES

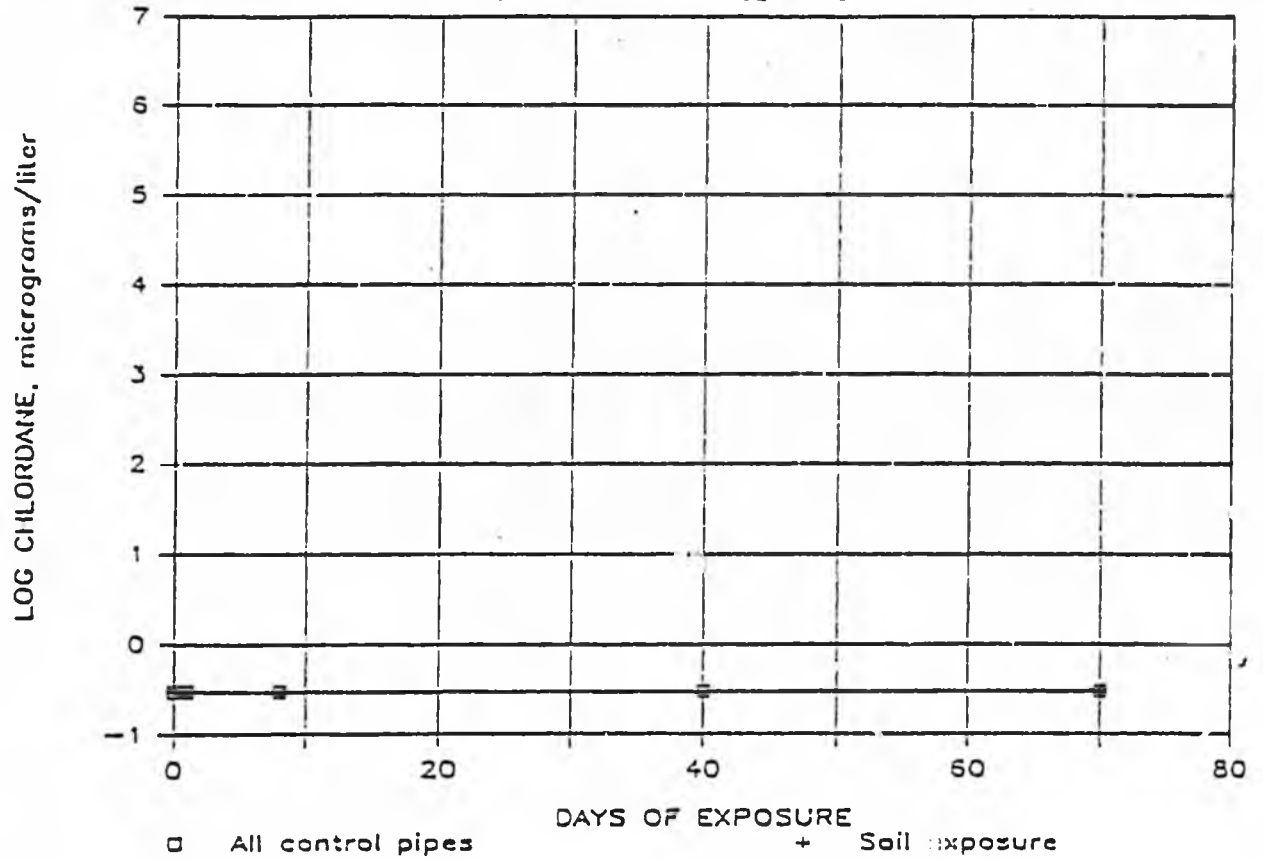
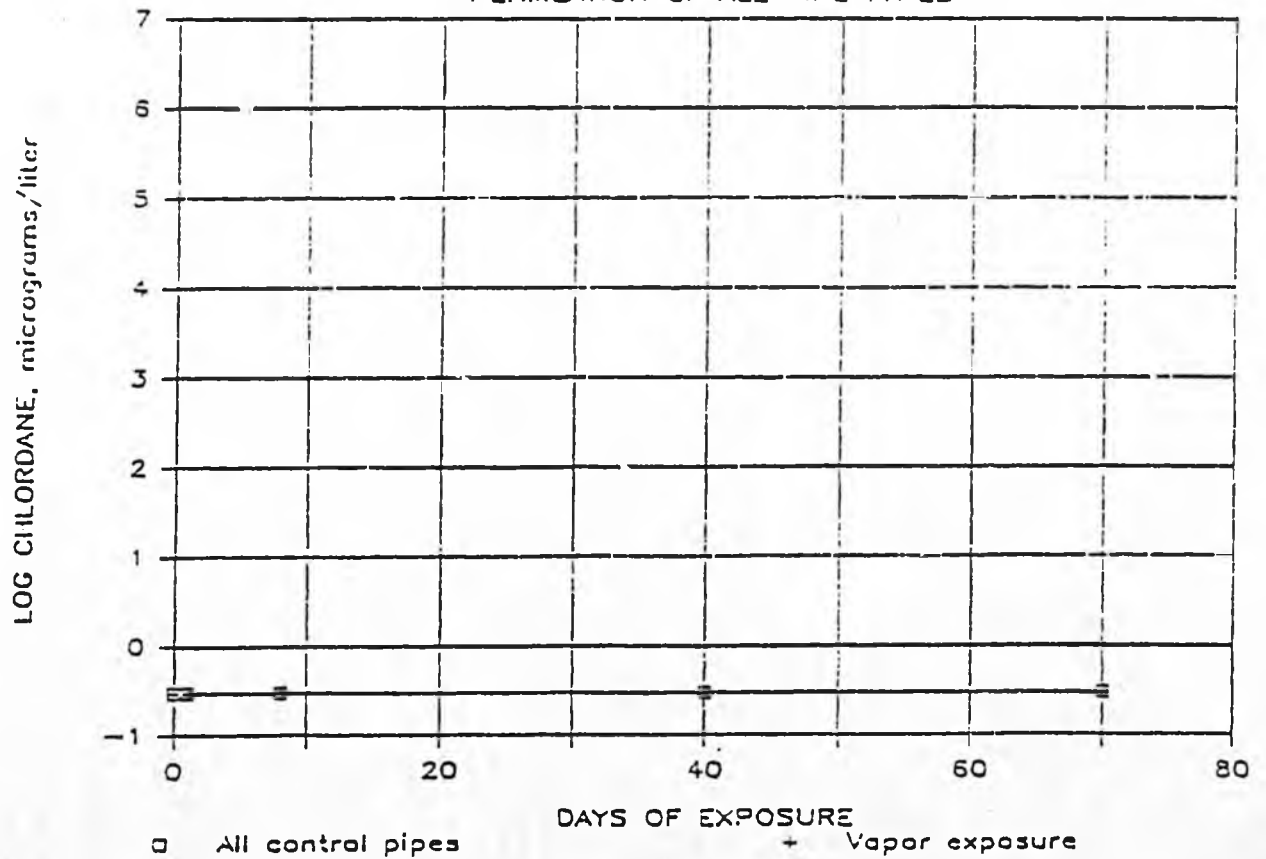


FIGURE VIB. CHLORDANE

PERMEATION OF ALL PIPE TYPES



after 70 days. The control pipes were negative throughout the study. Neither was there any apparent physical damage to the pipe resulting from the chlordane exposures.

When the chlordane was initially applied to the soil as 1500 ml of 72% chlordane, the liquid seemed to be adsorbed into the top and not migrate to the tank bottom. To overcome this, 2 gallons of distilled tap water were added to disperse the chlordane. With a total of 2.4 gallons applied, the pipes were in the saturated zone. This application may more closely simulate actual field conditions since rainfall could raise groundwater levels such that the service lines are in saturated soil. If the chlordane was adsorbed onto the soil particles in the soil exposure this would also be the case in the field. In any case, there is no apparent danger of chlordane permeating plastic pipe based on the results of this study.

C. Gasoline Exposure

When the gasoline was initially placed in the exposure tanks, there was leakage at the tank wall joints and the pipe openings. The gasoline had attacked the silicone rubber sealant causing the leakage. As a result, the tanks were emptied, cleaned and resealed using a pliable "Permatex" which is resistant to gasoline. Additionally, to prevent possible leakage a heavy aluminum foil liner was placed in the soil exposure tank extending 3 inches up on all sides.

Despite the efforts to seal the exposure tanks so that there would be no leakage or contamination of the controls, there was a

detectable level of gasoline components in every control pipe sample and in every iron and copper pipe sample. The levels were low, less than 50 ug/L, in all but two samples where the levels were 125 and 174 ug/L. This low level contamination of the control and metal pipe samples was attributed to leakage of vapors which may have caused contamination during sampling and/or permeated the plastic pipes outside the tank. Because of this background contamination, permeation was operationally defined as an occurrence in which the level of any gasoline component (Benzene, Toluene, Xylene) in the exposed pipe was 2 orders of magnitude (100 times) higher than the plastic pipe controls. The results are presented graphically in Figures VII - XI.

Iron Pipe - The results of the iron pipe exposure are presented in Figure VII. Low levels of benzene, toluene and xylene were found in the iron pipe samples throughout the 99 day exposure. However, because the levels were low (generally less than 10 ug/L), and never approached the levels found in the three plastic pipe controls, the occurrence was attributed to sample contamination rather than permeation of the iron pipe.

Copper Pipe - The results of the copper pipe exposures are presented in Figure VIII. As in the iron pipe exposure, low levels of gasoline components were detected throughout the exposure. With one exception, the levels found were almost identical to the iron and plastic control pipe samples. The exception was the 99 day soil exposure sample where levels exceeding 100 ug/L were found; toluene - 169 ug/L, benzene - 122 ug/L. While the levels are relatively high, they are not two orders of magnitude

FIGURE VIIA. GASOLINE

PERMEATION OF IRON PIPE

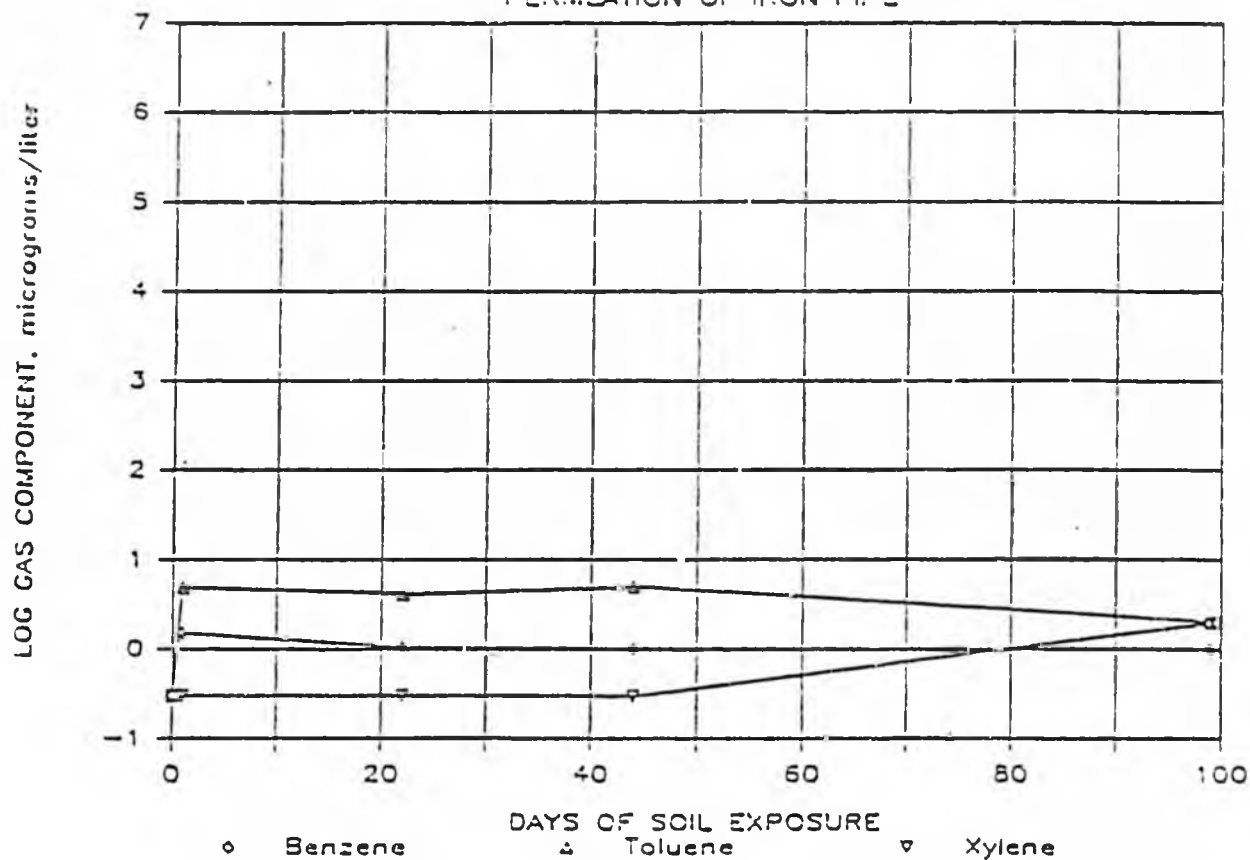


FIGURE VIIB. GASOLINE

PERMEATION OF IRON PIPE

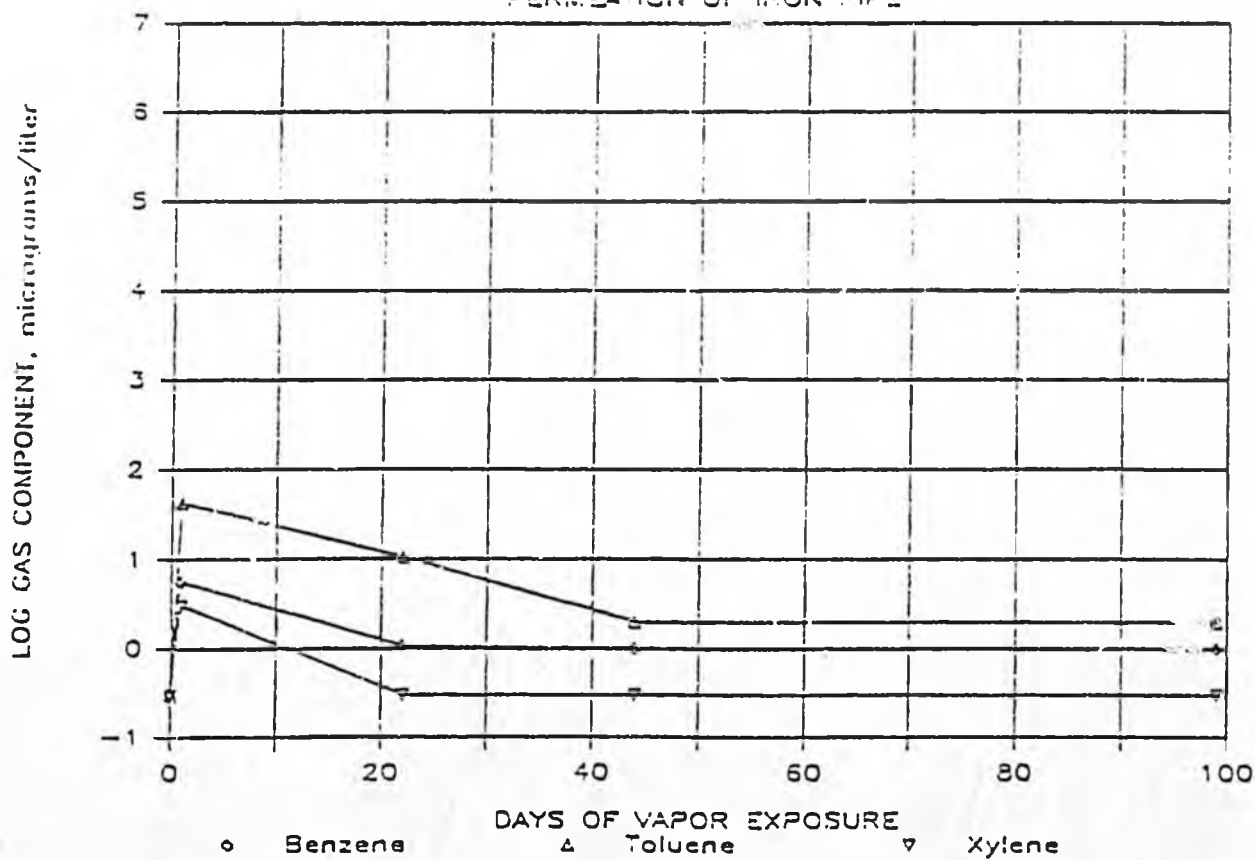


FIGURE VIIIA. GASOLINE

PERMEATION OF COPPER PIPE

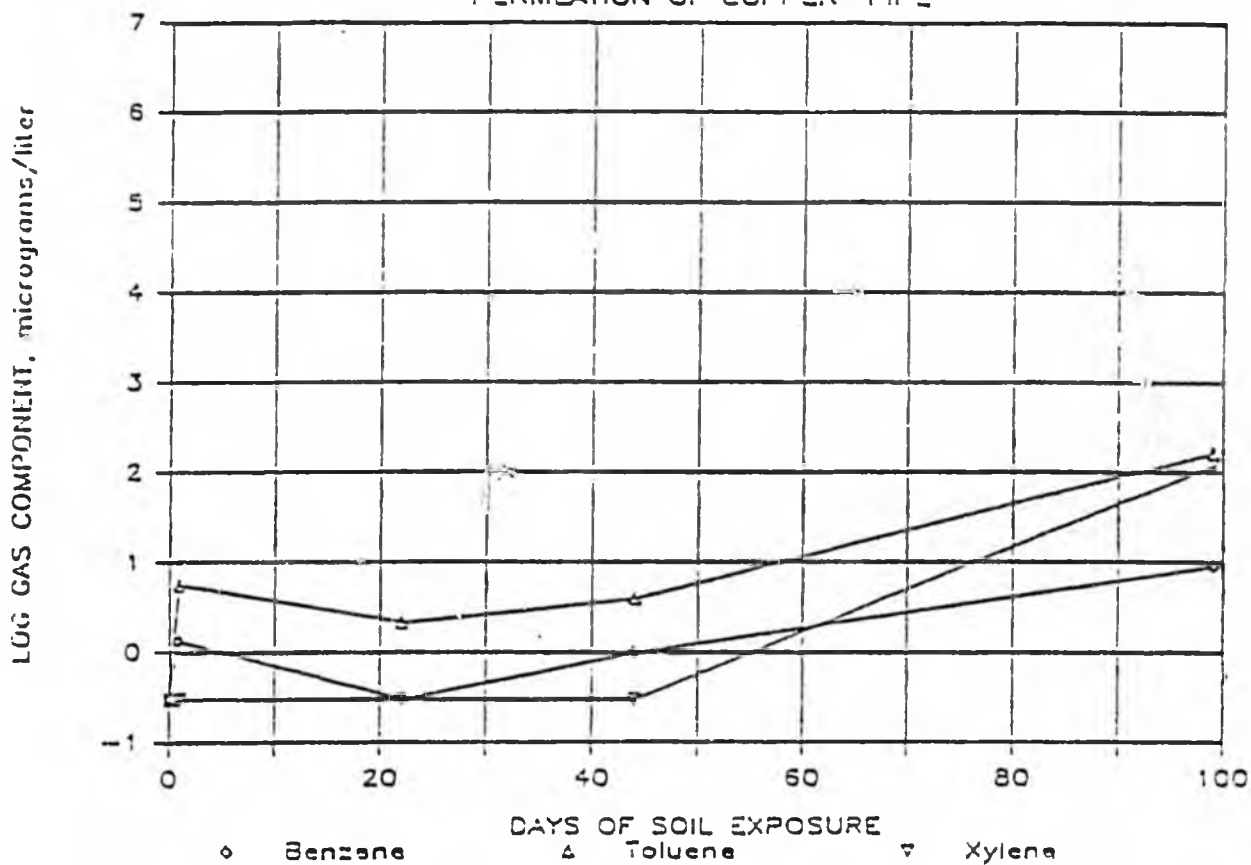


FIGURE VIIIB. GASOLINE

PERMEATION OF COPPER PIPE

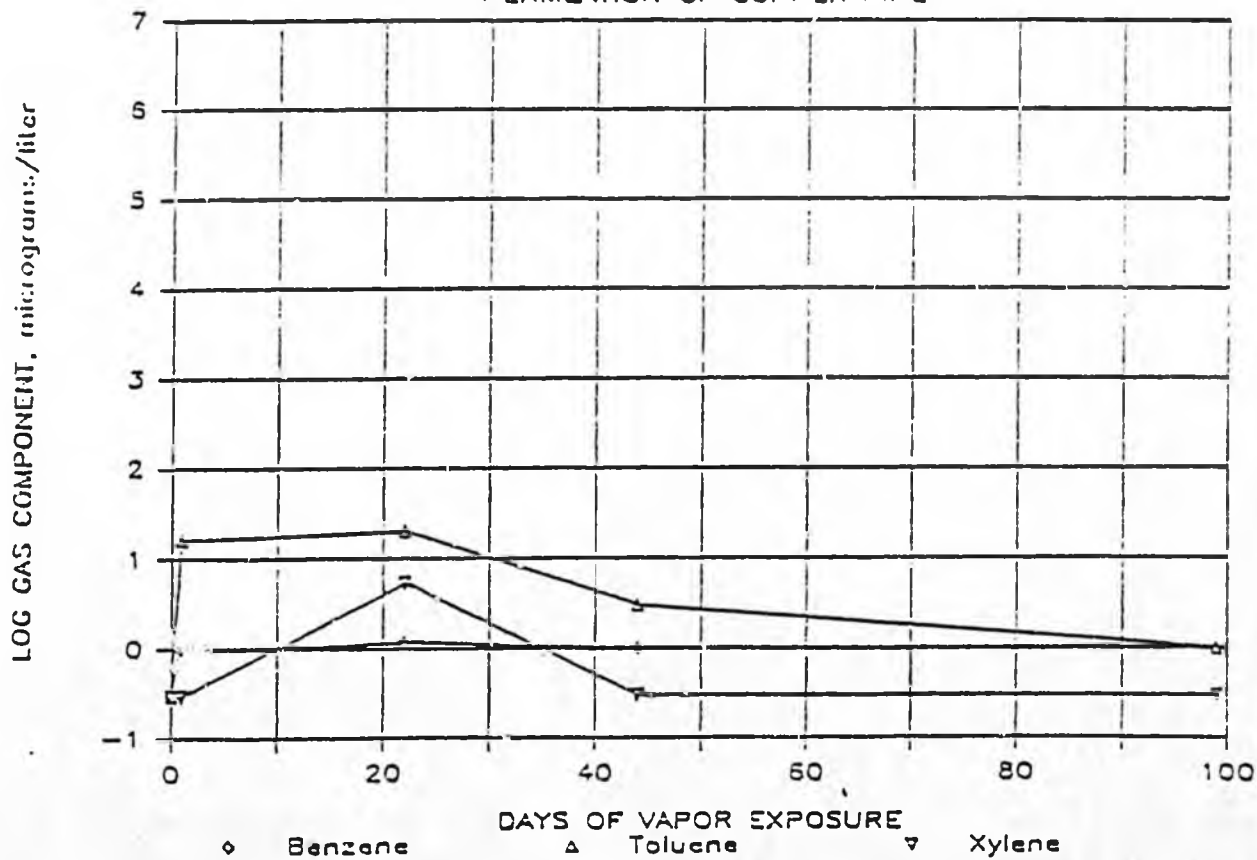


FIGURE IXA. GASOLINE

PERMEATION OF POLYETHYLENE PIPE

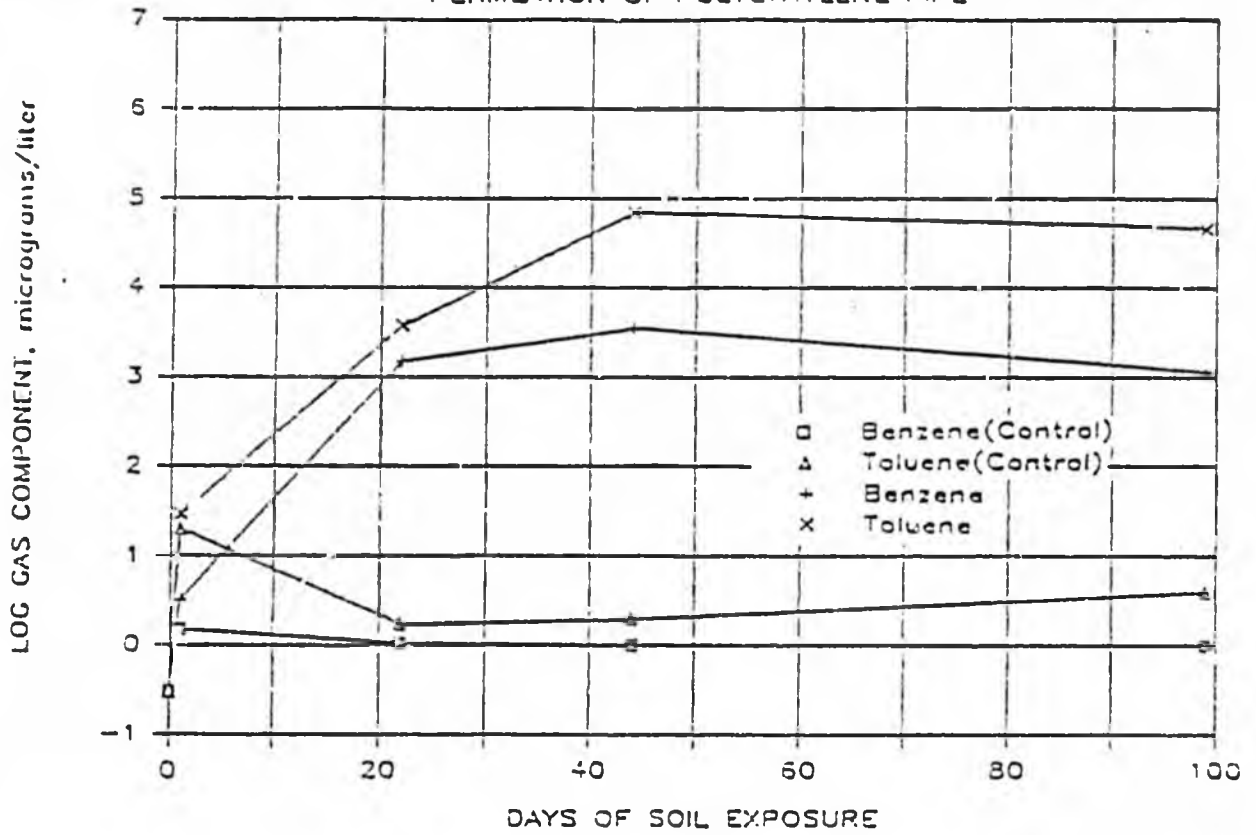


FIGURE IXB. GASOLINE

PERMEATION OF POLYETHYLENE PIPE

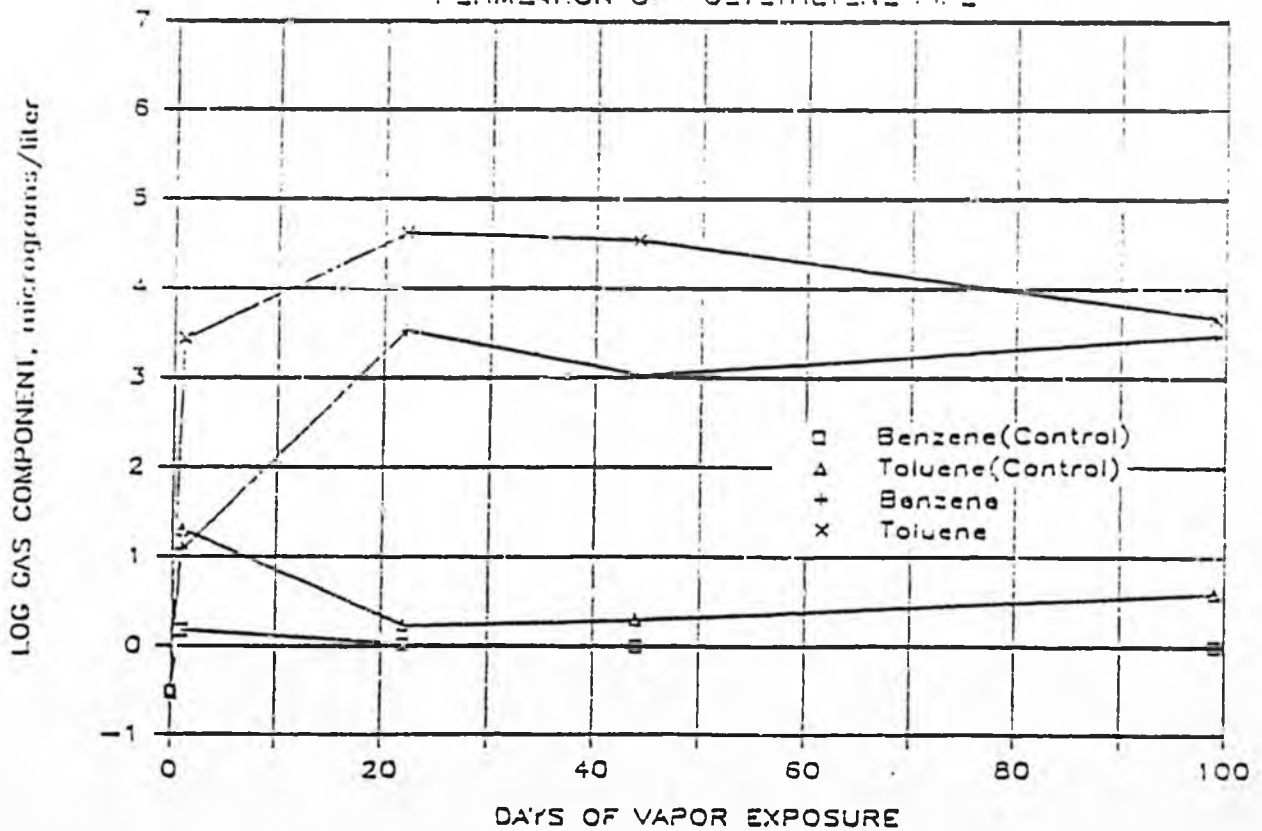


FIGURE XA. GASOLINE
PERMEATION OF POLYBUTYLENE PIPE

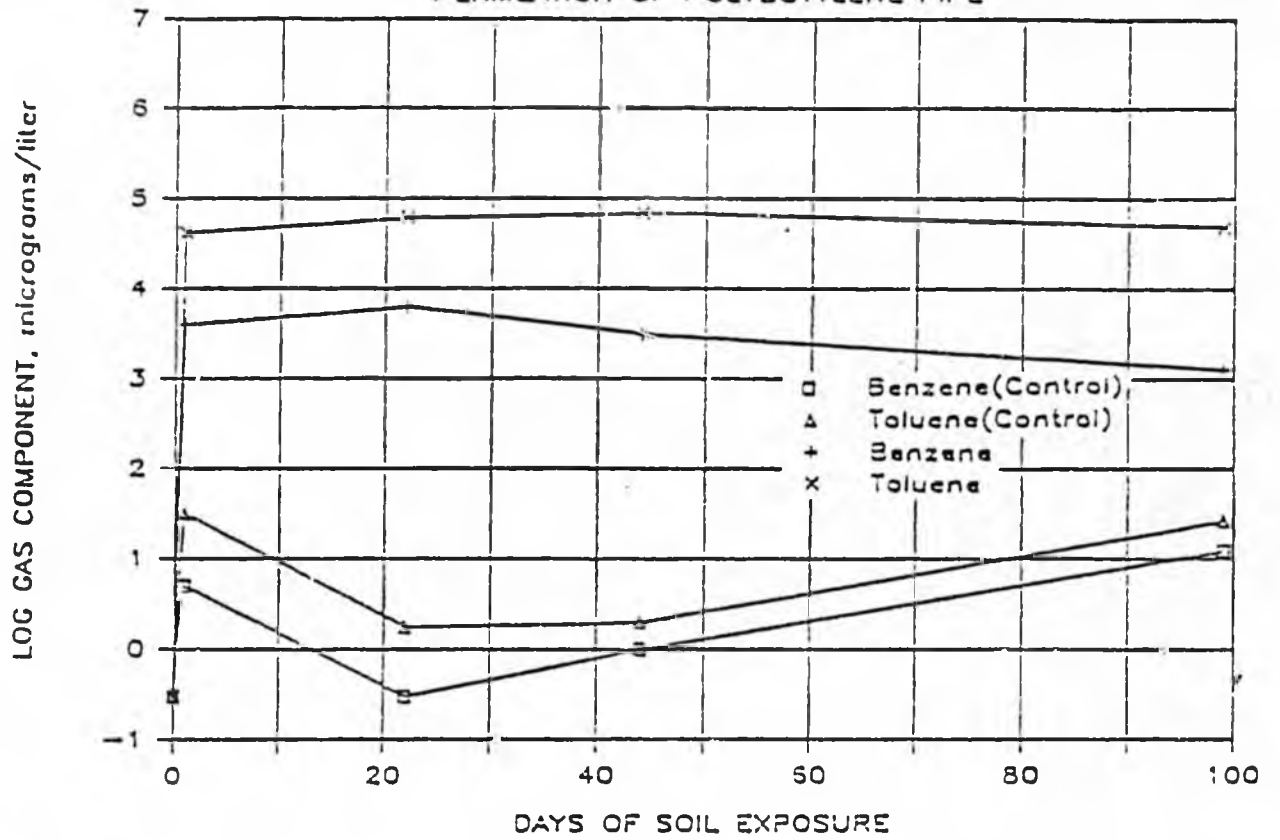


FIGURE XB. GASOLINE
PERMEATION OF POLYBUTYLENE PIPE

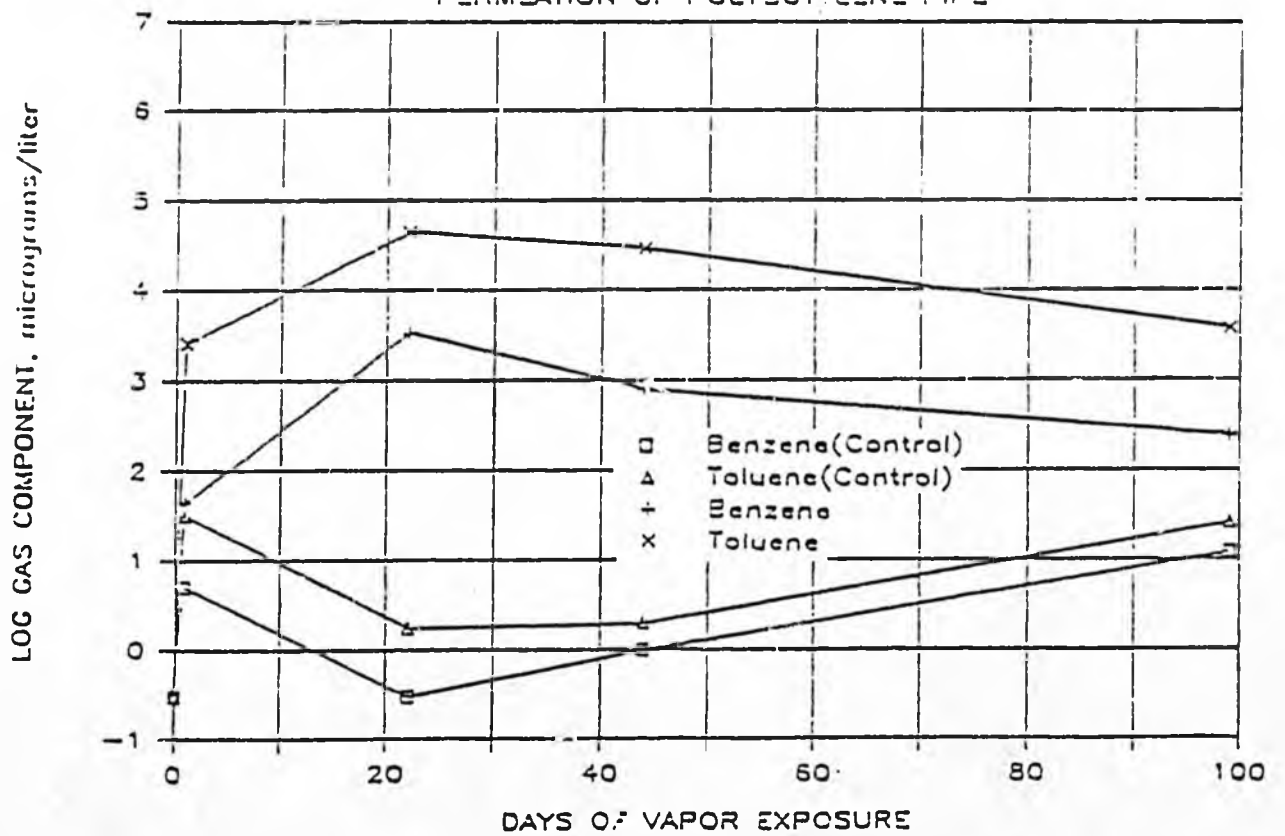


FIGURE XIA. GASOLINE

PERMEATION OF CPVC PIPE

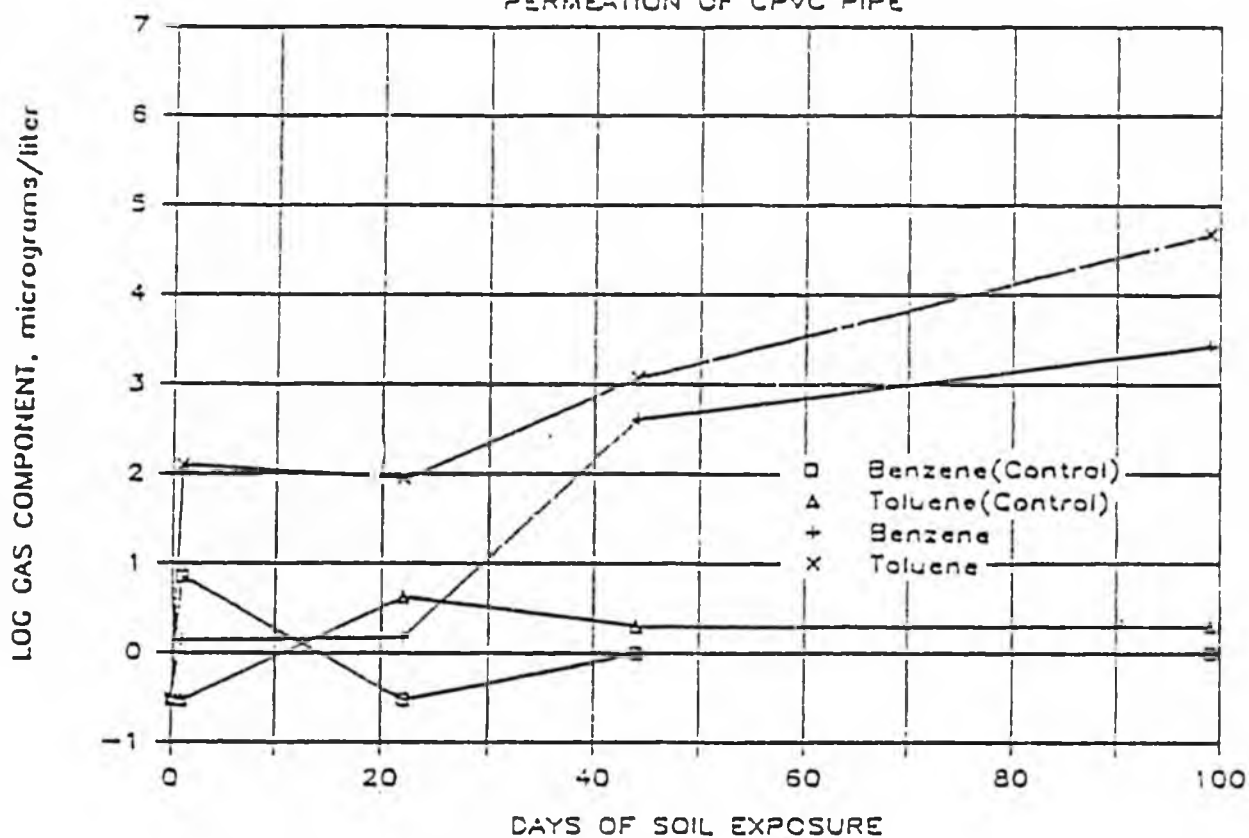
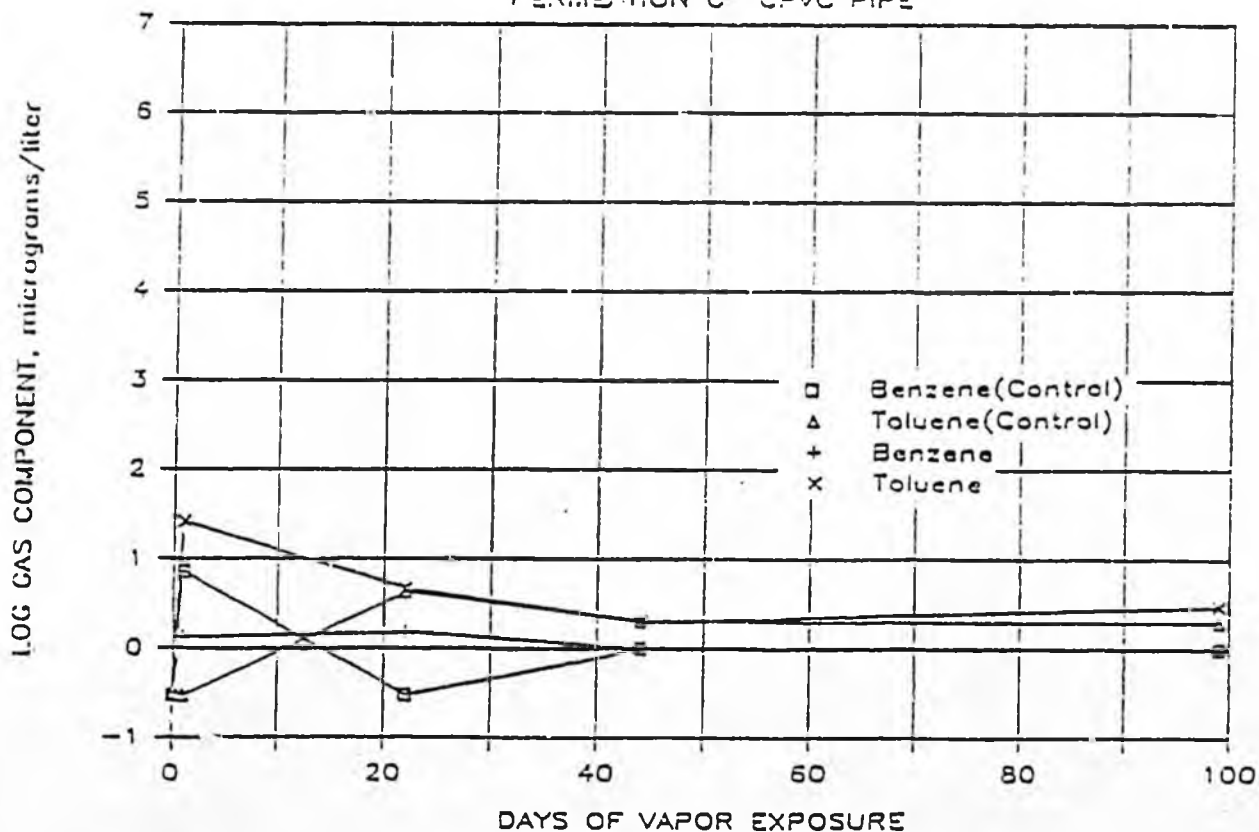


FIGURE XIB. GASOLINE

PERMEATION OF CPVC PIPE



above the iron pipe or plastic control sample results. On this basis, no permeation was believed to have occurred.

Polyethylene Pipe - There was no apparent physical change in the PE pipe as a result of either exposure. There was a noticeable gasoline odor in the soil exposure samples collected on days 22 and 99. Additionally, those samples had a gasoline film on the surface. The results of the PE pipe exposure samples are presented in Figure IX. Permeation occurred in both exposures within 22 days. The permeation was slightly more rapid in the vapor exposure where toluene actually permeated within 24 hours using the 2 orders of magnitude criterion. The levels for all gasoline components were in the 1,000 - 10,000 ug/L range in the 22 day samples where they stayed throughout the remaining samples.

Polybutylene Pipe - There was no apparent physical change in the PB pipe as a result of either exposure. There was a noticeable gasoline odor and film on all samples collected from the soil exposure, and all samples except the 1 day, from the vapor exposure. The analytical results of the PB pipe exposure are presented in Figure X. The control samples had no film or odor present. As seen in Figure X, at least two components in each exposure had levels near or exceeding 1,000 ug/L at day 1. However only the toluene in both exposures, and benzene in the soil exposure met the criterion for permeation within 1 day. This was due to the relatively high levels (5 to 125 ug/L) in the control samples. However, by day 22 the control samples were less than 2 ug/L for all components and the exposed pipe samples were all in the 3,000 - 60,000 ug/L range for all components. The

permeation remained high through day 44 with the concentrations declining slightly. By day 99 the levels in the exposed pipes had again declined slightly, while the control samples contained 12 to 42 ug/L. In the vapor tank the levels had declined such that the criterion defining permeation was no longer met. The only explanation for the declining levels in the exposed pipes is that losses occurred from the exposure tanks through evaporation and leakage causing the differential driving force to be reduced, resulting in the declining levels. In any case, it is clear that gasoline permeation of the PB pipe occurred within a few days.

Chlorinated Poly (Vinyl Chloride) Pipe - There was a physical deterioration of the CPVC pipe in the soil exposure. However, the extent of the pipe damage was not as great as in the TCE exposure. The pipe ends extending from the tank did not droop as in the TCE exposure, but when the experiment was terminated and the soil and pipe were removed, the CPVC pipe was soft enough to be tied into a knot. After remaining out of the tank where it dried, it again became rigid in the exact shape in which it was placed to dry. The CPVC pipe in the vapor exposure remained rigid throughout the study. The only CPVC pipe sample having a detectable gasoline odor was the 99 day sample from the soil exposure.

The analytical results presented in Figure XI are consistent with the physical characteristics of the CPVC pipe and the water samples. Only benzene and toluene are shown in Figure XI in order to simplify the presentation. The xylene and ethyl benzene results were similar (See Appendix II). There was some control pipe sample contamination in the 1 and 22 day samples, however the

highest levels found in the CPVC control were below 10 ug/L. In the soil exposure the gasoline had permeated by day 44, with increased permeation by day 99. There was no permeation in the vapor exposure where the 44 and 99 day samples had identical results in the control and the test pipe. It is significant that the CPVC was softened only where permeation also occurred.

Summary of Gasoline Exposure - There was some contamination of the plastic control pipes during the gasoline exposure, most likely due to the presence of vapors which leaked from the tank. However, the level of contamination was minor when compared to the level of gasoline components present in the pipes where permeation occurred. No permeation occurred in the iron pipe exposures where the samples contained levels at or below the plastic control pipe samples. Similarly, no permeation occurred in the copper pipe exposures where gasoline was detected, but not significantly above the plastic controls. Permeation occurred within 22 days in the PB and the PE pipe in both the soil and vapor exposures. Gasoline permeated the CPVC pipe within 44 days in the soil exposure but not at all in the vapor exposure. The CPVC pipe was the only pipe to exhibit physical damage as a result of the gasoline exposure; being softened in the soil exposure test. Most samples in which the levels exceeded 1000 ug/L had a detectable odor and a visual gasoline film on the surface of the sample.

APPENDICES

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APPENDIX I

Permeation Results from Various Studies (1)

Author	Reference	Test Compound	Type of Pipe						
			PE	PB	PVC	CPVC	Asbestos	Iron	Copper
East Bay MUD	1	gasoline	yes/1	yes/1	no/6	--	--	--	--
KIWA	5	methyl bromide	yes/1	--	no/8	--	--	nc/8	--
Analab	6	1,1-Dichloroethane and 1,2-Dichloroethane Trichloroethylene	yes/1	yes/1	(2)	--	--	--	no/3
			yes/1	yes/1	(2)	--	--	--	no/3
		Dinoseb, Dicamba and 2,4-D	no/3	no/3	(2)	--	--	--	no/3
		Chlordane	no/3	no/3	no/3	--	--	--	no/3
		Lindane	(3)	(3)	(3)	--	--	--	(3)
Battelle Lab	7	toluene	--	--	yes/5	--	yes/1	no/6	--
		hexane	--	--	no/6	--	no/6	no/6	--
		1,1,1-trichloro- ethane	--	--	no/6	--	yes/2	no/6	--
AMWSC		TCE	yes/1	yes/1	--	yes/1	--	no/14	no/14
		Chlordane	no/10	no/10	--	no/10	--	no/10	no/10
		Gasoline	yes/3	yes/1	--	yes/6	--	no/14	no/14

(1) Results expressed as yes (permeation did occur) or No, followed by weeks of exposure e.g. yes/5 means permeation occurred after 5 weeks exposure.

(2) Solvent welded joints came apart, negating results.

(3) Low level permeation (12-33 ppb) occurred in all pipes after 3 weeks, test to be repeated.

(4) Additional tests done on jointed pipe sections (not shown).

Phase III Results (cont.)

Gasoline (Xylene), micrograms per liter

<u>Sample day</u>	<u>Controls</u>			<u>Soil Exposure</u>					<u>Vapor Exposure</u>				
	<u>PE</u>	<u>PB</u>	<u>CPVC</u>	<u>Iron</u>	<u>Copper</u>	<u>PE</u>	<u>PB</u>	<u>CPVC</u>	<u>Iron</u>	<u>Copper</u>	<u>PE</u>	<u>PB</u>	<u>CPVC</u>
0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1	<1	125	174	<1	<1	45	11.05	36.56	3.02	<1	177.12	1000	1
22	<1	<1	<1	<1	<1	4549	7309	24.7	<1	5.4	6288	7281	<1
44	<1	<1	<1	<1	<1	7857	7107	565.9	1	1	5838	5361	<1
99	<1	<1	<1	2	122	22530	23276	22590	1	1	7948	7926	4

Gasoline (Ethyl benzene), micrograms per liter

<u>Sample day</u>	<u>Controls</u>			<u>Soil Exposure</u>					<u>Vapor Exposure</u>				
	<u>PE</u>	<u>PB</u>	<u>CPVC</u>	<u>Iron</u>	<u>Copper</u>	<u>PE</u>	<u>PB</u>	<u>CPVC</u>	<u>Iron</u>	<u>Copper</u>	<u>PE</u>	<u>PB</u>	<u>CPVC</u>
0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1	<1	<1	<1	<1	<1	<1	1248	30	1.57	<1	166	932	1.08
22	<1	<1	<1	<1	<1	3207	3456	10.46	<1	2.59	2924	3363	<1
44	<1	<1	<1	<1	<1	4500	4194	405.7	<1	<1	3309	2808	<1
99	<1	<1	<1	1	46	4297	6612	3407	<1	4	1380	1546	1

Phase III Results

Gasoline (Benzene), micrograms per liter

<u>Sample day</u>	<u>Controls</u>			<u>Soil Exposure</u>					<u>Vapor Exposure</u>				
	PE	PB	CPVC	Iron	Copper	PE	PB	CPVC	Iron	Copper	PE	PB	CPVC
0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1	1.5	5	7.2	1.5	1.3	3.25	4051	1.4	5.5	1	12.36	44.2	1.36
22	1.05	<1	<1	1.04	0.3	1533	6301	1.52	1.07	1.17	3400	3391	1.52
44	1	1	1	1	1	3561	3124	415.6	1	1	1073	793	1
99	1	12.29	1	1	9	1142	1270	2722	1	1	3046	246	1

Gasoline (Toluene), micrograms per liter

<u>Sample day</u>	<u>Controls</u>			<u>Soil Exposure</u>					<u>Vapor Exposure</u>				
	PE	PB	CPVC	Iron	Copper	PE	PB	CPVC	Iron	Copper	PE	PB	CPVC
0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1	20	32	<1	4.9	5.6	29.6	41924	126.94	42.68	16.2	2781	2614	25.86
22	1.72	1.76	4.29	4.17	2.14	3809	62100	89.67	10.41	20.3	41892	44435	4.63
44	2	2	2	5	4	70200	69712	1210	2	3	34470	28880	2
99	4	26.4	2	2	169	46474	47965	48912	2	1	4612	3800	3

Polybutylene plumbing pipe saved thousands of home and apartment owners the cost and inconvenience of broken water pipes during the extremely severe cold spell over the 1983 Christmas holidays.

"It was a major disaster in this area," says Jack Smith of Sundance, Inc., a plumbing contractor in Marietta, GA, where temperatures dropped to near zero and high winds pushed the chill factor to -50°F . "We had 500 to 700 service calls. They came in waves. But only one involved a system piped with polybutylene pipe. All the others involved breaks in copper and galvanized pipe. And we've installed hundreds of polybutylene piped water systems in this area."

The experience with polybutylene pipe during the freeze in Cobb County, GA, has fire and building code inspectors smiling. Cobb County, which is part of the rapidly growing Atlanta metropolitan area, has been a leader in changing building codes to allow the use of polybutylene pipe in hot and cold water plumbing and to authorize cost-saving building code modifications to encourage the installation of residential fire sprinkler systems.

"There were leaking pipes all over town -- and one in an unheated area of a new school may have caused a quarter of a million dollars or more in damages by itself -- but virtually no problems with the residential systems based on polybutylene pipe," says Lt. Jerry W. Grier of the Cobb County Fire Department. "We've got about 9,000 water systems and sprinklers based on polybutylene pipe in the county." Because of the dramatic difference in performance, the Cobb County Fire Department is now considering mandating polybutylene pipe for all sprinkler systems installed in the attic.

"We're very pleased with the performance of polybutylene," says Jim Bechtel, Senior Vice President of Post Properties, Inc., which is one of the largest builders and operators of multi-family dwellings in the Atlanta area. "We have 250 domestic water systems and 148 fire sprinkler systems based on polybutylene pipe in operation. There was only one break involving a system based on polybutylene pipe during the freeze."

"This freeze changed a lot of people's minds about plastic pipe," says Danny R. Gosdin, a field supervisor for Carroll & Boyd, Inc., of Jonesboro, GA, a mechanical contractor for Pulte Homes. "We've installed hundreds of water systems based on polybutylene pipe, and during the freeze we had only one fitting push off from freezing, but virtually no water damage resulted. Yet, the first day after the hard freeze, we had 250 calls, all involving water systems made with copper or galvanized pipe. That makes you think this polybutylene pipe is pretty good stuff."

"Knowing what I know now, I'd pay more to have a water system piped with polybutylene than I would for a system made with metal pipe," says W. T. Anderson, who is director of inspections for Cobb County. In actual practice, polybutylene plumbing systems can be installed less expensively than copper systems, even at today's depressed copper prices.

In Houston, the same cold front dropped temperatures to a record low of 11 degrees on Christmas morning and held the area below freezing for more than 100 hours. According to preliminary estimates, freeze damages were expected to match or exceed damages caused by the wind and flooding from Hurricane Alicia

last August. Some 5-10 percent of homes and apartments in the area experienced frozen and broken pipes.

"One apartment complex I repaired had over 180 breaks," says Laurence Klein, a master plumber who specializes in repair and replacement plumbing for large apartment and condominium operators. For several years, Klein has used polybutylene pipe to replace copper and galvanized pipe in water systems and during that time has replaced hundreds of metal water systems in the Houston area with polybutylene pipe.

"I did a good month's work in the week following the freeze, but didn't get a single call involving polybutylene pipe," he said. "The freeze really separated the good from the bad plumbing. Polybutylene isn't giving me very much repair business."

Wood Brothers Homes, one of the larger home builders in the Houston area which switched to polybutylene pipe for its plumbing a little over a year ago, also reported no complaints of breakage or water damage from occupants of some 250 to 300 homes constructed with the high performance plastic pipe.

"Our sales department, because of problems in the past with other plastic pipe, has been uncomfortable about our changing to polybutylene, and felt they were having to sell over it," says Trudy Starkey, who is purchasing agent for Wood Bros. "Since the freeze, that has changed and they now feel that it is a sales point in favor of Wood Bros. Homes."

Shell Chemical Company

A Division of Shell Oil Company



One Shell Plaza
P.O. Box 2463
Houston, Texas 77001

May 16, 1984

EXPRESS MAIL

Chairmen and Members
Senate Labor and Commerce Committee
State of Alaska
Juneau, Alaska

Dear Sir:

REFERENCE: HOUSE BILL NO. 508, AN ACT RELATING TO THE PLUMBING CODE

I appreciate the opportunity to give testimony to the state Senate of Alaska on house bill No. 508. I was disappointed, however, that testimony extended well beyond the scheduled committee meeting time, so that it became necessary for me to leave before I could address the numerous allegations about the performance of polybutyle piping. This letter is written to address those allegations and show that there are facts that clearly refute the arguments that were made. We would like to see this letter and the substantiating information that is attached entered into the official transcript of the hearing.

In his testimony, Dwight Perkins of the Pipe Trades Council of Alaska raised several general issues in protesting the potential approval of polybutylene pipe. The issues raised by Mr. Perkins and the true facts on those matters are as follows:

Durability of polybutylene pipe - Polybutylene pipe resists virtually all of the actions that destroy metal piping. Polybutylene piping does not rust, rot, or corrode. It resists scale buildup that can plug metal pipes. It is not subject to electrolysis. It resists breakage due to freezing water far better than any metal pipe. It has a wet abrasion resistance superior to metal plumbing pipe (see attached performance report on the use of large diameter polybutylene pipe to replace steel piping in the transport of highly abrasive bottom ash slurries from coal fired power plants). Because of its flexibility, polybutylene pipe should be able to accommodate any movement due to earthquakes much better than metal piping. Indeed, the ability to accommodate movement was one of the primary reasons that polybutylene pipe replaced metal pipe in the mobile home industry. Far from being less durable, the facts clearly show that polybutylene pipe is far superior to metal pipe.

HRA413702

Thawability - There are proven methods that can be used to thaw plastic water lines. Because of its excellent high temperature properties, polybutylene pipe can be thawed by either hot water or low pressure steam, applied from either the outside of the pipe or by a flexible probe inside the pipe. As verification of the pipe's ability to tolerate temperatures in excess of 180°F during thawing, I am enclosing test data that shows that, at close to the condensation temperature of steam (210°F rather than 212°F), polybutylene pipe will carry an internal pressure of 150 psi for well over a year - certainly long enough to thaw the pipe.

I believe that it should be pointed out that, once the polybutylene pipe is thawed, the consumer's problems are over. By comparison, the thawing of a frozen metal pipe frequently presents the consumer with the very serious problem of broken, leaking water lines. I have enclosed an article attesting to the substantial benefit realized this past winter by users of polybutylene plumbing pipe.

Fire hazard - In spite of Mr. Perkin's allegations, SRI International, in an Environmental Review Document prepared for the state of California, concluded on page V-3 of the summary that, "The potable water pipes, kept cooler by the water inside and of much lower mass, are not a significant fire safety issue."

Allegations on smoke toxicity are also not borne out by the facts. A document detailing tests done by Dr. Carlos Hilado using a test method patented by NASA concluded that "dry" polybutylene produced less toxic gases than Douglas fir does. Obviously a pipe wet with water as it will be used constitutes even less of a risk.

Electrical grounding - We were surprised that Mr. Perkins would bring this point up as the National Electrical Code cautions against the use of water pipes as electrical grounds.

Permeability - This allegation only relates to buried piping and as such has no bearing on the installation of hot/cold water plumbing pipe in walls of buildings.

Worker safety - This is another curious point for Mr. Perkins to raise. In their objective study, SRI International concluded on page V-8 of their summary that, "PB is clearly a preferred material from the worker safety and health viewpoint compared with both metal systems and with plastics that require cementing."

Mr. Vernon Akin (sp.?) commented on toxicity/health issues, the installation requirements for polybutylene pipe, his opinion that polybutylene pipe will not be less expensive to install than metal pipe systems and thermal expansion/contraction. Again, addressing the facts as they relate to these issues:

Toxicity/health - Every component of polyethylene pipe - the resin itself, the pigments, and the stabilizers - are approved for food contact use up to 180°F (the maximum sustained plumbing temperature) under the Food and Drug Administration regulations. None of the piping materials currently approved by the Alaska code can make that statement. In fact, some of the metal systems currently approved by the state of Alaska are coming under increased scrutiny (see enclosed comments on 50/50 time-lead solder). Far from being a health risk, polyethylene pipe is likely the safest potable water piping material.

Installation requirements - Mr. Akin alleged that the requirements in the code cannot be practiced. The facts are that over 500,000 residences were plumbed with polyethylene piping during this last year to the satisfaction of the local plumbing officials.

Installed costs - We certainly recognize Mr. Akin's right to his own opinion on this matter, but the facts are otherwise. The National Association of Homebuilders Research Foundation documented a 44 percent reduction in plumbing costs. In his report to Congress on February 18, 1982, the Comptroller General of the United States estimated a savings of \$300 per house.

Thermal expansion/contraction - Whereas polyethylene does have a higher coefficient of thermal expansion than metal, it is at least 100 times more flexible. As a result, it can flex to accommodate any thermal expansion or contraction, actually generating fewer concerns than metal systems. In almost 5,000,000 plumbing systems installed with polyethylene pipe in the United States, I am unaware of thermal expansion causing a single problem.

Several comments were also raised about the solvent cements thought to be used with polyethylene. The simple fact is that polyethylene pipe is not joined with solvent cements. The 1982 IAPMO code calls for mechanical joining systems. Referring back to my earlier comments on worker health and safety, these joints are actually safer than metal joints.

Judged by the facts as interpreted by objective, credible third parties, polyethylene pipe is not only equal to the metal pipe currently approved in Alaska, it is decidedly superior. It offers the consumers of the state of Alaska a better, safer material at a lower cost. It offers the tradesman a safer material that is easier to use. The facts as differentiated from the opinions and allegations clearly show that the approval of polyethylene pipe as embodied in the 1982 IAPMO code will pay substantial benefits to all of the citizens of Alaska. I urge you to

move expeditiously to move this bill out of committee so that the benefits of the progressive product can be made available throughout Alaska.

Very truly yours,

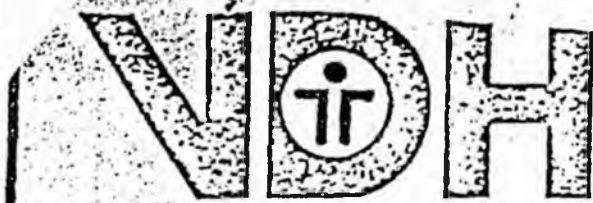
(Original signed by:)

A. H. Schroer
Manager Sales Development
Polybutylene Business Center

Enclosures

cc: Mr. Clark Gruening
Mr. Gordon E. Evans

Mr. R. W. Baxandall
Alaska State Homebuilders Association
P.O. Box 3-6000, Suite 140
Juneau, AL 99801



PUBLIC HEALTH NEWS

Virginia Department of Health
109 Governor Street
Richmond, Virginia 23219

DATE:
RELEASE:

December 16, 1983
IMMEDIATELY

CONTACT: Thomas B. Gray, Assistant Technical
Services Chief, Water Supply Engineering
(804) 786-5566

A health advisory is being issued by state Health Department officials to persons whose home plumbing consists of metallic pipe. State Health Commissioner, Dr. James B. Kenley, is advising persons who live in newly constructed homes (less than two years old) or homes where plumbing has been recently replaced to flush the stagnant water from their taps for 3 minutes before using it for human consumption.

Dr. Kenley said, "Whenever a water tap that has not been used for 6 hours or longer is opened, the initial portion of water may contain dissolved metals in excessive amounts. Flushing a tap for several minutes will remove stagnant water from a house's plumbing and should ensure that water obtained after this maneuver is safe for human consumption."

Recent scientific articles have indicated elevated levels of piping and jointing metals (copper, zinc, lead) in the water after it has been allowed to stand for a period of time. Due to a limited amount of data presently available regarding the extent of this problem in Virginia, Dr. Kenley has established a work group to collaborate with the Department of Housing and Community Development in investigating the occurrence of these corrosion products in stagnant water.

--END--



Solder labeled health threat

By Hugh Robertson
News Leader staff writer

In an investigation with statewide and possibly national implications, an engineering consultant hired by Chesterfield County has concluded that the use of lead-based solder to seal plumbing joints can pose a health threat to owners of new homes.

The investigation was undertaken following complaints this summer by a Brandermill couple, Douglas and Jeanette Corkum, that the water in their new, \$158,000 home at 4016 McTyree's Cove Terrace was bad and they had suffered from vomiting, diarrhea and fatigue since moving into the home in January.

Because of the consultant's findings, the solder problem will be laid before the state Board of Housing and Community Development next month with the suggestion that the use of lead-based solder be prohibited in future construction.

The state board administers the Uniform Statewide Building Code to which home and other construction in Virginia must conform.

Additionally, the Virginia Department of Health plans to undertake a statewide study to determine how much of a health danger, if any, may exist in new homes where the lead-based solder was used.

In the meantime, according to Assistant Health Commissioner Robert B. Stroube, owners of homes less than 2 years old who feel they may have a water safety problem should run their water through faucets "a couple of minutes" before drinking it.

Problems with lead and copper in new home plumbing systems usually are resolved, with the metals flushed out, in about two years, he added.

However, Dr. Stroube cautioned that just how much of a problem exists from use of lead-based solder is unknown at present.

Dr. Stroube also reported that water quality problems may be created by using water with a high acid content, such as is sometimes found in wells. Corrosion may occur, putting copper into the water system, in these cases, he said.

In Chesterfield County Administrator Richard L. Hedrick also cautioned that "our data right now is rather uncertain" and how much of a problem exists is unknown.

Laboratory testing of the Corkums' water by the state health department disclosed it was highly contaminated by both lead and copper. In one sample, the metal content was 200 times that allowed under federal and state health standards. The tests also showed the county-supplied water was not at fault.

The Corkums' problem then became involved in suits and countersuits filed by the Corkums and their contractor, Edward J. Buzzell Jr.

On Oct. 27, the county hired the Jordan firm to investigate the situation and recommend what could be done about it.

Last month, the plumbing beneath the Corkums' home was removed and the soldered joints opened and examined.

Additional tests were made by the health department of water which had been allowed to stand for several hours in the joints. Again, high lead and copper content was found.

In a Nov. 10 preliminary report to the county's top building official, Robert S. Hodder, the Jordan firm said, "Several relatively new homes in Chesterfield . . . have been found to have high lead levels in the internal water piping system which are far in excess of the . . . limit." The limit for lead is .05 milligrams per liter.

"Some have levels in the 5 to 8.1 milligrams per liter range," the re-

port said.

"All of the homes involved were relatively new and built by different builders and plumbers" and were in different parts of the county, the Jordan report continued.

The firm also reported that all the houses concerned had copper tubing in which the joints had been sealed by what is called "50-50" solder, which is half tin and half lead. The 50-50 solder is commonly used in home construction, according to building officials.

Additionally, the Jordan firm reported that a "self-cleaning" plumber's flux had been used in each instance. The flux is a liquid which is used in conjunction with solder in sealing pipe joints.

The problem apparently is a far-ranging one, the report continued, because difficulties with water systems where lead solder has been used have been found in Long Island, N.Y.; Carroll County, Md.; Seattle; Portland, Ore.; England; Canada; Scotland and the Netherlands.

"There definitely is a problem associated with the use of 50-50 solder in copper pipe joints which results in lead levels in the water system higher than the federally mandated levels," the report said. "The overwhelming consensus has been in previous problem areas to preclude the further use of lead solder in copper piping."

The report urged that lead-based solder be banned and that solder without lead be required in the future. It also said use of the "self-cleaning" flux should be investigated further.

As did the health department, the report recommended that owners of new homes let their water run for several minutes before drinking it.

"It does appear, however, that the problem dissipates within about (two years) . . . after all the lead in contact with the water has been corroded and flushed through the water system,"

the report also noted.

Neal Barber, deputy director of the state's housing and community department, said the agency's staff would lay the problem before the state board at its Jan. 9 meeting and suggest that a solution would be to prohibit use of the 50-50 solder.

Instead, the code should be revised to require use of "95-5" solder, which is 95 percent tin and 5 percent antimony, Barber said. The antimony contains just .02 percent lead, according to the building code.

Barber said the department has learned the use of lead solder recently has been banned in California and New Jersey.

However, the Virginia building code allows the use of 50-50 solder, and, until it is changed, local building officials have no authority to prohibit use of that type solder.

Barber said that, if the board decides to require use of 95-5 solder, the code-amendment process would take about seven to ten days. Various procedures, including holding of public hearings on the issue, would have to be followed.

In a followup report to Hodder, the Jordan firm reiterated, "It is apparent that the lead-tin solder was the source of the contamination in the Corkums' piping system."

Once new piping, using 95-5 solder and a different flux, was installed in the home, the problem disappeared, the report said.

"We feel that the recommendations made in our preliminary report are still valid," the followup continued, adding that the state building code should be changed.

"Consideration should be given to testing the water supplies in recently constructed public buildings," where children are present, such as schools, day-care centers and nurseries, where lead solder and copper piping have been, the report also recommended.

"We hope that our reports will help to solve what has apparently been a longstanding problem which no one was aware of until recently," the report concluded.

Tests of Polybutylene Pipe at PT Relief Valve Conditions

Over four years ago, Shell contracted with Springborn Testing Institute, Inc. to evaluate the performance of polybutylene tubing subjected to a constant pressure of 150 psi at a constant temperature of 210°F. Sustained pressure testing was done in accordance with the ASTM D1598 test method. The results accumulated to date (see table below) clearly show that the tubing far surpasses the IAPMO performance requirement of 48 hours at 210°F and 150 psi.

<u>Test Sample</u>	<u>Nominal Size (inches)</u>	<u>Failure Time (hrs.)*</u>
1	1/2 CTS	N31792
2	1/2 CTS	26929
3	1/2 CTS	26653
4	3/4 CTS	N31792
5	3/4 CTS	N31792
6	3/4 CTS	N31792
7	1/2 CTS	N31008
8	1/2 CTS	N31008
9	3/4 CTS	N30072
10	3/4 CTS	25887
11	1/2 CTS	N31008
12	1/2 CTS	N31008
13	3/4 CTS	21792
14	3/4 CTS	14415
15	3/4 CTS	N31008
16	3/4 CTS	N31008

*N denotes a sample which has not yet failed and is still under test.

BY THE COMPTROLLER GENERAL

Report To The Congress OF THE UNITED STATES

Greater Use Of Innovative Building Materials And Construction Techniques Could Reduce Housing Costs

Problems exist within different levels of government and the homebuilding industry that hinder the development and use of innovations which could check rising costs. For example:

- Builders are reluctant to accept risks associated with using new technology.
- Local building codes are sometimes restrictive and administered inconsistently.
- Builders lack technical information on innovative technology.

GAO makes several recommendations to the Secretary of Housing and Urban Development and the President of the National Institute of Building Sciences to encourage the development and use of cost-saving innovations in homebuilding.



CEG-82-35
FEBRUARY 18, 1982

A 1971 study prepared for HUD 1/ regarding builders' use of 12 cost-saving innovations showed that, on the average, 70 percent of the responding builders did not use the innovations. According to building code officials, 73 percent of the time builders in their areas used the innovations occasionally, seldom, or never. Subsequently, a 1973-74 NAHB survey, which included 11 of the 12 items, showed that 8 of the 11 were not used in the great majority of new single-family houses nationally. Our 1978 report, which addressed 8 of the 12 items, showed 3 of the 8 were still widely unused by builders in the 87 communities included in our review. The three still widely unused items and the estimated potential savings per house at the time were: spray painting (\$185), 2x4 studs 24" oncenter for exterior bearing walls (\$119), and the preassembled plumbing tree (\$55).

Examples of available cost-saving innovations currently not widely used by builders, as identified by HUD and NAHB research officials, and estimates of savings they could yield in the medium-price house include:

Engineered 2" by 4" studs, 24" oncenter interior and exterior wall framing (in lieu of 16" oncenter)	\$300 - \$700
Under floor plenum heating system (in lieu of duct work system)	\$400
Polybutylene piping for plumbing (in lieu of metal piping)	\$300
One-piece fiber glass bathtub with integral surround (in lieu of tile- work)	\$50

Rapid, widespread adoption of cost-saving innovations is hindered in part because the traditional onsite homebuilding industry is extremely fragmented--more than 100,000 builders, the majority of which build less than 25 units annually. However, the 1971 HUD study identified and analyzed a range of other factors impeding builders' use of innovations. While the study has not been updated, its results were substantially corroborated by the widely varied sources we consulted during our review. The study ranked in order of importance a total of 20 constraints, of which it called the following "important":

1/"Constraints to Builders' Use of Cost Saving Innovations," NAHB Research Foundation, Inc., July, 1971.

H60128
Cold Bay (Short version)
Feb. 18, 1982

On the Alaskan Peninsula where snow falls 124 days a year, temperatures frequently plunge below zero and earthquakes are common, the choice for a plumbing system for a new home is not a decision made lightly.

"I needed a plumbing system that wouldn't freeze-crack on me or fall apart during our frequent earthquakes and storms," said Magistrate Karl Heiker who completed the first privately built single family dwelling ever constructed in Cold Bay, one of the most seismically active areas in the world.

Other construction complications Heiker had to contend with were hurricane force winds, the high cost of shipping building supplies, plus water with a mineral content that can choke metallic plumbing pipe.

Heiker selected a plumbing system based on a tough, flexible pipe manufactured from Shell Chemical Company's DuraflexTM polybutylene resin. The pipe, fittings and fastenings were supplied by U-Plumb-N-Save in Wasilla, Alaska near Anchorage.

In addition to costing much less than copper, Heiker said shipping charges for Duraflex pipe were less because of its light weight. Fewer fittings, tees and elbows were required because the flexible pipe can be snaked around curves and obstacles.

H60128
Page 2

With skilled labor scarce, Heiker said he wanted a system that would be as trouble free as possible. If water freezes in the pipe, the pipe expands, then retracts when the ice thaws. The pipe neither cracks or corrodes and easily withstands vibrations. Silt doesn't accumulate, reducing water flow.

The construction of Heiker's house of 1,724 square feet is about as solid as a fort. It features 2 x 6 studs throughout, a bolted and cable secured pier foundation, heavy insulation and triple pane windows. Heiker took two years to build his house.

"Part of the careful planning that made it possible to meet a target completion time I had, was my choice of polybutylene plumbing. We hooked up the system and it was secure. We haven't had a minute's trouble and I don't expect any. Our heavily mineralized water won't even scale up," he said. "The system has lived up to my expectations," the magistrate said, adding that "others who are planning to build here are convinced that polybutylene offers exceptional benefits to our corner of the world."

Heiker's home was the first built after the State of Alaska revised its policy to only lease lease lands in Cold Bay, the seat of Heiker's jurisdiction over a district that is 1,600 miles long and only 80 miles wide with a population of about 5,000.

###

Shell Chemical Company

A Division of Shell Oil Company



May 27, 1983

P.O. Box 7637
Stockton, CA 95207

Dear Sir:

As one who has been following the progress of DURAFLEX polybutylene I thought you might be interested in the attached comments and report.

On March 28, 1983, S.R.I. International issued their first report on the California Plastic Environmental Impact Report (EIR). While S.R.I. indicates the possibility of some additional testing being necessary, they did make several definitive statements on the subject of polybutylene (PB).

As the plastics controversy continues polybutylene has been in the center of activity. The S.R.I. report clearly refutes those allegations regarding the safety of polybutylene. I have attached for your review a copy of Chapter V of the California Environmental Quality Act (CEQA). The entire 588 page report is available from the Department of Housing and Community Development, 6007 Folsom Boulevard, Suite A, Sacramento, California 95819, at a cost of \$62.33.

In addition, I would like to quote a few of the statements by S.R.I. that relate to polybutylene.

- "PB poses little if any worker safety and health concern."
- "PB produce(s) combustion products that are not highly toxic; few if any additional fatalities or serious injuries would be likely from its combustion."
- "At present, the only partial alternative that seems reasonably certain to meet this requirement is to allow PB for hot and cold supply both outside buildings and inside buildings that are not fire-rated or within the fire-resistive construction of fire rated buildings."
- "Parenthetically, there seems little reason to prohibit PB in exposed locations of fire-rated buildings as long as the penetrations of fire-rated construction are designed to maintain the rating of that building."

--"PB is clearly a preferred material from the worker safety and health viewpoint," . . .

--"Although PB will certainly burn and metal will not, the additional risk of fire spread appears minimal, as does that of smoke toxicity."

While it is clear that polybutylene is a safe, cost efficient plumbing material, our opponents will not allow logic and scientific evidence to stand in their way. It is expected that the California Legislature will be presented with a number of bills attempting to ban or restrict the use of polybutylene.

Given the volume of scientific evidence along with the S.R.I. International report, we sincerely hope that you will consider the fact and not allow the use of polybutylene to be restricted any longer.

As always, should you have any questions or would like additional information, please call me. In the meantime thank you for your interest.

Very truly yours,

M. J. O'Brien /s/

M. J. O'Brien
Regional Sales Manager
Polybutylene Department

MJO/ja

Enclosure

LEGISLATIVE PROPOSAL ANALYSIS

Subject of Proposed Bill:

"Adoption of 1982 Uniform Plumbing Code"

Background Information:

Every third year, the International Association of Plumbing and Mechanical Officials adopts a revised plumbing code incorporating advances and improvements in technology. During the Twelfth Legislature, the department did not propose legislation to adopt the 1982 version of the Uniform Plumbing Code because there were conflicts between the Uniform Plumbing Code and the Uniform Building Code. The Department of Public Safety (Fire Marshall's Office) will propose legislation to adopt the most recent edition of the Uniform Building Code which is consistent with the 1982 Uniform Plumbing Code.

Summary:

The most noticeable changes in the plumbing code are as follows:

Section 108 allows for a larger grease interception to serve one or more fixtures. Section 203(d) states that copper tubing used for water service shall have a weight of not less than Type L.

Table 4-3, footnote #4. Evidence indicates that a three-inch horizontal waste will effectively handle discharge from three water closets; thus the code change, so that only four water closets or six unit traps are allowed on any vertical stack, and not to exceed three water closets or six unit traps on any horizontal branch or drain.

Section 601 changes will not allow cold storage rooms, refrigerators, cooling counters, etc. designed to hold food or drink, or sinks for washing or preparation of food, to be directly connected to a waste or vent pipe. All drains shall discharge through an air gap into a open drain or approved receptor.

Section 1004 is one of the major changes, and allows Poly Butylene (PB) water pipes to be used for hot and cold water distribution tubing systems, using inserts for connectors. It also inserts language to assure that when metal pipe is used as a building ground, it will be replaced by metal pipe when repairs are made to these pipes.

Also adopted were insulation standards for cold water service and yard piping. These standards were for Poly Vinyl Chloride (PVC), asbestos cement pressure piping and Poly Butylene (PB).

Those groups most affected by this change will be plumbers, contractors, local governments and state agencies issuing building permits.

Estimated Fiscal Impact: (FY '83 - FY '87)

To the state: -0-

To others: -0-



UTILITY CONTRACTORS OF ALASKA, INC.

Alaska Chapter of the National Utility Contractors Association

P.O. Box 10-1186 • Anchorage, Alaska 99511 • (907) 344-4581

April 4, 1984

Sharon Macklin, Lobbyist
315 5th Ave. #6
Juneau, AK 99801

Re: House Bill Number 63 and Senate Bill Number 238, "An act relating to the plumbing code".

Dear Sharon:

UCA has no objection to adoption of the Uniform Plumbing Code as outlined in the above referenced bills.

However, we very much would like to see an amendment to Alaska Statute 18.62.070, (copy attached). We feel that House Bill No. 63 and Senate Bill No. 238 would be the appropriate vehicle for such an amendment. We propose that the AS 18.62.070 be amended to add the following:

- (3) The requirement for Certificate of Fitness does not apply to "sewer/water line installers".
- (4) A "sewer/water line installer" means:
 - a) A worker who installs the building sewer piping within the property lines, starting at the first joint from the building to the main sewer trunk or disposal field; or
 - b) A worker who installs water service piping to the first joint in a building above ground, within the property lines from either a public or private water supply.

The purpose for this proposed amendment is to avoid the kind of hassels we had last year with Bill Zubeck. The proposed definition for "sewer/water line installers" conforms with industry wide practice.

Please call me concerning this amendment at your convenience.

Sincerely yours,

William A. McKeever

cc: All UCA members

6.6.1

CERTIFICATE OF FITNESS

AS 18.62.070 PERSONS REQUIRED TO OBTAIN CERTIFICATE. A person engaged in one of the following trades shall first obtain from the department the appropriate certificate of fitness in that trade:

(1) electrical wiring subject to the standards established in AS 18.60.580; and

(2) plumbing subject to the uniform plumbing code, as established in AS 18.60.705 (1ch 12 SLA 1974)

AS 18.62.080. PENALTY: A person, either an employer or employee, who violates a provision of this chapter or of a regulation issued under this chapter is guilty of a misdemeanor and upon conviction, is punishable by a fine of not more than \$500.00 (1ch 12 SLA 1974)



Cloudy
High mid-80s
Details/D2

Ueberroth:
teams will
stay put/B1



NCAA is
getting
tough/B1



hawks
'taking
up' / B1

Seattle Times

25 Cents

Saturday, June 22, 1985

A CLEARST NEWSPAPER

City fear: Plastic pipe lets poisons in

By Jane Hadley
P-I Reporter

The first time Alicia Berger, 29, drank a glass of water at the West Seattle house she was renting, she spit it out because it tasted so bad.

Soon, she and her boyfriend, Jeffrey Lewis, 38, found that their water was contaminated by xylene and toluene, two organic solvents commonly found in airplane glue, gasoline, paint solvents, plastics and other products.

As a result of five or six similar cases, the Seattle Water Department may stop using plastic water pipes, an official said.

The city already has tightened its policy within the past year on plastic water pipes, no longer installing them in industrial or commercial areas, said Jim Chapman, supervisor of water quality at the city Water Department.

Organic solvents

But now Water Department executives soon will discuss going even further and discontinuing their use altogether, he said.

The main problem with plastic pipes is that organic solvents can permeate the pipe, polluting the water they carry, said Roy Jones, an environmental scientist for the U.S. Environmental Protection Agency.

Typically, the ground around the pipe becomes saturated with a solvent, such as gas or oil or paint thinner, which passes through the pipe wall to the water.

A second problem is that certain kinds of adhesives used to join some plastic pipes also permeate the pipe and contaminate the water.

Plumbing code

The plumbing code requires that the right combination of adhesive and plastic be used, but Jones says it's hard for plumbing inspectors to know whether an installer has used the correct adhesive.

Chapman said the city began to use plastic pipe in the early 1960s and estimates that maybe half the city water lines serving residences are on plastic pipe today.

In the last two or three years, there have been about six cases in which residents have reported drinking water contaminated with organic solvents such as toluene, xylene and benzene, Chapman said.

Benzene is a known human cancer-causing agent, linked to leukemia. Xylene and toluene are

See TWO, Page A-1



Jeffrey Lewis and Alicia Berger had to leave a rental home because the water there was contaminated with organic solvents. Plastic water pipes may have been part of the problem.

Two leave rented house because city water there is contaminated

From Page A-1

not linked with cancer but can cause kidney, liver and central nervous system damage.

In all but one of the cases, the residents lived in commercial or industrial areas, Chapman said. But in one case, the home was in a residential neighborhood.

Chapman speculated that in that case somebody poured oil or some other petroleum product into the gutter and it leaked through an expansion joint in the concrete to saturate the soil around the water pipe.

In each case, the city replaces the plastic pipe that runs from the street to the property line with copper pipe. It's up to the property owner to replace the pipe from the property line to the house.

Berger and Lewis moved into a rented house last Nov. 28 on a sparsely populated, overgrown ridge in West Seattle just above Marginal Way Southwest. By Jan. 1, they had moved out.

The two were so upset by their experience they didn't even want to talk about it for several months, said Lewis, a teacher of Indian music.

He complained that officials at various agencies were slow to respond initially, never called back when they said they would, were timid and uninformative and tried constantly to limit their responsibility for the problem.

"Everybody was very nice, but nobody would make a commitment," he said. Meanwhile, the couple was driving 40 miles round-trip to shower every day, borrowing water from people across the street and eating elsewhere.

Berger, a graduate student at the University of Washington, and Lewis hired a private lab to test the water, because they felt the Water Department would not do a test.

But the Water Department did do a test. Both tests found the water contaminated and the department decided the plastic service line should be replaced.

When crews dug holes in the

ground near the meter box along Marginal Way Southwest to install copper pipe, the soil was clearly contaminated and gave off a strong solvent odor, said Jones of the EPA.

Lewis said, "From 20 feet away you could smell this ground they were digging up. It stunk."

But though the Water Department did replace the pipe, nobody ever did anything about the contaminated soil.

In fact, Water Department crews started to cover over the new pipe with the old contaminated soil until Lewis questioned the wisdom of that move.

"Aren't you just asking for trouble?" Lewis asked. The crews then decided to haul the soil away and put clean dirt down instead.

Jones said he was at the site "strictly as an observer." Jane Lee of the Seattle-King County Department of Public Health said once she saw that the water department replaced the pipe, she considered her responsibility over.

Chapman said the Water Department's responsibility was only to replace the plastic pipe.

He said nobody checked to see whether the contamination is widespread or limited to the meter box area. And nobody checked the source of the contamination.

He said it would be hard to know where it came from, though he added, "Obviously, with the painting contractor next door, that would be suspicious." The meter box is adjacent to the property of Central Painting Inc. on Marginal Way Southwest.

Both Jones and Chapman said any soil contamination would be in the jurisdiction of the state Ecology Department. But the Ecology Department was never called about the case.

And Joan Thomas, director the Ecology Department's regional office in Redmond, said soil contamination isn't that department's responsibility unless either groundwater or surface water is polluted.

She acknowledged that

groundwater pollution almost always starts as soil pollution.

When asked whose responsibility the soil contamination would be, Thomas said: "I can't say it was anybody's responsibility. I'm saying I don't know."

Tom Hubbard, a water quality biologist at Metro, said he considers it important to follow up such reports of soil contamination. Hubbard has been monitoring testing the shores of the Duwamish River the past several years trying to figure out where various river pollutants come from.

Jones of EPA said: "The problem is because of different jurisdictions and the delegation of programs and delegation of programs and delegation of programs leave some pretty big gaps in the system. It's not saying they're right, but they exist."

Chapman said: "It's an area of mixed responsibilities. It's not entirely clear who does have responsibility. I agree it's not a terrific situation."

One person who has taken a stand on the source of the pollution is the owner of the house Berger and Lewis were renting. Landlady Carol Knox, a Cashmere resident, recently filed suit against Central Painting Inc.

Knox's Seattle lawyer, Linda Larson, said the suit alleges that the paint company released chemicals into the soil which ended up in the water line to Knox's house.

Though the new copper pipe put in by the Water Department reduced the levels of contamination, the drinking water is still contaminated, said Chapman.

Knox probably will have to replace at least some of the pipe on her property. To replace all of it up to her house, a long distance up a steep hill, would cost an estimated \$23,000, said Knox's lawyer.

John Hamilton, president of Central Painting, denied responsibility for the problem. He said tests performed by a local environmental laboratory show that the pollution in the house drinking water is unrelated to diesel oil found at the meter box and naphtha found at a sump on his property.



Section D

Classified D/5

Wednesday

August 14, 1985

Seattle Post-Intelligencer

D-2 WEATHER

D-4 COFFEE BREAK

D-12 FUNERALS

City halts use of plastic pipes for drinking water

By Jane Hadley
P-I Reporter

The Seattle Water Department has placed a moratorium on its use of plastic pipe that delivers drinking water.

"We're not using any until we do come to a final decision" about the safety of the pipe, said Jim Chapman, water quality supervisor for the department.

"We've been contacted by a number of people who claim to have further information."

Water contaminated

The moratorium follows the discovery by a couple renting a home in West Seattle that their water was contaminated with toluene and xylene, two substances commonly found in airplane glue, gasoline, paint solvents and other products.

When the department investigated, it found soil around the meter box contaminated with a strong-smelling solvent. The department then replaced the plastic

pipe from the street main to the meter box with copper pipe.

Plastic pipe is a problem because it can be permeated by organic solvents such as gasoline or trichloroethylene, a widely used degreasing solvent. Also, certain glues used to join the pipes are toxic and permeate the pipe to contaminate the drinking water inside.

The city first began to use plastic pipe in the early 1960s for service lines that run from the mains in the street to meters, Chapman said. He estimated that about half the service lines in the city are some type of plastic pipe. The mains are not plastic.

Many lines from the meters to the houses probably also are plastic, Chapman said, but property owners are responsible for installing those.

Forbidding use of plastic for those lines would require a change in the plumbing code, which the City Council would have to do by ordinance.

Chapman said there have been six or seven cases in Seattle within the past two or three years in which drinking water was contaminated when organic solvents penetrated plastic pipe.


All but one were in primarily commercial or industrial areas, where the likelihood of gasoline spills and other soil contamination is greater than in residential areas.

Installations halted

Consequently, the city already has stopped installing plastic water pipes in commercial and industrial areas. The new moratorium applies to residential and all other areas.

Bob Giron, business agent for the United Association of Plumbers and Fitters Local No. 82 in Seattle, said yesterday that plumbers oppose the use of plastic pipe for drinking water.

"it's not delivering as pure an item as it should be," he said. "And from the workers' standpoint, the glues and solvents we have to use we feel are dangerous."



Reel's JOURNAL - JULY 1985

Southwest Gas Replacing ABS Pipe in Gas Lines

PHOENIX, — Southwest Gas Corp. has been given the central business area top priority in its program to replace an estimated 2,300 miles of possibly defective gas pipe.

The utility acquired the gas distribution system from Arizona Public Service (APS) last November.

The first phase of the project is expected to require between three and four months and will depend on several contractors working simultaneously in various sections of the target area. Some of the work is already underway, according to John Hanenburg, program manager.

Utility officials noted that the program will involve all ABS-type plastic pipe. APS had used the pipe extensively in the Greater Phoenix area and in other parts of Arizona between 1959 and 1971.

Officials said the pipe constitutes about 23 per cent of the entire system. The whole replacement program will cost an estimated \$120 million and will last about six years.

The ABS pipe was involved in an explosion in Phoenix last September that killed five persons and prompted an investigation. The probe revealed that the pipe was aging more rapidly than expected initially.

Oregon City Seeking \$3 Million to Replace Broken Plastic Pipe

by Jim Norland

MEDFORD, Ore. — This southern Oregon city of 50,000 is asking seven suppliers of plastic pipe to reimburse more than \$3 million in damages the city expects to sustain in replacing the polybutylene water pipe bought between 1971 and 1981.

Attorneys for the Medford Water Commission and the City of Medford told the suppliers by letter, "It would appear . . . that this water pipe does not meet the requirements, warranties or representations made by you at the time of sale."

The city and the water commission have recently discovered defects and consequent breaking of "numerous pipe," says W. V. Deatherage, a member of Frohnmayer, Deatherage, deSchweinitz, Pratt & Jamieson, P.C., Attorneys at Law, in Medford.

Deatherage has asked each of the seven suppliers to notify his firm by June 26 whether they want to reimburse the two government entities "for the damages they have suffered as a result of said defective pipe.

"The Medford Water Commission will be required to replace all of this water pipe, which it has estimated will be at a cost in excess of \$2,000,000,"

Deatherage's letter continues.

Medford City Attorney Gene Clark told Reeves Journal that the total damage is expected to be "in excess of \$3 million, but no one supplier is expected to be responsible for more than \$2 million."

Letters identical to the one quoted went to The Flintkote Co., Pipe Products Group, Orangeburg, N.Y.; Clow

Corp., Plastics Division, P.V.C. Plastic Pipe, Bensenville, Ill.; Western Products Co., Union City, Calif.; Hinds Supply Co., Beaverton, Ore.; Westflex Manufacturing Co., Division of Western Plastic & Rubber Co., Richmond, Calif.; Budge-McHugh Supply Co., Medford; and Consolidated Supply Co., Portland, Ore.

November, 1985
65th Year

PLUMBING • HEATING • COOLING

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- **Hoover Dam Celebrates 50th Anniversary (Cover)**
- **NAPHCC, ASA Convention and Exposition Highlights**
- **Boede Calls for Improved Contractor/Labor Communication**
- **A-40 Committee Puts Plastic Pipe on Hold**

Calif. Attorney General Critical of IAPMO Decision

SACRAMENTO — California's attorney general has written a brief of amicus curiae in support of the anti-plastics factions involved in an appeal of a court decision requesting that an injunction ordered against the International Association of Plumbing and Mechanical Officials (IAPMO) in 1983 be extended to IAPMO's 1985 Uniform Plumbing Code (UPC).

A number of parties, including the State Building Construction Trades Council of California (backed heavily by the United Association), filed suit in 1982 in an attempt to prevent IAPMO from circulating its 1982 edition of the UPC in California because of the addition of several new plumbing code changes which allowed plastic piping materials to be used for potable water within buildings for the first time under UPC guidelines.

The anti-plastics concerns attempted to stop circulation of the 1982 UPC in their lawsuit, which was also filed by the former director of the state's Department of Consumer Affairs, Richard Spohn, and a handful of environmentalist groups and individuals. The original suit alleged that IAPMO did not have the jurisdiction to make such additions to the code and that it was violating the state's Business and Professions Code.

Los Angeles Judge Jack A. Crickard ruled in the county's superior court, however, that IAPMO was not in violation of any laws or alleged unfair business practices and ruled against the anti-plastics factions' efforts to stop the publication of the 1982 UPC.

Crickard based much of his decision in favor of IAPMO on his opinion that there was not sufficient evidence to back up the anti-plastics camp's claims that plastic piping could be hazardous to the public health. Crickard did rule in favor of an environmental impact report to provide further input

and agreed to issue an injunction on the code calling for a disclaimer to be distributed with the 1982 UPC in California, stating that an environmental impact report is in progress and advising users of the newly added plastics materials to consult with their local officials as to the status of plastics.

IAPMO had already agreed to voluntarily print the disclaimer before the injunction was ordered.

The injunction was scheduled to be in effect only for the 1982 UPC. Now, as the 1985 UPC is being published (IAPMO issues a new update every three years), the plaintiffs in the case have attempted to continue the injunction through the appeals process.

California District Attorney John Van De Kamp issued his opinion, which has no enforcement powers, on Oct. 15. In his statement, Van De Kamp stated that he felt the appeals case in question falls "within the ambit of Business and Professions Code Section 17500" and that "IAPMO's conduct constitutes a violation of that section."

Van De Kamp called for the extension of the trial court's injunction to apply to the 1985 UPC and the 1985 IAPMO Research Directory (which lists approved products).

One of the primary contentions of the original lawsuit was that IAPMO did not have the authority to list products or grant product approval for products said to be in compliance with the standards of the UPC. Crickard rejected this claim and, in fact, praised IAPMO's efforts and professionalism in making such determinations, citing the input and testimony of the National Sanitation Foundation, which provides testing information for IAPMO and other model code writing bodies.

Van De Kamp's opinion challenges IAPMO's right to make such determinations and contends that the organization's operations should be governed under the Business and Professions Code.

A-40 Committee Puts Plastic on Hold

by Larry Dill

CAMBRIDGE, Mass. — In an effort to avoid becoming bogged down in a never ending materials debate that could slow progress on the American National Standards Institute's A-40 Committee on Safety Requirements for Plumbing, the committee voted during its Oct. 22-25 session here to withhold acceptance of plastic piping materials for use in domestic hot and cold water systems for potable use until it can receive more input on the subject from impartial, outside sources.

The action took place following a follow-up to the controversial discussions about plastic pipe at the committee's last session in July in Universal City, Calif. The July session of the A-40 Committee was highlighted by presentations from plastic pipe advocates and opponents. It was during the July session that both sides of the issue were provided with equal time to discuss the plastics issue.

The anti-plastics camp headed by the United Association presented a well organized and emotional program featuring its two key "expert witnesses," attorney Raymond Leonardini, and Dr. Marc Lappe, PhD., two of the key figures in the union-backed California Pipe Trades council's long running legal battle with the International Association of Plumbing and Mechanical Officials (IAPMO) over the use of plastic pipe in Uniform Plumbing Code (see page 24).

The Plastic Pipe and Fittings Association's participation in the July presentations consisted of a brief six-minute summary of its position on the issue of alleged permeation and leaching of plastic piping materials and the distribution of two documents supporting its position.

After much debate after the July program, PPFA, which had contended that it was not properly notified of the format of the July presentations (which was refuted strongly by A-40 officials), was extended a second invitation to present its case before the A-40 body during the October session. The presentations were established on a similar format with each side given 45 minutes to present its testimony. Following the testimonies equal time was also provided for rebuttals and question answering sessions.

This time it was the plastics advocates who rolled out their team of hired guns in the expert witness derby.

The United Association, which was called upon to make its presentation first, was content to have its legal counsel briefly state that the union felt it had adequately presented its case in July and that it did not feel further input

was necessary to express its views on the plastics issue. The United Association then distributed new documents for the committee members' consideration including an opinion (which has no legal binding power) by California attorney general John Van De Kamp on the on-going IAPMO court case over the use of plastics in the Uniform Plumbing Code (see page 24). In his statement, Van De Kamp voiced the opinion that an injunction which called for the inclusion of a disclaimer notifying users of the 1982 UPC in California that an environmental impact report was in progress to study plastic products, be extended for distribution with the 1985 UPC in California.

The United Association also distributed copies of a study being conducted by scientific experts at the University of California, Berkeley. The study, commissioned upon the request of the state's Department of Health Services, is providing a review of recent literature and research on the permeation of plastic pipe. The materials distributed were released Sept. 30 and represent the first half of a study that is scheduled to be concluded by April 1, 1986.

Also distributed were copies of correspondence to Leonardini from a representative of the California Department of Housing and Community Development which included a recent press release explaining the suspension of the environmental impact report assigned to Versar, Inc., a Virginia based research firm. This was accompanied by an audit of the work performed by Versar before suspension of the project.

Plastics Testimony

The plastics proponents were keyed by PPFA representative Jack Lancaster, who repeated PPFA's position following the July presentations. Lancaster continued to state that "PPFA believes, as it has stated other times, that this

committee is not the appropriate group to decide complex, scientific and technical issues with regard to plastics or with regard to any other materials."

"None of us has the professional expertise to decide issues like alleged permeation and leaching that have been raised against plastic pipe in this committee," Lancaster continued.

Apparently intent upon stressing its position that the members of the A-40 Committee did not have the technical or scientific background to make decisions on plastics materials, the PPFA representatives inundated the voting committee members with more than 50 documents on the plastics issue. They then presented three witnesses of their own to provide technical testimony on various aspects of the plastics issue.

PPFA's witnesses included Steven C. Packham, PhD, of Salt Lake City, a longtime toxicologist who has worked with a number of governmental and scientific agencies, who announced that he is currently conducting a study of all available data on plastics.

Another witness was Joseph Zicheran, PhD, of Innovative Fire Technology, Berkeley, who discussed his work with studies concerning plastic piping materials in fire stations.

The third PPFA witness was Alan Olson, PE, of B.F. Goodrich's chemical group. Olson addressed the charges of permeation in plastic piping.

Put on Hold

Following the presentations, the committee was still faced with the monumental task of forging ahead with the A-40 document's Table 3.1.3 which provides "standards for materials, equipment, joints and connections."

Realizing that the table, which must be passed before any definitive progress can be made toward completing the document, contains hundreds of pro-

Continued on page 24



Edward Brabec of the United Association ponders the large stack of technical materials presented to A-40 members for their study on the plastic pipe issue.

REEVES JOURNAL

August 1985
\$5.00

PLUMBING • HEATING • COOLING

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Executive Committee Holds
Session in Los Angeles

Industry Financial
Outlook Looks Good for '85

Contractors May Have
More to Gain



duct listings and their relating standards, the committee members were faced with the possibility of having progress slowed by debates on every plastics product that appears in the table.

In an effort to avoid such delays, Donald Dickerson, representing the American Society of Plumbing Engineers, suggested a motion which stated:

"Serious concerns regarding the suitability of plastic pipe to convey domestic hot and cold water for potable use have been brought before this committee.

"The committee has heard presentations and received materials regarding data which has been compiled and tests performed, planned and underway which deal with and address the 'complicated chemical, medical and public health questions' involved in such issues.

"It has been stated, and we believe, that much more work must be done in order to provide those data necessary to (make) a sound decision on these important matters.

"With all of the above in mind, the A-40 Committee is withholding acceptance of plastic pipe for use in domestic hot and cold water systems for potable use until such time as clear, definitive and impartial data are available which can substantiate its use for this purpose."

After acceptance of the motion, the committee members agreed that material from an outside source should be submitted and then studied before the committee made any decisions on plastics.

Refuting the charges by PPFA that the A-40 body is not capable of making the proper decisions on plastics, Dickerson noted that the body was qualified to make such determinations provided that it was given sound and impartial study results to evaluate. "I believe we have within this body the ability to analyze pretty technical reports," Dickerson said.

Vincent Doyle, co-chairman, said, "Collectively, we're probably the finest minds in the country in the plumbing industry."

PPFA's Richard Church protested the singling out of plastics materials and asked that all piping materials be studied. His pleas fell upon deaf ears. He continued his contention that the plastics industry would be willing to participate in such studies "if it was done across the board."

The A-40 Committee scheduled its next session for January in Tampa. At that time it will resume work on Table 3.1.3, which is nearly halfway completed with the exception of the plastics materials which have been placed on hold.

Anti-Plastics Forces Bring Out Hired Guns in LA A-40 Session

by Larry Dill

UNIVERSAL CITY, Calif. — It was only fitting that the American National Standards Institute's A-40 Committee on Safety Requirements for Plumbing hold its latest meeting at the Universal Sheraton Hotel here July 23-25.

Overlooking the Universal Studio lots, soundstages and outdoor arenas used for western stunt shows and the like as part of the studio's tours, the hotel was the perfect site for an old fashioned shootout between the advocates and opponents of plastic piping materials. The only trouble with the shootout, however, was that it was as one-sided as Custer's debate with Sitting Bull. If it was a fight, it would have been stopped on cuts in the third round.

While the majority of the three-day exercise was dominated by tedious reviews of the A-40 Committee's Table 3.1.3 (Standards for Materials, Equipment, Joints and Connections) and discussions regarding the chapters pertaining to such products in the developing model code being formulated by the committee, the liveliest session took place on the opening afternoon when it was announced that there would be a 90-minute discussion on permeation of plastic piping materials, providing 45 minutes for both advocates and opponents of plastic pipe to speak, to be followed by a 10-minute question-and-answer session.

The first speaker called to the podium was Jack Lancaster, spokesman for the Plastic Pipe and Fittings Association (PPFA). Lancaster briefly outlined PPFA's position on the issue of pipe permeation and reviewed two documents — a review of the plastics industry's position on permeation (which had the joint letterheads of the Plastic Pipe Institute, the Vinyl Institute, the Uni-Bell PVC Plastic Pipe Association and PPFA) and a copy of PPFA's position that characteristics of water and soil should be considered when making materials selections.

The former document listed the advantages of using plastic piping materials and the latter stressed that proper evaluation of soil and water conditions would lead to responsible selection of materials. The conclusions of the second document stated that "in order to maintain a viable supply of potable water, thought must be given to the installation of affected materials in known or suspect soil and ground water conditions which may cause



Jack Lancaster, Plastic Pipe and Fittings Association, reviews PPFA's position on pipe permeation.

permeation, corrosion or structural failure of the pipe, tubing or fittings."

The point of Lancaster's presentation, it appeared, was that all piping materials are subject to failure or permeation and leaching under particular circumstances.

Lancaster's statement was concluded in approximately six minutes and he sat down with nearly 40 minutes still allotted to him. The shortness of Lancaster's presentation was surprising to many of the committee members present at the session, including one who candidly told *Reeves Journal*, "I went to the bathroom and when I got back Jack was sitting down."

Opponents Speak

After Lancaster concluded his remarks and left the podium, chairman Vincent Doyle, representing the Mechanical Contractors Association of America as part of the joint committee with the National Association of Plumbing-Heating-Cooling Contractors as joint secretariats of the committee, called for the other speakers to step forward.

If Lancaster's presentation appeared to be surprisingly short and light to the committee members, what was to follow was a grand performance.

The committee members next witnessed a very organized, polished, professional and dynamic presentation by Raymond J. Leonardini, the attorney who has represented the California Pipe Trades (consisting primarily of United Association interests) in its legal battles

with the International Association of Plumbing and Mechanical Officials (IAPMO) during the last three years over the addition of certain plastic pipe products to the Uniform Plumbing Code. He was followed by Marc Lappe, PhD and the chief consultant to the California Pipe Trades on matters concerning its charges that plastic pipe contains toxic materials which are hazardous to the health of the public.

Leonardini, in his best courtroom manner, delivered a moving presentation blasting plastic piping products and their usage in plumbing systems. He also called for the A-40 Committee members to use their own judgment to keep plastics from their model code document. Lappe followed with supporting statements from a health policy consultant's viewpoint, before Leonardini delivered the closing summation.

Toxic Spills

Addressing the subject of permeation, Leonardini cited statistics that estimate 300 toxic waste spills in California every three months. "You don't know where those spills are going to be," he said, "so the idea of analyzing permeation and saying not to put them (plastic pipes) in areas where there are known toxins" is similar to "closing the corral after the horses are out."

"How are you going to know where there is going to be a toxic spill?" Leonardini asked, labeling the committee members "public policy makers and public health officials."

The attorney then pointed out that while efforts are made to determine locations that were once the sites of hazardous wastes, several cases pop up each year where housing tracts have been found to be built on waste sites three or four years after their construction.

One of Leonardini's strongest contentions was that research performed by the American Water Works Company revealed that toxic vapors, particularly from gasoline products, can permeate plastic piping as well as liquids.

"Now where are you going to put pipe to avoid infiltration and permeation by vapors?" he asked.

Leonardini went on to discuss a recent lawsuit filed in the San Jose region concerning polybutylene piping system failures. Submitting a deposition on the issue for the record, Leonardini called the failure rate of PB "time dependent."

"Because of the chemical development of that pipe (PB), if you wait long

enough that particular installation will fail," he claimed.

Leonardini concluded his opening remarks and called upon Lappe, a former official with California's Department of Health and the chief consultant in the lawsuit brought forward by the California Pipe Trades Council and the state's former director of the Department of Consumer Affairs, Richard Spohn, who lent his name to the IAPMO lawsuit under the banner of the Department of Housing.

"I want to thank this group for giving me the opportunity to speak, and the United Association for bringing me here," Lappe said in his opening remarks.

Lappe later explained that the quality of drinking water is generally measured at its source in public treatment facilities. "We assume that nothing happens to it to aid and abet any levels of contaminants in transit," he added, charging that contaminants are being picked up through plastic piping systems.

"We also know of contaminants from metal ions and we are assuming that they are not raising the level of lead, copper or arsenic above the levels that are permissible from the source."

Lappe pointed to three studies conducted by the Pipe Trades Council (under his supervision), the American Water Works Company and the Vinyl Institute.

"What each of these studies found was that there are differences as clear as day and night between plastic and metal," he said. "Plastic permeates certain organic chemicals of health concern. Metal absolutely unequivocally does not."

Leonardini Summarizes

Leonardini followed with a tight, passionate conclusion that hit home with a number of emotional charges and pleas to the committee members.

The attorney challenged IAPMO (which has successfully defended its position on plastics against the Pipe Trades Council, et al in the courts, largely from a judge's ruling that no sufficient evidence has been produced to show any health hazards from plastic piping) and its 1982 UPC additions of plastics. He also questioned the validity of the National Sanitation Foundation which presented key testimony in IAPMO's California lawsuit.

Noting that IAPMO relies upon NSF testing, Leonardini said, "NSF 14 is an inadequate standard for the evaluation and analysis of leaching characteristics in plastic pipe.

"Can you trust EPA? EPA is talking about relying on NSF. EPA has not developed drinking water standards for any of the chemicals that are involved."

Leonardini concluded by stating that all of the data is yet to be received and



John Woodward, Cast Iron Soil Pipe Institute, expresses his opinion during a discussion of the A-40 Committee's proposed product standards.

that it would probably take at least another year and a half to gather all information and comments on the conclusions.

"You have nothing to gain and everything to lose" by acting before governmental studies are completed, he said in closing.

Confusion Begins

The polished presentation by Leonardini and Lappe was followed by Doyle's announcement that "in the interest of fairness to both sides and everyone who is on the committee," a 10-minute question-and-answer period would follow.

Lancaster returned to the podium and began to comment on the remarks made by the other two speakers by first acknowledging that he, indeed, represented PPFPA and that the other speakers were employed to represent the interest of the United Association.

Lancaster's remarks were quickly met with an objection from Edward Brabec, executive vice president of the United Association. This was followed by Doyle's announcement that the remaining time would be limited to questions from the floor, not rebuttal statements.

Lancaster protested the procedures and then left the podium where Leonardini and Lappe proceeded to answer several questions from the committee members regarding their statements.

Very Convincing

To the members of the audience, it must have appeared as though the anti-plastic speakers clearly presented a very convincing argument for their case, while the plastic concerns failed to prove any of their contentions.

When confronted with the question of why Lancaster had failed to make a more comprehensive and prepared statement, PPFPA attorney Robert Creamer and Lancaster both charged that they had no prior knowledge that

speakers were going to be given 45 minutes each nor were they informed of the type of presentation Leonardini and Lappe were going to make.

While the plastics representatives claimed that they had not been contacted directly by the committee, but that a message was delivered through a third party, chairman Doyle told Reeves Journal that he did speak to Lancaster personally by telephone. William Abernathy, committee secretary, George Kauffman, co-chairman, and at least two A-40 members told Reeves Journal they had been told that PPFPA was notified of the anti-plastics concerns' plans to appear at the meeting more than a month prior to the sessions.

Creamer told Reeves Journal that PPFPA did not have any plans of making a similar presentation before the committee because the organization did not feel it was the proper venue to air such testimony.

"This group, regardless of what they call themselves or how they self-anoint themselves, is not competent to make these kinds of decisions, and we are not going to engage in a debate before the A-40 Committee on scientific and technical matters.

"The union can bring in people to talk about whatever they want, but we are not going to do anything that would imply that this committee is competent enough to make those kinds of judgments.

"For us to bring in toxicologists would be, in effect, to submit this issue to this group; and it doesn't belong here. This may be a safety code in terms of traditional concern of plumbers for safety, in terms of what is a safe plumbing system, but I don't believe that makes this group competent to decide whether a particular kind of plastic pipe leaches or is permeable to

Continued on page 50

Final Arguments Presented In Calif. Suit Challenging AC Efficiency Rates

by Larry Dill

SACRAMENTO, Calif. — A Sacramento county superior court judge is expected to deliver a final decision in early October on the lawsuit pitting air conditioning manufacturers against the California Energy Commission (CEC) over the CEC's proposed 1988 and 1993 minimum energy efficiency standards.

Judge James I. Morris heard final arguments from attorneys on July 16 and agreed to allow both sides of the litigation to file final closing briefs within 15 days. Upon filing of the briefs, which will be limited to material presented during the July 16 court session, the parties involved in the suit will then have 30 days to file written responses. Upon review of the material submitted, Morris will then deliver his written decision, probably in early October.

The suit was filed by Lennox Industries, Inc., Bard Manufacturing Co., Heil Heating and Cooling Products and Borg-Warner Central Environmental Systems, Inc.. In a related action, American Standard's Trane Division has petitioned the CEC to reconsider its decision to adopt a minimum seasonal energy efficiency ratio (SEER) of 8.9 — beginning in 1988. The SEER would raise to 9.9 in 1993. California's current minimum SEER is 8.0.

The majority of the July 16 session centered around closing arguments by attorneys Thomas Knox, who represents Lennox Et Al. and Bruce Dodge, legal counsel for Trane.

The plaintiffs' attorneys focused their attention on charges that the CEC staff was selective in its use of reference materials, particularly data from the Department of Energy, and claims that the proposed regulations would drastically increase costs while resulting in products and requirements that would not be cost effective for consumers.

"We're very optimistic about the outcome," David F. Lewis, director of marketing for Lennox Industries, told Reeves Journal. "We think that the regulations will end up costing the consumer a lot more money. The key is that we don't feel it will be cost effective for the consumer."

Lewis also pointed out that the manufacturers contend CEC reached its decision through the selection of data that would only support its position.

Knox outlined a number of points raised in previous testimony which are being challenged by the manufacturers.

While questioning the methodology used to evaluate such factors as feasibility of compliance, distribution and maintenance costs and per-

formance of units," Knox zeroed in on his clients' contention that the CEC did not have sufficient evidence to develop its regulation. Knox contended that CEC used the wrong "baseline" to determine the cost efficiency of air conditioners that would be subject to the regulations.

"They used the wrong yardstick to measure the cost effectiveness of the 1993 standards," Knox said. "There is no evidence considered that states SEER 9.9 will be cost effective in 1999," he added.

A large portion of the final session was spent arguing the language used in the regulation. The primary question was whether units covered by the regulation should be classified as residential or commercial or single and triple phase air conditioners.

Dodge stated that no data was submitted on a commercial category and that there is no evidence to support the contention the proposed SEERs would be cost effective. He suggested that the regulation be sent back to the CEC staff to either add language specifying commercial air conditioners or that com-

mercial units be exempted from the action.

Exemption would be more favorable, he argued, because of the projected difficulty in enforcing such distinctions, particularly in light of the possibility of units designated for commercial applications being used for residential installations.

In challenging the CEC's selection of data in its regulation formulation process, Knox contended that the CEC staff ignored workshop testimony and input from industry sources and instead selectively referred to data that only tended to back its position on SEER minimums, particularly information from DOE.

Alan B. Lilly, deputy attorney general representing the CEC and the State of California, responded that CEC didn't rely on testimony supplied by industry because it was "just the opinions of their engineers."

CEC has been joined in the defense of the proposed regulation by Carrier Corp. and the Natural Resources Defense Council.

A-40 Committee

Continued from page 10

such a point that it should not be used in plumbing systems.

"No one on that committee is competent to make those kinds of decisions, and it's ironic to note that through all of the procedures they have said they are incompetent to decide whether lead should be used. They have decided they aren't competent to decide whether certain kinds of asbestos products should be used in the code. They have said they are not competent to make judgments whether certain kinds of pipe assemblies are fire retardant. They have denied competence to determine all kinds of issues, but yet when it comes to these extremely complex, complicated and controversial issues about plastic pipe, then all of a sudden there is a group of people that is in there who deem themselves highly competent to decide if plastic pipe should be used.

"And that's what we have, but we simply aren't going to submit that issue to this group. So we're not going to come in with our own dog and pony show."

Both Lancaster and Creamer contend that governmental agencies such as EPA and the Department of Health should be involved in the study and evaluation of the issue.

Couldn't Rebut

Lancaster protested the fact that he was not provided the opportunity to answer the charges made by Leonardini and Lappe, stating that they made several misstatements of fact.

As an example, he countered that the lawsuit in San Jose is centered around a mechanical fastening system, not issues concerning cancer. "He was pulling apples and oranges," Creamer added of his legal counterpart.

When it was pointed out to the plastics spokesmen that a member of the audience would surely have to be influenced by the presentation made by their foes, based on PPFA's lack of performance, Creamer concluded, "You got the message that the sponsors and the union people wanted you to get because, again, we were never told what was going to happen and they had a canned, rehearsed, slick presentation. The other thing to remember, and I'll stop saying it eventually, is that this is not the forum for that kind of thing."

Regardless of the contentions of PPFA, they may find that their counterparts on the committee left with a very strong impression from the presentation made by Leonardini and Lappe. If they were keeping score in the grandstands, the committee members may have concluded that it was no contest. The hired guns scored a TKO.

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February 13, 1986

The Honorable Mike Navarre, Chairman
Labor and Commerce Committee
House of Representatives
Pouch V
Juneau, AK 99811

**FROM THE OFFICE OF
REP. MIKE NAVARRE
FOR YOUR INFORMATION**

Dear Representative Navarre:

Thank you for the opportunity to review the ICBO's proposed amendments to our electrical and plumbing statutes.

Basically, the proposal is that the statutes be amended to require that the Department of Labor adopt the latest editions of the national codes. The ICBO's rationale is that Alaska's minimum standards could then be routinely updated through the administrative regulations process without requiring action by the Legislature.

Historically, the courts have invalidated statutes, such as the one ICBO is proposing, that provide for the adoption of future amendments to a code or set of standards from another state or a private organization. In these cases, the courts have held that such statutes constitute an improper delegation of authority. In the instant case, the Legislature would effectively be empowering the American National Standards Institute and the International Association of Mechanical and Plumbing Officials to make whatever future amendments they wished to Alaska's minimum electrical and plumbing standards. Although the ICBO's proposal does provide that the Department of Labor may amend the codes as it deems appropriate, the intent does not appear to be that the Department do a wholesale rewrite of the codes; rather, the intent seems to be that the department would rely largely on the national codes. In sum, it is our belief that this proposed legislation would likely be disapproved of on legal grounds. ✓

Even if this potential legal problem did not exist with respect to the ICBO's proposal, I am not sure I would be comfortable with it. It appears to me, after following the plastic pipe issue, that the matter is being dealt with in the proper forum. ✓

**FROM THE OFFICE OF
REP. MIKE NAVARRE
FOR YOUR INFORMATION**

Honorable Mike Navarre, Chairman -2-

February 13, 1986

A degree of politics will necessarily play a part in the outcome of the issue; and the Legislature, not the Executive Branch, is the proper place for that negotiation and compromise to occur.

I appreciate the opportunity to comment on this proposal.

Sincerely,

A handwritten signature in cursive script that reads "Jim Robison".

Jim Robison
Commissioner

SOUTHEAST ALASKA ICBO CHAPTER
Task Force on Legislative Affairs
February 10, 1986

RE: An Act relating to standards for electrical safety and the Uniform Plumbing Code.

BACKGROUND: The attached Bill causes the State of Alaska, through the Department of Labor, to adopt the most recently published edition of both the Electrical and Plumbing code. This Bill makes future legislation unnecessary for such adoption. Amendment to these codes would be through the processes of regulation governed by the Administrative Procedures Act (APA).

ISSUE STATEMENT: Some communities have adopted recent editions of the National Electrical Code and Uniform Plumbing Code. The State of Alaska operates from older code editions. Design professionals, contractors, banks, and local Building Officials currently must design, build, finance and enforce practices based on conflicting code editions. The result is confusion within the industry, higher cost of construction, conflict between state and local officials, and an inability to use most advanced materials and technologies allowed by current code editions.

BENEFITS: Passage of this bill would result in the following benefits:

1. Minimize conflict between codes and code officials in Alaska and make the system easier for private sector interests to work within thus keeping construction costs lower.
2. Greater predictability about code requirements meaning design professionals, contractors and suppliers can more accurately assess construction (materials and labor) costs.
3. Provides a position of leadership on the part of the State from

IN THE _____

BY _____

BILL NO. _____

IN THE LEGISLATURE OF THE STATE OF ALASKA

FOURTEENTH LEGISLATURE - SECOND SESSION

A BILL

For an Act entitled: "An Act relating to standards for electrical safety and the Uniform Plumbing Code."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. AS 18.60.580 is amended to read:

Section 18.60.580. MINIMUM ELECTRICAL STANDARDS. The lat-est [1984] published edition of the National Electrical Code (ANSI/NFPA) approved by the American National Standards Institute [ON AUGUST 5, 1983] and the latest [1984] published edition of the National Electrical Safety Code [ANSI C2-1984] approved by the American National Standards Institute [ON JULY 15, 1983], constitute the minimum electrical safety standards of the state.

* Section 2. AS 18.60.580 is amended by adding a new subsection to read:

(b) The department may by regulation adopt amendments to the minimum electrical safety standards of the state that are set forth in the latest published editions of the National Electrical Code and the National Electrical Safety Code under (a) of this section.

* Section 3. AS 18.60.590 (a) is repealed.

* Section 4. AS 18.60.705 is amended to read:

Section 18.60.705. PLUMBING CODE. The Department of Labor shall adopt, as the official minimum plumbing code for the State, the latest published edition of the code, [UNIFORM PLUMBING CODE, 1979 EDITION, ADOPTED AT THE 49TH ANNUAL CONFERENCE, SEPTEMBER, 1978, INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS, CHS. 1-13 AND APPENDICES, BUT EXCLUDING PART I, ADMINISTRATION, PAGES 1a-6a, AND] subject to AS 18.60.710 - 18.60.740.

* Section 5. AS 18.60.705 is amended by adding a new subsection to read:

(b) The department may by regulation adopt amendments to the code.

* Section 6. AS 18.60.740(1) is amended to read:

(1) "code" means the latest published edition of the Uniform Plumbing Code [,] approved and issued by [1979 EDITION, ADOPTED AT THE 49TH ANNUAL CONFERENCE, SEPTEMBER 1978,] the International Association of Plumbing and Mechanical Officials.

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WITH PLASTIC PIPE

A STATUS REPORT

OF

THE CALIFORNIA PIPE TRADES COUNCIL

OF

THE UNITED ASSOCIATION OF JOURNEYMEN

AND APPRENTICES OF THE PLUMBING AND PIPE FITTING

INDUSTRY OF THE UNITED STATES AND CANADA

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TABLE OF CONTENTS

PART ONE: SUMMARY OF HEALTH ISSUES

	INTRODUCTION.....	1
I.	FIRE SAFETY.....	3
II.	HEALTH HAZARDS FOR WORKERS	5
III.	ENVIRONMENTAL CONTAMINATION.....	8
IV.	PLASTIC PIPE FOR POTABLE WATER.....	10
V.	POLYBUTYLENE PIPE FOR POTABLE WATER.....	15
VI.	CONCLUSION.....	19

PART TWO: EXHIBITS

- EXHIBIT 1. Letter of California State Fire Marshal to State Commission on Housing and Community Development, March 31, 1981, requesting study of fire issues involving plastic pipe because of MGM Las Vegas fire.
- EXHIBIT 2. Summary of Major Findings, "Health Hazards Associated With the Use of Plastic Pipe" Interim Report. California State Department of Health Services. April 29, 1980.
- EXHIBIT 3. Letter of Deputy Chief for Health, Division of Occupational Safety and Health Administration, California Department of Industrial Relations to California Commission on Housing and Community Development, March 5, 1981, correcting misleading statements of the Plastic Pipe and Fitting Association (PPFA).
- EXHIBIT 4. Letter of Alexandra Levine, M.D., Lymphoma-Leukemia Program, University of Southern California Medical Center, October 3, 1981, describing research on lymphoma and plumbers.

- EXHIBIT 5. "Impurities Detected in ABS, PVC and CPVC Plastic Pipe." California Analytical Laboratories, Inc. November 12, 1980.
- EXHIBIT 6. (a) Resolution of the California Consumer Advisory Council, February, 1980.
- (b) Letter of the Sierra Club to Commission on Housing and Community Development, November, 1980.
- (c) Letter of the Center for Law in the Public Interest to California Commission on Housing and Community Development, November, 1980.
- (d) Letter of Women For to Commission on Housing and Community Development, October, 1980.
- EXHIBIT 7. "Discussion and Conclusions," Final Report on Potential Health Hazards Associated With the Use of Plastic Pipe in Potable Water Systems. California Department of Health Services, October 17, 1980.
- EXHIBIT 8. Letter of California State Department of Health Services to the National Association of Plumbing, Heating, Cooling Contractors, (PHCC) February 2, 1981.
- EXHIBIT 9. Letter of Director, California State Department of Consumer Affairs to Commission on Housing and Community Development, November 21, 1980, on risks of cancer for consumers who drink water from plastic pipe.
- EXHIBIT 10. California Analytical Laboratories report on chemicals in polybutylene pipe, December 31, 1980.
- EXHIBIT 11. Addendum document published by the United States Environmental Protection Agency (EPA) entitled "Priority Review Level 1 - Di- (2-ethylhexyl) Phthalate (DEHP)," December 1980.
- EXHIBIT 12. California Analytical Laboratories report on chemicals in polybutylene pipe as flexible fixture connectors, March 18, 1981.

- EXHIBIT 13. Letter of California State Department of Health Services to Commission on Housing and Community Development, January 28, 1981, regarding polybutylene posing a potential health hazard to consumers.
- EXHIBIT 14. "Analysis of Polybutene Pipe Leachate For Selected Organic Species" by Radian Corporation presented to: Shell Development Company. March 1981.
- EXHIBIT 15. "Review and Evaluation of Radian Corporation's 'Analysis of Polybutene Pipe Leachate For Selected Organic Species.'" California Analytical Laboratories. April, 1981.
- EXHIBIT 16. Letter of Staff Toxicologist to attorney for Shell Chemical regarding the possible presence of BHT and alkylbenzene sulphonate in PB pipe, June 15, 1981.
- EXHIBIT 17. Letter of Director, California State Department of Housing and Community Development to Commission on Housing and Community Development, April, 1981.
- EXHIBIT 18. Letter of Director, California State Department of Consumer Affairs to Commission on Housing and Community Development, April, 1981.
- EXHIBIT 19. News Accounts, San Francisco Chronicle, Sacramento Bee, April 21, 1981.
- EXHIBIT 20. Letter of general counsel for the California Building Standards Commission regarding the relationship between the California Building Standards Law and the California Environmental Quality Act (CEQA). July 21, 1981.

(NOTE: Additional information on these Exhibits may be obtained by contacting the law offices of LEONARDINI & FATHY, 400 Capitol Mall, Suite 221, Sacramento, California, 95814-4480, (916) 441-4405.)