

PHASE ONE REPORT

on

EVALUATION OF THE PERMEATION OF ORGANIC
SOLVENTS THROUGH GASKETED JOINTED AND
UNJOINTED POLY(VINYL CHLORIDE), ASBESTOS
CEMENT AND DUCTILE IRON WATER PIPES

for

THE VINYL INSTITUTE
A DIVISION OF THE SOCIETY
OF THE PLASTICS INDUSTRY, INC.

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by

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EXECUTIVE SUMMARY

Phase one of the Vinyl Institute's research program "Evaluation of the Permeation of Organic Solvents through Gasketed Jointed and Unjointed Poly(vinyl chloride), Asbestos Cement and Ductile Iron Water Pipes", has been completed. Phase one involved the exposure of commercially available four-inch water pipe joints to three neat organic solvent environments, toluene, hexane, and 1,1,1-trichloroethane, for a period of six weeks. Each pipe specimen contained demineralized water under a pressure of 40 psig and throughout the six-week exposure period, samples of water were removed from each pipe and analyzed for traces of the appropriate organic liquid.

The objective of this study was to study when and how permeation of selected solvents occurs through the jointed and unjointed pipes and to develop a hypothesis for the mechanism of permeation. The test results indicate that the mechanism for fastest breakthrough (permeation) is through the gasketing material. The unjointed pipe showed slower permeation or no permeation compared to the jointed pipe. When permeation did occur with the jointed pipe, it happened much earlier than with the straight unjointed pipe. Another mechanism for breakthrough is based on the composition of the pipe. The more porous asbestos cement unjointed pipe showed early permeation with toluene and 1,1,1-trichloroethane and the unjointed PVC pipe swelled to permeation with toluene after day 37 of the 42-day test. These results are summarized in Table 1.

The initial work was performed under "worst case model" conditions. The breakthrough of neat solvents in the jointed test specimens indicates that the joints of all three materials are susceptible to permeation. The second phase of the program, exposure to aqueous solutions of the same organic solvents, appears to be warranted in order to determine permeation under more realistic conditions. Consideration should be given in characterizing the rubber compounds used in the gaskets. Differences in the gaskets used with each type of pipe may explain the apparent differences in permeation, particularly the hexane results.

TABLE 1. SUMMARY OF PERMEATION TEST RESULTS

Solvent	Sampling Days Between Which Organic Solvent Breakthrough Occurred									
	Poly(Vinyl Chloride)		Ductile Iron		Asbestos Cement					
	CP ¹	JP #12	JP #2	CP	JP #1	JP #2	CP	JP #1	JP #2	
Toluene	37-41 (38) ³	9-13 (10)	3-6 (4)	NP ⁴	9-13 (9)	3-6 (3)	6-9 (7)	1-3 (1)	3-6 (3)	
1,1,1-Trichloroethane	NP	22-26 (22)	12-15 (15)	NP	4-8 (4)	8-12 (8)	12-15 (14)	4-8 (5)	12-15 (12)	
Hexane	NP	10-14 (10)	10-14 (11)	NP	NP	NP	NP	3-10	14-17 ⁵	

1. CP represents unjointed control pipe.

2. JP represents jointed pipe.

3. The number in parenthesis represents the day at which a graph of the amount of organic solvent permeate versus exposure time passes through a statistical control limit indicating significant permeation at the 99 percent confidence level.

4. NP represents no permeation at the 99 percent confidence level.

5. Due to insufficient data, a statistical control limit was not determined.

MANAGEMENT INFORMATION SYSTEM	Number	MIS-01-1.01	
	Issued	3/1/84	
	Supersedes	7/22/83	

Title			
AACPP ANNUAL BUDGET			

	ACTUAL FY 1983	BUDGET FY 1984	
FUND BALANCE - January 1:			
Designated (1)	\$106,803	\$ 11,626	\$- 95,177
Undesignated	0	9,600	9,600
Total Fund Balance	<u>\$106,800</u>	<u>\$ 21,226</u>	<u>\$- 85,577</u>
REVENUES:			
Membership Dues			
Regular - Domestic	\$100,000	\$180,000	\$ 80,000
Regular - North America	12,000	12,000	0
Associate	50,000	51,000	1,000
Subtotal	<u>\$162,000</u>	<u>\$243,000</u>	<u>\$ 81,000</u>
Miscellaneous Income			
Meeting Fees	\$ 9,150	\$ 12,000	\$ 2,850
REP Programs	532	0	-532
Special Assessment	0	0	0
Other Income	0	0	0
Subtotal	<u>\$ 9,682</u>	<u>\$ 12,000</u>	<u>\$ 2,318</u>
Interest Income	6,946	6,800	-146
Total Revenue	<u>\$178,628</u>	<u>\$261,800</u>	<u>\$ 83,172</u>
EXPENDITURES:			
Executive Management	\$123,358	\$120,000	\$ - 3,358
Office Operating	1,909	10,000	8,091
General Operating	27,438	34,500	7,062
Research, Education & Promotion	109,299	107,125	- 2,174
Professional Services	2,200	11,400	9,200
Total Expenditures	<u>\$264,205</u>	<u>\$283,025</u>	<u>\$ 18,820</u>
FUND BALANCE - December 31:			
Designated (1)	\$ 11,626	\$ 0	\$ -11,626
Undesignated	9,600	0	-9,600
Total Fund Balance	<u>\$ 21,226</u>	<u>\$ 0</u>	<u>\$ -21,226</u>

EXPENDITURES	BUDGET FY 1984
Executive Management	
IAI Retainer	\$120,000
Subtotal	\$120,000
Office Operating	
Office Supplies	\$ 600
Printing & Duplication	4,200
Postage, Freight, Messenger	3,300
Telephone & Telegraph	1,500
Data Processing	100
Miscellaneous	300
Subtotal	\$ 10,000
General Operating	
Travel & Entertainment	\$ 6,000
Membership Dues	800
Annual Meeting	24,000
Subscriptions/Publications	1,600
Insurance & Taxes	1,900
Miscellaneous	200
Subtotal	\$ 34,500
Research, Education & Promotion	
SOP-01-01, Municipal Market Program	\$ 60,000
SOP-01-02, State Monitoring Program	10,000
SOP-01-03, EPA Drinking Water Regs	3,950
SOP-01-04, Public Education Program	12,000
SOP-01-06, OSHA/EPA Rulemaking	7,675
SOP-01-99, International Affairs	13,500
Subtotal	\$107,125
Professional Services	
Legal	\$ 9,000
Accounting	2,400
Subtotal	\$ 11,400
Total Expenditures	\$283,025

(1) Actual fund balance carryover to FY 84 for:

SOP-01-03	\$ 3,951.33
SOP-01-06	\$ 7,674.88
Total	\$11,226.21