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STATE OF ALASKA  
THE LEGISLATURE

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May, 1988

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Mary Van Nimwegen

*House Labor & Commerce:*

*May 5, 1988*



STATE OF ALASKA  
1988 LEGISLATIVE SESSION

BILL VERSION : CSSB 498 (Fin) title am  
PUBLISH DATE : \_\_\_\_\_

FISCAL NOTE

REQUEST:

Revision Date: \_\_\_\_\_ Agency Affected: Labor  
Title: "An Act relating to certain  
plumbing installations and repairs; " BRU: Labor Standards & Safety  
Sponsor: Senate Labor & Commerce Components: Mechanical Inspection  
Requestor: House Labor & Commerce

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND&STRUCTURES						
GRANTS,CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0

CAPITAL						
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REVENUE						
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FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: (Attach a separate page if necessary)

\_\_\_\_\_

Prepared by: Tom Stuart, Director Phone: 264-2452  
Division: Labor Standards & Safety Date: 4/29/88

Approved by Commissioner: Jim Samoson Date: 4/29/88  
Agency: Department of Labor

Distribution (by preparer) :  
Legislative Finance  
Legislative Sponsor  
Requestor  
Office of Management and Budget  
Impacted Agency(ies)

STATE OF ALASKA  
1988 LEGISLATIVE SESSION

BILL VERSION: CSSB 498 (FIN) (Title  
PUBLISH DATE: 4/28/88

FISCAL NOTE

REQUEST:

Revision Date: \_\_\_\_\_  
Title: An Act relating to certain  
plumbing installations and repairs  
Sponsor: Senate Labor & Commerce  
Requestor: House Labor & Commerce

Agency Affected: DEC  
BRU: Environment Quality  
Components: Water Quality Management

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0	0	0	0	0	0

CAPITAL	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93

REVENUE	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93

FUNDING: (Thousands of Dollars)

GENERAL FUND	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
FEDERAL FUNDS						
OTHER						
TOTAL	0	0	0	0	0	0

POSITIONS: None

FULL-TIME	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PART-TIME						
TEMPORARY						

ANALYSIS : (Attach a separate page if necessary)

Prepared by: Amy Kyle *akyle* Phone: 465-2600  
Division: Commissioner's Office Date: 4/28/88

Approved by Commissioner: Dennis D. Kelso Date: 4/29/88  
Agency: Commissioner

- Distribution (by preparer):
- Legislative Finance
  - Legislative Sponsor
  - Requestor
  - Office of Management and Budget
  - Impacted Agency(ies)

# STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

STEVE COWPER, GOVERNOR

POSITION PAPER  
CSSB 498 (Fin) (TITLE AM)

## Title

An act relating to certain plumbing installations and repairs; and providing for an effective date.

## Effect of the Bill

The bill would amend Department of Labor statutes to ban the use of lead solders and fluxes in installation of new water systems and repair of existing water systems.

## Department position

The Department supports the bill. The bill would implement a key provision of the federal Safe Drinking Water Act Amendments, passed in 1986.

Use of lead solder in drinking water systems is a leading cause of elevated lead levels in drinking water.

Lead has extremely adverse effects on persons exposed to it. These effects range from acute swelling of the brain and seizures at high blood levels to symptoms such as fatigue, loss of appetite, or abdominal pain at low levels. Lead is known to damage the digestive system, reproductive system, gastrointestinal system, and kidneys. It also interferes with the blood-forming process and exposure has been related to increased miscarriages. Lead accumulates in the human body and has no beneficial uses in the body. Young children and fetuses are at highest risk because they absorb a higher percentage of the lead to which they are exposed than adults do.

Individuals who are exposed to lead in water have been shown to have increases in blood lead levels. Lead solder in plumbing has been identified as the most significant source of lead in drinking water. Lead in raw water is rare.

In Alaska, high lead levels have been found in drinking water systems in St. Michaels, Gambell, Shishmaref, Point Hope, Point

Lay, Barrow, Nuiqsut, Atquasak, Wainwright, Fairbanks, Birch Creek and Mekoryuk due to corrosive water in contact with lead solder. The problem could be expected in most water systems using surface water and in some systems using ground water. No comprehensive testing for lead in distribution systems has been done. The North Slope Borough has imposed a ban on the use of lead solders and fluxes.

The federal Safe Drinking Water Act was amended in June, 1986 to include a new section 1417 titled "Prohibition on Use of Lead Pipes, Solder, and Flux." This section bans the use of solder and flux containing greater than 0.2% lead and pipes and pipe fittings containing more than 8.0% lead. The Act requires that states with primacy in the drinking water program implement this requirement. In Alaska, the Department of Environmental Conservation has primacy for the drinking water program.

The most effective way to ban use of lead fluxes and solders is to do so in conjunction with laws and regulations that govern plumbing. Under Alaska law, this requires an amendment to Title 18, the statute pertaining to the Department of Labor. Both the Department of Environmental Conservation and the Department of Labor support this change.

Alternative tin solders are available and are preferable to lead solders in terms of strength. Material unit cost is slightly higher, but less solder is used so that overall cost is equivalent. Initial education will be needed to help industry address the change of requirements.



Dennis D. Kelso, Commissioner  
Department of Environmental Conservation

THE FOLLOWING DOCUMENT(S) MAY NOT FILM  
LEGIBLY BECAUSE OF POOR QUALITY OF THE  
ORIGINAL.

INFORMATION PACKET ON SB 498

BAN ON THE USE OF LEAD SOLDERS AND FLUXES

IN DRINKING WATER SYSTEMS

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Original sponsor: Labor and Commerce Committee

1 IN THE SENATE BY THE FINANCE COMMITTEE

2 CS FOR SENATE BILL NO. 498 (Finance)(title am)

3 IN THE LEGISLATURE OF THE STATE OF ALASKA

4 FIFTEENTH LEGISLATURE - SECOND SESSION

5 A BILL

6 For an Act entitled: "An Act relating to certain plumbing installations  
7 and repairs; and providing for an effective date."

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

9 \* Section 1. AS 18.60.705 is amended by adding a new subsection to  
10 read:

11 (b) Notwithstanding (a) of this section, the use of a pipe or  
12 pipe fitting containing more than 8.0 percent lead, or of solder or  
13 flux containing more than 0.2 percent lead in the installation or  
14 repair of a public water system or in the installation or repair of  
15 plumbing of a residential or nonresidential facility that provides  
16 water for human consumption is prohibited. This subsection does not  
17 apply to the use of leaded joints necessary to repair cast iron pipe.

18 \* Sec. 2. AS 18.60.740(1) is repealed and reenacted to read:

19 (1) "code" means the code adopted under AS 18.60.705(a) as  
20 amended by AS 18.60.705(b).

21 \* Sec. 3. APPLICABILITY. Section 1 of this Act applies to the instal-  
22 lation or repair of a water system or plumbing begun on or after the effec-  
23 tive date of this Act.

24 \* Sec. 4. This Act takes effect immediately under AS 01.10.070(c).

# STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

STEVE COWPER, GOVERNOR

POSITION PAPER  
CSSB 498 (Fin) (TITLE AM)

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Lay, Barrow, Nuiqsut, Atquasak, Wainwright, Fairbanks, Birch Creek and Mekoryuk due to corrosive water in contact with lead solder. The problem could be expected in most water systems using surface water and in some systems using ground water. No comprehensive testing for lead in distribution systems has been done. The North Slope Borough has imposed a ban on the use of lead solders and fluxes.

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Alternative tin solders are available and are preferable to lead solders in terms of strength. Material unit cost is slightly higher, but less solder is used so that overall cost is equivalent. Initial education will be needed to help industry address the change of requirements.



Dennis D. Kelso, Commissioner  
Department of Environmental Conservation

*bill file*

STATE OF ALASKA  
1988 LEGISLATIVE SESSION

BILL VERSION : CSSB 498 (Fin) title am  
PUBLISH DATE : \_\_\_\_\_

FISCAL NOTE

REQUEST:

Revision Date: _____	Agency Affected: <u>Labor</u>
Title: <u>"An Act relating to certain plumbing installations and repairs;"</u>	BRU: <u>Labor Standards &amp; Safety</u>
Sponsor: <u>Senate Labor &amp; Commerce</u>	Components: <u>Mechanical Inspection</u>
Requestor: <u>House Labor &amp; Commerce</u>	

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND&STRUCTURES						
GRANTS,CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0

CAPITAL						
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REVENUE						
---------	--	--	--	--	--	--

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: (Attach a separate page if necessary)

\_\_\_\_\_

Prepared by: Tom Stuart, Director Phone: 264-2452  
 Division: Labor Standards & Safety Date: 4/29/88

Approved by Commissioner: Jim Sampson Date: 4/29/88  
 Agency: Department of Labor

- Distribution (by preparer) :
- Legislative Finance
  - Legislative Sponsor
  - Requestor
  - Office of Management and Budget
  - Impacted Agency(ies)

STATE OF ALASKA  
1988 LEGISLATIVE SESSION

BILL VERSION: CSSB 498 (FIN)(Title A)  
PUBLISH DATE: 4/28/88

FISCAL NOTE

REQUEST:

Revision Date: \_\_\_\_\_  
Title: An Act relating to certain plumbing installations and repairs  
Sponsor: Senate Labor & Commerce  
Requestor: House Labor & Commerce

Agency Affected: DEC  
BRU: Environmental Quality  
Components: Water Quality Management

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0	0	0	0	0	0

CAPITAL						
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REVENUE						
---------	--	--	--	--	--	--

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0	0	0	0	0	0

POSITIONS: None

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS : (Attach a separate page if necessary)

Prepared by: Amy Kyle *akyle* Phone: 465-2600  
Division: Commissioner's Office Date: 4/28/88

Approved by Commissioner: Dennis D. Kelso *Dennis D. Kelso* Date: 4/29/88  
Agency: Commissioner

Distribution (by preparer):  
Legislative Finance  
Legislative Sponsor  
Requestor  
Office of Management and Budget  
Impacted Agency(ies)



DEPARTMENT OF SOCIAL & HEALTH SERVICES  
DIVISION OF HEALTH

RECEIVED  
MAR 28 1988

AOO-JUNFALL

## TOXIC SUBSTANCES FACT SHEET

### LEAD IN DRINKING WATER

State of Washington

DATE:

August 1987

#### GENERAL INFORMATION ABOUT LEAD

Everyone has some exposure to lead. Lead from automobile exhaust and industry are the major sources for contamination of air, water and soil. People who live in cities are exposed to more lead than those who live in rural areas. Lead enters the body through breathing (inhalation) or eating (ingestion).

Lead poisoning can cause a variety of symptoms such as loss of appetite, fatigue, crankiness and anemia (low blood count). Because these symptoms can resemble the flu - lead poisoning can sometimes be unrecognized. The early symptoms of lead poisoning are reversible and complete recovery is possible. However, if lead poisoning progresses - symptoms become more severe and permanent damage may occur to the blood, nervous system, kidneys, brain and sex organs. A person can be tested for lead poisoning by having a blood sample taken for a blood lead level.

Lead poisoning is especially dangerous for young children and the unborn babies of pregnant women.

In Washington State, no cases of elevated blood lead levels or lead poisoning have been linked with lead in drinking water. Cases which have occurred have been associated with: pottery contaminated with lead; certain occupations which have high lead exposure; children who eat dirt contaminated with lead from highly industrialized areas near freeways and busy streets; or children exposed to lead dust brought into the home on their parents' work clothes.

#### LEAD IN DRINKING WATER

Studies have been done to analyze drinking water for lead. These studies show that for public water systems the lead content of the water delivered to the homeowner is higher at the faucet in the home than the lead content where the water originates. This indicates that the lead is "picked up" in the household plumbing system. This is most likely to occur when there is water low in mineral content (soft water) or the water is acidic. These conditions can cause lead to leach from lead pipes or lead soldering materials into the drinking water.

Even though adults and children are exposed to some lead through drinking water - the major source of lead comes from food. In fact it appears that the average lead intake from drinking water is about 1/10 of that obtained from an ordinary diet.

May 1987

# Utilities lead' aim

year on the serious subject of lead in water.

College Utilities Corporation last month had 14 places tested for lead in water, and six of them had higher than federally safe levels. But the lead isn't due to College Utilities' water supply, which tests substantially lower than required.

Lead-based solder appears to be the major culprit, particularly in newer structures. However, CUC's water is corrosive, a quality that helps water pick up lead and other metals within plumbing systems.

Not only did the company pay for the testing itself, but College Utilities Friday sent informational letters to all its customers, began a three-week advertising campaign and its chief executive officer, Stan Justice, called officials to explain some of the situation. CUC immediately offered its results to the Alaska Department of Environmental Conservation.

People can learn more about this issue during National Drinking Water Week this next week. CUC is having an open house Friday.

(See ENR, page 2)

(Continued from page 1)

Under the Federal Safe Drinking Water Act of 1986, new language in 1988 will require public water suppliers to inform customers of lead hazards even if the lead is not coming from the main water supply.

Water at Gordon's home, four public schools, and at professional offices and homes were sampled and tested.

The first sample at all 14 showed a higher lead content than CUC's supplier's water. Six of those places exceeded the federal safe limit. Then, after a three-minute flushing, a second sample was taken. All 14 were within the federal limit, Gordon said.

Currently the federal standard on lead is .05 parts per million, but that will change next year to .02. The utility, which draws underground water through wells and treats it, tested at .002 parts per million.

Of the four schools—Woodriver and University Park elementary schools, West Valley High School and Hutchison Career Center—only Woodriver's initial sample exceeded the federal limit, Gordon said.

Lead can be a serious health hazard, particularly to children. Studies link lead to hyperactivity, decreased intelligence and learning disabilities in youngsters. High blood pressure and cardiovascular problems also are linked with lead.

The federal law prohibits public water suppliers from using lead pipes and lead-based solder, and eventually building codes will prohibit lead-based solder as well. That's the solution for new construction, but what about existing buildings?

Ideally buildings should be re-plumbed if there's a serious problem, Gordon said, but that's costly and not practical.

Flushing, or letting the tap run, is the easier answer.

"Before they consume water from the tap, first thing in the morning they should run the water

cold, which will insure they're getting water directly from our distribution system," said Gordon. Water sitting for a long period in a line is more likely to have a higher lead content. Letting the water run helps purge it from the lines.

What people should not do is drink hot water from the tap, even indirectly, he said. That's water most likely to have the lead content.

College Utilities hired Northern Testing Laboratories in Fairbanks to do the testing. Mike Pollen, president of that company, said testing water corrosiveness is a common test, particularly for utilities. It's called the Langelier Index, and it tests pH, alkalinity, chemical composition, hardness, temperature and total dissolved solids. Homeowners pay about \$55 for the test.

A zero means the water is neither scaling or corroding, said Pollen. Water that tests positive on the index is protective, it builds a film on the inside walls of pipes. A negative on the index indicates corrosive water. There is no protective film and corrosive water picks up virtually any metal in the pipes.

"It kind of caught us by surprise that George (Gordon) brought these results in," said Stan Justice, environmental engineer with the ADEC. "Since then I've been calling around to the other major utilities to see what kind of corrosion control program they have."

"I was pleasantly surprised that the utilities are doing something," Justice said.

Water suppliers in the area include the military, the University of Alaska, Fairbanks Municipal Utilities System, the City of North Pole, and another private company, Valley Water Co.

The ADEC next year will enforce the lead ban and public notification requirements under the federal law. Justice credited College Utilities for its effort. "They have taken some initiative to address this issue in their own jurisdiction actual-

# BSSD will replace pipes

by CAT STEPHENSON

A recent discussion with Bob Collins, director of the Bering Straits School District, revealed the district's plans to renovate the St. Michael elementary school's water system which is currently sloughing off particles of lead into the water at levels higher than what the Department of Environmental Conservation deems safe. District officials are waiting until the summer to replace about two-thirds mile of copper water pipes which are soldered together with lead and to rebuild the wooden utility which houses the water and sewage pipes and electrical lines.

The lead-soldered water system was installed by the Bureau of Indian Affairs which built the school. Bob Collins moved to St. Michael in 1977 to teach at the BIA school and was appointed as its principal the following year. He recalled that the lead content was discovered during his last years at the school and that the BIA added soda ash to the water to slow the erosion process. When put in hard water the soda ash will form a hard coat on the inside of the water pipes, but the water in St. Michael is soft, reducing the effectiveness of the preventive measure.

"We were told by the BIA in Nome that the soda ash merely prevented the water erosion of the lead," Collins said.

The school was transferred to the Rural Education Attendance Area's Bering Straits School District last summer. Collins said the district must wait until next summer to remedy the problem in fall. The lead-soldered copper tubing goes all the way up the building walls to the water taps so they must wait for the warm weather before tearing the walls out. The copper pipes will be replaced with about 3,000 feet of new tubing which will be joined with silver solder. He could not estimate the cost for the two work crews to be sent there or the pipes, solder, and new utility housing.

"What we've done now is shut off the water supply to all drinking and tap water," he said. "The toilets are connected to a salt water flush system. We are carrying drinking and cooking water from holding tanks to coolers in the classrooms."

One piece of construction is underway at this time. Silver-soldering piping is being installed from the school's holding tank to the kitchen for the convenience of the cook who must prepare meals for the 75 students and staff members daily.

by Stan Justice

# Lead in Alaskan Village Water Systems



St. Michael, 1975. (Photo by J.M. Antonson; courtesy of the Alaska Division of Parks, Office of History and Archeology.)

High lead concentrations have been discovered in the water systems of the four remote villages of St. Michael, Birch Creek, Gambell and Shishmaref. This paper covers preliminary findings by the state, federal, and local agencies involved, for the purpose of alerting engineers to the problems and how they may best be avoided.

The problem was discovered during a sampling program to assess water quality in rural Alaska, conducted jointly by the State Village Safe Water Program, the Alaska Department of Environmental Conservation (DEC), and the Federal Public Health Service (PHS). Under this program water samples are collected by the PHS sanitarians and mailed to the DEC lab in Douglas. The lab analyzes the samples for 11 toxic elements (arsenic, barium, cadmium, chromium, lead, mer-

cury, selenium, silver, sodium, fluoride, and nitrate) and the 13 aesthetic and operational parameters, including iron, manganese, calcium, magnesium, potassium, chloride, sulfate, carbonate alkalinity, total filterable residue, pH, turbidity, color and conductivity. The results are then distributed to the agencies involved in water programs.

## ST. MICHAEL

St. Michael is a village of 206 Eskimo people on the south shore of Norton Sound, 125 miles southeast of Nome. The situation there best illustrates the problem, so this paper covers it in some detail. On July 20, 1979, Ray Van Ostran, PHS sanitarian, collected two samples in St. Michael. The raw water sample showed no lead, but the sample collected from

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*Stan Justice is an environmental engineer who worked for the Alaska Department of Environmental Conservation for the past year, directing the regional drinking water program. He has an M.S. from the University of Alaska and spent two years as a Peace Corps volunteer constructing water systems in Nepal.*

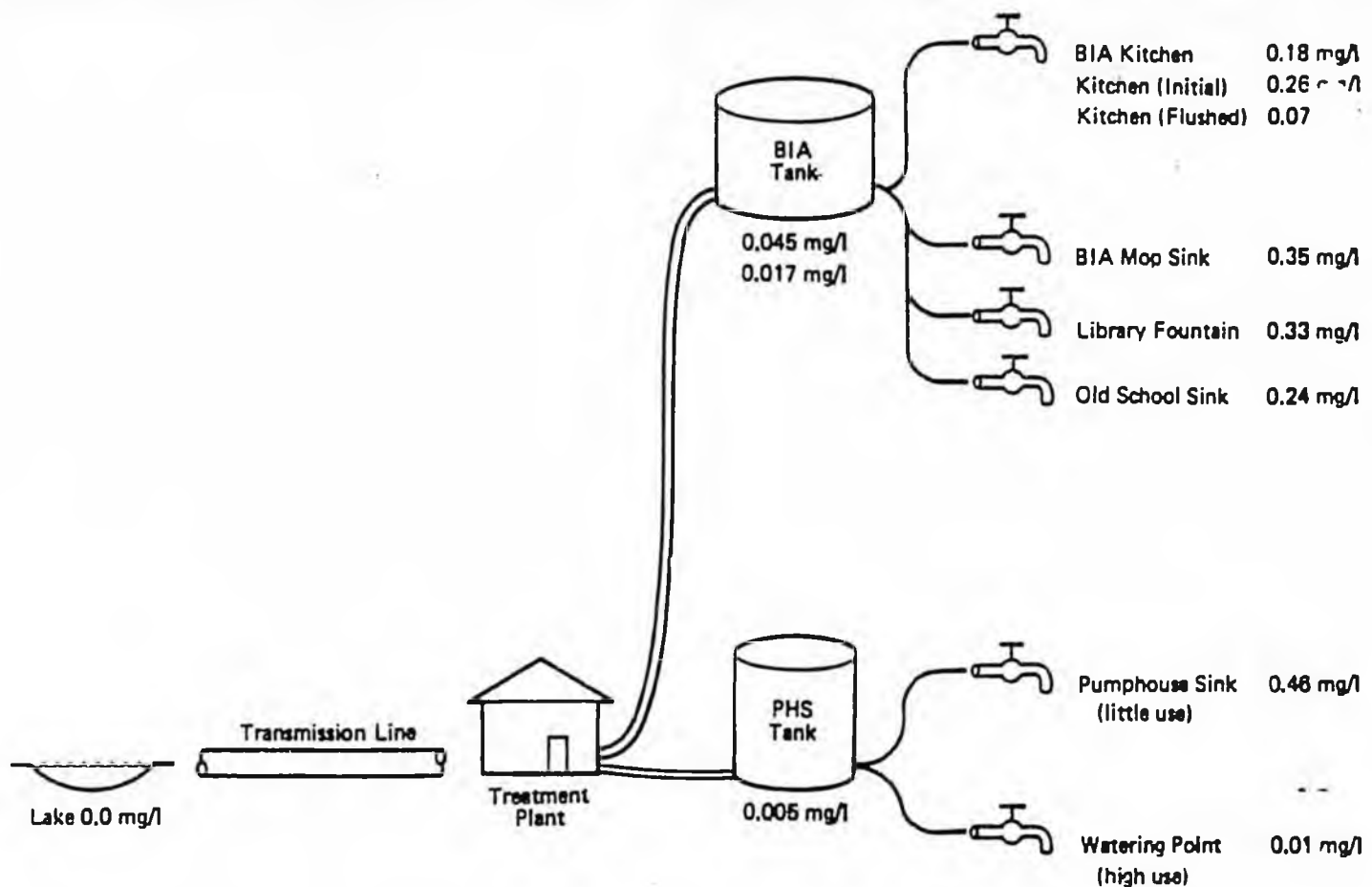


Figure 1. St. Michael water system showing locations of water samples and lead values.

the Bureau of Indian Affairs school showed 0.18 mg/l, over three times the 0.05 mg/l limit set by the Environmental Protection Agency.

The water source consists of a shallow lake located 3½ miles from town across wet tundra. Attempts have been made to locate a ground water source for the village, but to date all test wells have produced salt water. The water transmission line is four-inch diameter portable aluminum irrigation pipe. The line is assembled twice a year and gasoline-powered pumps are used to supply the water treatment plant. The treatment scheme consists of pressure sand filtration, HTH (the trade name for calcium hypochlorite) chlorination and fluoridation. The treated water is stored in the 100,000 gallon PHS wood stave tank adjacent to the plant and a 150,000 gallon steel tank at the BIA school. The PHS distribution system consists of a watering point and a sink in the pump-house. The watering point is the primary source of water for the village. The BIA tank provides water to the school at

various taps, water fountains, lavatories and the kitchen. Both distribution systems are constructed primarily of copper pipe joined by soldered joints. Water is heated by oil-fired boilers via heat exchangers and circulated by pumps.

Additional samples were collected on various dates and locations to determine the source of the lead (Fig. 1). The raw water contained no lead, so we knew the lake was not the source. Lead contents in the samples from the storage tanks were low also, which eliminated tank coatings and the treatment process as the lead source. All the high lead samples were from various points in the distribution system. The lead concentration was highest in the water taps with low use, such as the drinking fountains. We also noted a drop in lead concentration between the initial water from the kitchen tap and a sample taken after flushing the tap for five minutes. All this indicated a possible corrosion problem in the distribution system. Investigation established that the pipes had been joined with solder containing 50% lead, a standard construc-

tion technique, and inspection of some open pipes revealed a splattering of solder on the inside of the pipe.

#### Water Pipe Corrosion

Several indices are available for quantifying the tendency of water to corrode pipe materials, but one of the easiest to use is the Aggressive Index (AI).<sup>1,2,3</sup> The formula for calculating the AI is

$$AI = pH + \log (Ca \times Alk)$$

where Ca is the calcium concentration expressed as mg/l CaCO<sub>3</sub> and Alk is the alkalinity also expressed as mg/l CaCO<sub>3</sub>. The scale below is used to interpret the figures:

AI < 10	highly aggressive
10 < AI < 12	moderately aggressive
AI > 12	not aggressive

Tests of the St. Michael raw water showed AIs from 6.9 to 8.5, well within the highly aggressive range. This indicates that the source water is derived from rain and snow melt which has not contacted earth minerals.

Corrosion in a lead-copper-water system is similar to a galvanic battery. The copper acts as the cathode, lead the anode and water the medium for transporting the charged particles. Lead in this system is a sacrificial anode, releasing lead ions into solution. This will not occur with hard, non-aggressive waters due to the layer of calcium carbonate which builds up on the pipe walls.<sup>3</sup>

Literature indicates that high lead historically has been a problem in soft water areas of the 'lower 48' (Boston), Scotland and northern England. In some areas water is distributed in lead pipes and even stored in lead-lined cisterns. Other instances have been documented in which copper pipes joined with lead solder have raised lead concentrations in soft water.<sup>4,5</sup>

Several factors contribute to the acuteness of the problem in rural Alaska.

- 1) Soft surface water sources are often the only ones available due to the presence of permafrost or of saline aquifers.
- 2) Water use is low, so contaminant concentrations build up instead of being flushed away.
- 3) To prevent pipe freezing the water is usually heated and pumped through circulation loops. Heat and higher water velocity contribute to corrosion.<sup>3</sup>

## BIRCH CREEK

Birch Creek is a small Athabaskan village south of Fort Yukon, where the PHS has recently completed a new water system similar to that at St. Michael. The water source is Birch Creek, which has an AI of 10.3 to 11.6, or moderately aggressive. Again, the only lead found was in the distribution system, with the river source, water tank, added chemicals and even surrounding soils showing little lead. Literature indicates that new water systems have lead values higher than do ones five years old; since the Birch Creek system was completed recently, lead values may decrease as the system ages.

## OTHER VILLAGES

Gambell and Shishmaref have only recently been sampled, so little data are available. Check samples are being

collected to determine the extent of the problem in those villages.

## HEALTH IMPLICATIONS

Lead poisoning is a disease long recognized for its ability to cause weakness, depression, constipation, anemia and paralysis.<sup>5,6</sup> Young children are particularly susceptible.<sup>7</sup> For this reason the lead limit in drinking water has been set at 0.05 milligrams per liter by the Federal Environmental Protection Agency.<sup>5</sup>

Health aspects of the investigation have been conducted by the state epidemiologist, Dr. John Middaugh. He collected blood samples from the residents of Birch Creek and tested for erythrocyte protoporphyrin (EP), an enzyme which changes rapidly with increase in lead consumption. EP is used to indicate potential health problems prior to the onset of serious symptoms.<sup>7</sup> All samples were well within acceptable limits, with the highest value being from Dr. Middaugh himself. The blood test results are inconclusive tests of the health hazard from the water system, because many of the people have reverted to drinking river water because of the lead reports. Further blood tests will be done to determine if the high lead concentrations are affecting human health.

## SOLUTIONS

The solution to the lead problem is relatively easy for future installations. In planning for new facilities, water samples are commonly collected from possible sources to determine potability and palatability. It is a simple matter to check the Aggressive Index as well. When corrosive waters can not be avoided, pipe and fitting materials can be selected to prevent contamination. For example, copper pipe with threaded joints or corrosion-resistant plastic pipe could be used.

For existing facilities it is usually not economically feasible to replace all the piping. Other possible solutions include:

- 1) Install a second distribution system made of corrosion-resistant materials and sized to serve only the drinking water needs.
- 2) Install chemical addition equipment for adding lime, sodium hydroxide,

phosphates, or other corrosion inhibitors. (The problem with this is that corrosion control requires careful analytical control, control which may be difficult to obtain in remote villages.)

- 3) An alternate source of water could be developed to avoid extremely soft surface waters.

## CONCLUSIONS

We know that lead limits are being exceeded in some village water systems. No high lead values have been noted in non-soft water areas. We are fairly certain that soft corrosive waters are attacking the lead solder at the copper sweat joints. Investigations are continuing to determine the extent of the problem and the effects on human health, and solutions are being tried to mitigate the problem.

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WATER ANALYSIS AND EVALUATION FOR  
COMMUNITIES OF THE NORTH SLOPE BOROUGH

NOVEMBER 1983

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## EXECUTIVE SUMMARY

Lead was present above background levels in the water systems of all communities visited except ~~Atkasut~~ and Anaktuvuk Pass; selected samples in Point Lay, Nuiqsut, and Barrow indicated lead contamination in excess of permissible limits established by the EPA and ADEC. With the exception of water from a relatively deep well at Anaktuvuk Pass, all communities had water supplies that were moderately to highly aggressive (corrosive). Solder samples collected from the water systems in each community indicated lead contents in excess of 50 percent. Less than one-fifth of the solder samples collected indicated lead content of less than 10 percent. The use of copper piping with soldered joints was the standard material of construction for the water systems observed during the survey.

An acute health hazard requiring emergency corrective actions is not deemed to exist; however, recommendations are provided to minimize the potential for health impact until permanent control of water quality can be achieved. Health risks that might be suggested as potentially resulting from chronic consumption of water supplies, if corrections were not made, can be readily avoided. The corrosive tendency of the water has, or will, present significant impact on the maintenance requirements for the water systems of concern.

Immediate attention is warranted for developing a timely action plan for improving the water quality provided in the villages of the North Slope Borough.

NORTH SLOPE BOROUGH LEAD STUDY SUMMARY

Date	Sample Location	Flushed or Unflushed	Lead mg/l (limit .05 mg/l)
07/07/83	Barrow - High School Drinking Fountain	Unflushed	0.98
08/07/83	Point Hope - Womens Restroom	Unflushed	0.04
08/07/83	Point Hope - Womens Restroom	Flushed	0.53
08/09/83	Nuiqsut - School Sink	Unflushed	0.62
08/09/83	Nuiqsut - School Sink	Flushed	0.17
08/09/83	Kaktovik - School Sink	Unflushed	0.005
08/09/83	Kaktovik - School Sink	Flushed	<0.005
08/15/83	Wainwright - School Office Sink	Unflushed	0.056
08/15/83	Wainwright - School Kitchen Sink	Flushed	0.310
08/15/83	Barrow - Elem. School Kitchen Sink	Unflushed	0.145
08/15/83	Barrow - Elem. School Kitchen Sink	Flushed	<0.005
08/15/83	Barrow - High School Kitchen Sink	Unflushed	0.018
08/15/83	Barrow - High School Kitchen Sink	Flushed	0.080
08/16/83	Barrow - NSB Building Mens Room	Unflushed	0.006
08/16/83	Barrow - NSB Building Mens Room	Unflushed	0.005
08/16/83	Barrow - NSB Building Mens Room	Flushed	<0.005
09/28/83	Nuiqsut - Public Safety House	Unflushed	0.008
09/28/83	Nuiqsut - Public Safety House	Flushed	0.006
09/28/83	Nuiqsut - School Fountain	Unflushed	0.340
09/28/83	Nuiqsut - School Fountain	Flushed	0.028
09/28/83	Nuiqsut - Truck Fill Point	Unflushed	0.090
09/28/83	Nuiqsut - Truck Fill Point	Flushed	0.011
09/29/83	Point Hope - Gym Drinking Fountain	Flushed	0.012
09/29/83	Point Hope - Gym Drinking Fountain	Flushed	0.006

Page Two  
NORTH SLOPE BOROUGH LEAD STUDY SUMMARY

Date	Sample Location	Flushed or Unflushed	Lead mg/l (Limit .05 mg/l)
09/29/83	Point Hope - NSB Housing - Kitchen	Unflushed	0.013
09/29/83	Point Hope - NSB Housing - Kitchen	Flushed	0.013
09/29/83	Point Hope - Water Plant - Kitchen Sink	Unflushed	0.026
09/29/83	Point Hope - Water Plant - Kitchen Sink	Flushed	<0.005
09/30/83	Wairwright - Jack Farik's place	Unflushed	0.077
09/30/83	Wairwright - Jack Farik's place	Flushed	0.005
09/30/83	Wairwright - High School Kitchen	Flushed	0.029
09/30/83	Wairwright - School Drinking Fountain	Unflushed	0.098
09/30/83	Wairwright - Sink Downstairs	Flushed	<0.005
09/30/83	Wairwright - Water Fountain upstairs	Unflushed	0.610
10/12/83	Anaktuvuk Pass - W. Side Kitchen	Flushed	0.005
10/12/83	Anaktuvuk Pass - E. Kitchen Sink - Cold	Unflushed	<0.005
10/12/83	Anaktuvuk Pass - Well House Sink	Unflushed	<0.005
10/12/83	Anaktuvuk Pass - Well House Sink	Flushed	<0.005
10/12/83	Anaktuvuk Pass - Paul Hugo Kitchen	Unflushed	0.010
10/12/83	Anaktuvuk Pass - Paul Hugo Kitchen Sink Via	Flushed	<0.006
10/13/83	Atquasuk - Tony Susooks - Water Truck	Unflushed	0.011
10/13/83	Atquasuk - Tony Susooks - Kitchen Tap	Unflushed	0.079
10/13/83	Atquasuk - Empty Storage Tank	Unflushed	<0.005
11/10/83	Barrow - NSB Housing J.H. Hittson	Unflushed	0.006
11/10/83	Barrow - NSB Housing J.H. Hittson	Flushed	<0.005
10/13/83	Barrow - New High School Fountain	Unflushed	0.070
10/13/83	Barrow - New High School Fountain	Flushed	0.010
10/13/83	Barrow - New High School Kitchen Tap	Unflushed	0.130
10/13/83	Barrow - New High School Kitchen Tap	Flushed	0.015



# Implementing a Lead Solder Ban

Joe Glicker and Don Stewart

One of the most significant aspects of the 1986 Safe Drinking Water Act amendments is the ban on the use of lead solder and lead pipes, which is similar to a ban enacted by the state of Oregon in 1984. Implementing such a ban requires a close coordination among the water utility, plumbing inspectors, plumbing code authorities, and health officials. Education and enforcement programs are essential to ensure that the ban is effective. Understanding the experiences in establishing the ban in Oregon and enforcing it in Portland may be useful as the lead ban is extended nationwide.

One of the most far-reaching sections of the 1986 amendments to the Safe Drinking Water Act (SDWA) is section 1417—"Prohibition on Use of Lead Pipes, Solder, and Flux." This section of the act prohibits use of solder and flux with more than 0.2 percent lead and pipe and pipe fittings with more than 8 percent lead in all water systems and residential and nonresidential potable water plumbing. This section of the act also requires the water utility to provide notice to the public about possible lead contamination of tapwater in a manner to be prescribed by the US Environmental Protection Agency (USEPA).<sup>1</sup>

These provisions are similar to a lead ban enacted by the state of Oregon in 1984.<sup>2</sup> This ban was an outgrowth of a corrosion study undertaken by the Portland Water Bureau from 1981 through 1983.<sup>3-5</sup> Implementing such a ban requires the cooperative efforts of many agencies, organizations, and individuals. The experiences in establishing a ban in Oregon and in enforcing it in Portland may be useful as this ban is extended nationwide.

## Establishing a lead ban

The biggest obstacle to establishing a lead solder ban in Oregon—and the biggest reason that the ban was imple-

*Portland's corrosion study generated considerable coverage in the local press, as did the hearings and meetings that preceded issuance of the state rule.*

mented statewide—was the fact that the plumbing code in Oregon is statewide. Local governments do not have the option under state law to adopt their own plumbing codes. Thus, when the primary conclusion of the Portland Corrosion

Study was the desirability of a lead-solder ban in the area served by Portland's water supply, more than a local ordinance change was needed. It was also realized that although a local ordinance could perhaps control lead solder use within the city limits of Portland, Portland supplies water to other cities and water districts over which a local ordinance would have no effect. Compliance with a citywide only ban would likely be difficult because plumbers working in the metropolitan region would continue to use lead solder outside the city limits, and, in some locations, it would be difficult for a plumber to know whether the work was in or outside the boundaries of the city.

This led Portland's water bureau to take two actions: first, the city's Bureau of Buildings was contacted and the results of the corrosion study were explained. Together, the two agencies developed a notice that was distributed to each person who applied for a city plumbing permit. This notice explained the risks of using lead solders and rec-

TABLE 1  
Results of lead-solder testing

Period	Number of Solder Tests	Number of Locations Tested	Number of Samples With Lead Solder*	Number of Locations With Lead Solder*
Oct. 1984-Mar. 1985	10	10	5	5
Apr. 1985-Sept. 1985	19	8	11	3
Oct. 1985-Mar. 1986	5	4	2	2
Apr. 1986-Sept. 1986	4	4	3	3

\*Lead solder is defined as having more than 0.2 percent lead.



*The Portland, Ore., water quality laboratory analyzed 38 samples during the first two years of the statewide lead solder ban. Plumbing inspectors selected sampling sites from 26 locations on the basis of the solder's appearance—50:50 lead solder becomes dull, whereas 95:5 solder remains bright.*

commended the use of 95:5 tin-antimony solder for potable water plumbing.

Second, the study was brought before the State Plumbing Code Advisory Board with a request to ban the use of lead solder in the area served by Portland's Bull Run water supply. The Plumbing Code Board was reluctant to take such a step for several reasons: they did not have the technical background to evaluate the health-based need for the action, and it would be difficult for plumbers working in the general area of the proposed ban to know whether it was or was not in force in a particular location. Furthermore, they did not know whether other areas that served other water supplies were also at risk from the solder. The advisory board noted that a section of the plumbing code gave the administrator of the State Health Division the authority to ban use of any material determined to have adverse health effects.<sup>6</sup> The board suggested that this approach would be more appropriate. The State Health Division was contacted with a request to make this determination.

The health division held a number of fact-finding hearings around the state that eventually led to the final rule. This rule bans the use of solder with more than 0.2 percent lead in potable water systems and lines, requires labeling of any solder sold in Oregon with more than 0.2 percent lead to indicate that it shall not be used on potable waterlines, bans the use of new lead pipe in potable water systems, and requires removal of all lead services and lead service connectors from water systems on a schedule

approved by the health division. The rule does not specifically define lead pipe but allows the State Health Division to determine whether a water supplier is identifying and removing the appropriate material.

#### **Implementing the ban in Portland**

Portland's corrosion study generated considerable coverage in the local press during the two years it was being conducted, as did the hearings and meetings preceding issuance of the state rule. Despite this publicity, many plumbers, home remodelers, and plumbing engineers were unaware of the need for and requirements of the ban. An extensive educational campaign was undertaken to explain the new rule and the lead issue. All plumbing contractors working in Portland were sent notices explaining the rule. Speakers were provided to organizations of local plumbing contractors, plumbing inspectors, corrosion engineers, and interested civic groups. Articles describing the corrosion study were placed in a newsletter inserted with quarterly residential water bills. An informational flyer on lead prepared by the county health department was also mailed to each customer. One-on-one discussions with plumbers and the general public were held by the plumbing inspectors when applications for permits were made and when job sites were visited. Persons contacting the Water Bureau with water quality complaints or requests for information about the lead issue were told of the solder ban and the need to flush standing water prior to consumption.

Although this education campaign did much to inform the public about the solder ban and the reasons for it, there was still resistance to the idea. Cost increases for plumbing installations were feared by contractors and homeowners alike. Material costs for 95:5 tin-antimony solder, the primary alternative

solder, are usually higher than for lead-based solders. The higher melting point and narrower melting point range for this solder were thought to be more time-consuming and would therefore result in higher labor costs. Although everyone recognized the severe consequences of exposure to lead, not everyone was convinced that solder was a serious source of this exposure. Many wanted other solutions to the problem, such as adding water treatment chemicals. This would not affect or restrict the ability to use plumbing materials of their choosing.

This resistance led to the realization that in addition to education, an enforcement program was necessary if the lead solder ban was to become a reality. A cooperative program was established between the Water Bureau and the Plumbing Division of the Bureau of Buildings in Portland. If a field plumbing inspector found a solder being used that was suspected of containing lead in excess of the rule, the inspector took a sample of the solder for analysis in the Water Bureau's water quality laboratory. This provided the inspector with the certified data needed to force correction of the problem. The field inspector could then require removal of the portion of the piping system installed with the lead solder. If the whole system was found to be installed with lead solder, the whole system would have to be removed at the installer's expense. If the installer refuses to comply with the plumbing inspector's order, the installer is subject to a \$1,500 fine and loss of plumbing license. This enforcement program was communicated to the plumbing contractors along with other information about the ban.

Implementation of the ban on lead services and lead service connectors was considerably easier because this area was entirely under the control of the Water Bureau. No new lead piping has been installed for many years, and there

are no lead services in Portland, so compliance with those aspects of the ban required no effort. Portland has about 10,000 galvanized pipe services that are connected to the water main with a 2-ft (0.6-m) lead pipe connector or pigtail. Old records of services, mains, and foremen's reports were searched to identify all these installations. A compliance schedule to remove these pigtails and replace the services over a 10-year period was negotiated with the State Health Division. The cost of this program is estimated to be more than \$6.5 million although most of this cost would be incurred, even without the program, because the service lines being removed are old and often in need of replacement.

### Results of two years of experience

During the first two years of the lead solder ban, 38 solder samples have been analyzed by the Portland water quality laboratory. Samples were collected at 26 locations in Portland where plumbing inspectors suspected use of lead-based solder. Inspectors use the difference in appearance between lead solder and tin-antimony solder to identify points at which testing is needed. The 50:50 lead solder is usually dull in appearance after application, whereas 95:5 solder remains bright. A slight indentation or gap often appears where the fitting meets the pipe with tin-antimony solder, whereas this gap is bridged with lead-based solder. Twenty-one of the samples analyzed in the laboratory proved positive for lead-based solder at 13 of the locations. In each case in which a positive solder sample was found, the plumbing installer was given verbal and written notification to remove all piping that was installed using lead-based solder. In no case has it been necessary to impose fines or revoke licenses of installers to gain compliance.

As the plumbing inspectors gained field experience in identifying lead-based and lead-free solders, and as the contractors became accustomed to the rule, the need for laboratory testing decreased. Table 1 shows the testing frequency by six-month intervals since the ban was instituted. Included in these results is one particular location where 12 solder samples were analyzed, 9 of which contained lead-based solder and 3 of which were lead-free.

In recent months, a field solder testing kit<sup>7</sup> has been used to differentiate between solders. This test procedure is based on formation of an insoluble lead chromate precipitate when potassium chromate is added to a solubilized solution of the solder. This solder field test costs only a dollar or two per sample. Laboratory analyses of the solder samples have confirmed the results of the field test in all of the samples that have been compared.

The response to the results of the

solder-testing program is similar to the response received whenever code violations of any kind are found. The installer is reluctant to spend the money required to correct the violation, but ultimately does so because it is the law and because of the sanctions available if the installer does not comply.

The contractors' initial fears of increased job costs do not seem to have materialized. Cost increases in plumbing work seem to be negligible and the contractors have adjusted favorably to the rule. Although tin-antimony solder unit costs are slightly higher than lead solders, the more careful handling it requires results in use of less material and equivalent material costs on a per-job basis. Labor time on contracted work has not increased once the installer learned how to use the lead-free solders. Despite the initial reluctance to accept the solder changes, once implemented and in use for awhile, the new procedures have been generally accepted.

Perhaps the major problem with the rule is that the use of 95:5 solder and other lead-free solders has greatly decreased the ability of the nonprofessional to install copper water tubing. The professional installer has the ability to obtain the training needed to work with the new materials, whereas an individual usually does not. The greater skill required to use the approved solders has made copper less competitive with other pipe materials, particularly plastics, for the do-it-yourself plumber. This drawback may decrease over time as individuals become familiar with the other solders, but it may be a permanent side-effect of the ban because the amateur may never have sufficient experience to work with lead-free solders.

The other problem in implementing the rule has been the perception by some that health protection from plumbing materials is being examined from a narrow base. For example, the ban may increase the use of plastic pipe materials, and there is concern that the known carcinogen, vinyl chloride monomer, or that other pigments, lubricants, stabilizers, or plasticizers will leach from polyvinyl chloride (PVC) or other plastic pipe.<sup>8</sup> Also, taste- and odor-causing compounds have been reported from polyethylene pipes.<sup>9</sup> The health significance, if any, of such leaching has not been fully explored. Further documentation of the risks of plastic pipe, dissemination of the information on this topic, and control of the manufacture and use of plastic pipe, if necessary, are needed to address these concerns.

### Conclusions

Establishing a lead-solder ban requires close coordination among the water utility, plumbing inspectors, plumbing code authorities, and health officials.

Obtaining compliance with a ban requires an extensive education program for both the general public and the groups most affected by a ban.

An enforcement program of solder testing is essential to ensure that the ban is effective. Fears of increased costs and increased difficulties in doing plumbing installations have not turned into realities for the professional installer. However, the nonprofessional is turning to other plumbing materials, particularly plastics, because of the higher level of skill required to work with lead-free solders.

A comprehensive look at plumbing materials and their health effects would provide a better basis for making decisions about selecting materials and explaining their use to the public than the current piecemeal approach.

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# St. Michael: How long does it take to get the lead out?

Nome Nugget

12-23-82

## AT STEPHENSON

The lead leaching into the St. Michael elementary school water system was discovered by accident. But it is no accident that those who could not see the situation were not so. And the reason by local officials to dispute the problem is not an accident either. About 100 of the people concerned would not be quoted on the issue. The reason they refused to speak out was because they were unsure of the facts. But then the facts haven't always been available, even during research for this article. At stake here are two issues: public information and public health. We have been trying to tell this for three years." Justice, environmental engineer for the Department

of Environmental Conservation (DEC) said over the phone at his Fairbanks office.

The lead content in the water running from St. Michael elementary school taps was discovered in July, 1979, during a project to assess water quality in rural Alaska. "This was a widespread project costing very little money and getting a lot done," Justice said. "It was a cooperative effort between this department (DEC) and Public Health sanitarians like Geoff Langer (sanitarian for Arden Sound Health Corporation) and the DEC lab down in Juneau." Concern over the unexpected discovery of lead comes from its adverse effect when accumulated in the human body.

To locate the source of the lead, Justice tested St. Michael's water source, a

lake located three-and-a-half miles from town. Water from this lake is pumped about twice a year into a Public Health Service (PHS) Government plant. The treated water is stored in two tanks: the 100,000 gallon PHS tank and a 150,000 gallon steel tank installed by the Bureau of Indian Affairs (BIA). The BIA tank provides water for the taps, drinking fountains, kitchen, and restrooms in the school. The water travels through copper pipes soldered together. Justice found no lead content in the lake, and a minimal amount in the holding tank. But the concentration of lead flowing from the taps was above the maximum level permitted: 0.05 milligrams of lead per liter of water. The content was always above the maximum level. Water was re-

leased from taps that had been used often. Justice's theory was that the lead accumulated in the pipes. "The report he published in the Northern Exposure journal," All the diagrams of the water system in the school building showed the pipes being tested. "The solder tanks at the school in St. Michael are made of a standard construction technique."

This standard technique is appropriate in parts of the world where water is hard, coating of calcium carbonate forms on the inside of pipes. This scale-like coating as Justice described it prevents corrosion of the solder. "But the problem with St. Michael water is so soft there's really no calcium to precipitate out

thing that would  
to the kids' health.  
to protect the

o years ago when  
district drew plans  
set a high school  
hael, Justice found  
se to a legal battle  
A over lead solder-

was some con-  
re in that they had  
(construction)  
Anchorage off-  
DEC environmental  
explained. "Our  
e office looked at  
and sent them an  
to construct not  
that this project was  
airbanks region. I  
ut the school going  
re and I checked and  
plans so I contacted  
il district.

I kind of got into a  
h them getting those  
id convincing them  
uld change the spec-  
s on the solder.

In the end they fin-  
reed to use tin all-  
But I did consider  
tion to change the  
aterial."

occurred in the fall  
Attitudes must have  
I since then because  
t telephone interview  
n REAA official in  
lect office proved the  
district willing to  
ic situation. Dur-  
versation which occur-  
weeks ago REAA has  
manager Mike Dugan  
When we had our water  
returned from tests  
of Environment  
or suggestion  
district ceased

using the elementary school's  
water for drinking, cooking,  
and dish washing. He said  
they hauled cooking and  
drinking water and carried  
used dishes to the high school  
for washing.

Replacement of the sold-  
ered joints should be under-  
way right now, according to  
Dugan. Three school district  
maintenance men are being  
flown to the village to do the  
repair work. Dugan estimat-  
ed five to six weeks time and  
about \$20,000 of school dis-  
trict money will see the job  
done.

"Of course we have a pro-  
blem with it," the business  
manager said. "That's less  
dollars to spend elsewhere.  
The hauling of water is an  
inconvenience. And resold-  
ering can create plumbing  
problems by remedying the  
problem that exists."

He added the although he  
knew money had been avail-  
able in the past for health,  
life, and safety problems  
prior to the transfer of any  
BIA school, policy had  
changed in Washington D.C.  
"I guess the funds were not  
available for the transfer,"  
he concluded.

But BIA administrative  
official in Nome, Paul Ster-  
ling, said a budget proposal  
to replace the water pipes  
never crossed his desk for  
BIA to either approve or  
disapprove. He said the com-  
mission at St. Michael never

got beyond plant manage-  
ment.

"Our plant manager at  
that time (Melvin Martin) is  
not here for me to get state-  
ments from as to the reason  
why the pipes were not re-  
placed," Sterling said Dec.  
20. "But they were aware  
of it and we never received an  
administrative budget to cor-  
rect the situation.

"But they did do water  
tests and according to this,"  
he said referring to Stan Jus-  
tice's article in The Northern  
Engineer, "we did do the  
necessary treatments to bring  
the level down to 0.05 mg. of  
lead per liter. This was in  
Feb. 2.

"And so then in Sept. '81  
the report went in and the  
lead sample was up to 0.09.  
Solution was put into the  
water in March '82 bringing  
the lead sample down to  
0.05.

"These water tests were  
sent to the chemical and  
geological lab of Alaska and

they were approved as  
satisfactory. This is  
we did for the safety of  
kids," he said, adding,  
nothing was ever done about  
the replacement of the pipes.  
Then REAA took over the  
school before we had a  
chance to replace them."

from my supervisor. We're  
talking about lead and  
there's a lot of implications."

The "implication" of lead  
content in a public water  
system is lead poisoning. Dr.  
Tom Kosatsky who works at  
the Bureau of Epidemiology  
in Anchorage called medical  
knowledge of lead poisoning  
"flaky data." He said a short  
period of lead consumption  
even in high doses reveals no  
symptoms. But long term ex-  
posure will allow absorption  
in the body. The results are  
learning disorders, psycholog-  
ical problems, anemia, and  
problems in the skeletal and  
digestive system. Children  
are particularly susceptible

Continued on page 11

## St. Michael

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to the effects of lead poisoning and what is equally disturbing is that these symptoms are vague. They can originate from a number of sources. Assigning them to lead consumption after the fact could be difficult.

Stan Justice noted that when another doctor from the Bureau of Epidemiology, John Middaugh, traveled to Birch Creek to test blood taken from the villagers he came up with surprising results. The interior village located just south of Fort Yukon was also reported to have a high lead content in its PWS water system. But Middaugh's tests showed the lead content in the villager's blood was at an acceptable level. This was because they turned to the river for their water source when the lead was discovered. As it turned out, Middaugh's own blood, which he tested at that time, too, had the highest lead content of all. Justice laughed when he recounted the story and pointed out that gas fumes in Anchorage exude a higher lead content than some of the problem water systems in the state.

To date, St. Michael, Birch Creek, Savoonga, and Gambell have been tested and revealed high lead content within their water systems.

Middaugh said in Anchorage, Dec. 20, that he is currently assessing past water tests from St. Michael to

determine if he should perform blood tests on school children.

What is the lead content in St. Michael at this time? Justice said Simon Mawson (assistant to the state sanitarian in Nome) took samples this fall and "water samples from pipelines that had just been flushed still showed levels exceeding 0.05."

He concluded: "I think we're finally arriving at a solution there, through the actions of Simon Mawson and the school district. They've become concerned and are taking rapid action to correct the problem. In the future what it says is when people build new systems in the Arctic they are going to consider the corrosive nature of the water there. And if the water is found to be corrosive, they will use tin instead of lead solder."

A sound philosophy for the future. But the fact remains that three years and five months passed before the proper and final solution to the problem at St. Michael faced correction.

The adverse effects of lead in the body results after a long and steady accumulation of the substance. The solution to any problem arrives after an accumulation of facts. In the case of lead poisoning, it is imperative that the accumulation of facts exceeds the accumulation of lead.



