Oregon Drinking Water News
DIPLOMAT
Drinking Water Program, Oregon Health Division

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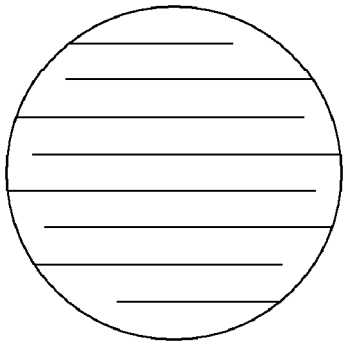
# Disinfection Helps Bend Avoid Filtration

***By Roger Prowell***

THE city of Bend, the fifth largest water system in the state, has sufficient watershed control and raw water quality to achieve a filtration exception under the Surface Water Treatment Rule (SWTR). The city constructed a 1.5 million gallon above-ground bolted steel basin to provide sufficient disinfection contact time to meet the "CT" values (concentration X time) required by the rule.

The disinfection process begins at the CT basin which has eight Hypalon curtain baffles 10 feet apart, anchored to the floor and, alternately, to opposite sides of the tank. They are 30 feet high and have 10 feet of free space between end of curtain and the side of the tank on the unattached side. The tank's inlet and outlet are floor level with a 10-inch mud ring on the outlet side. The design goal was to achieve detention time that would give a margin of safety in meeting CT requirements which would insure adequate disinfection.



*Bend's CT basin has eight Hypalon curtains to direct and slow water flow.*

On Sept. 4, a tracer study was conducted using food grade calcium chloride. Tracer solution was mixed to 20 parts per million (ppm) in a mechanical paddle wheel mixer in 100 gallon lots, then pumped to a 300 gallon holding tank and from there into the inlet side of the CT basin piping. The point of injection was approximately three feet from the existing point of chlorine injection. A calibrated meter was used to control the feed rate of the solution to 5 gallons per minute (gpm). Conductivity was measured with a Sybron/ Barnstead Model 70-CB analyzer.

The tracer study goals included testing the efficiency of the baffle system inside the CT basin and determining total CT immediately prior to the first customer. The Bend transmission system has no services until the water has passed through two separate reservoir systems. These reservoirs are not baffled but their capacity adds to total CT calculations. System reservoir levels were artificially lowered to 50% of capacity and either maintained at this level or, in the case of Awbrey reservoir (5 million gallons (MG)), slightly below 50% of capacity. Crews began mixing the tracer solution at 6 a.m. to fill the 300 gallon holding tank to provide a reserve in case of equipment breakdown.

The CT basin water level stabilized at 26 feet with a flow of 7,300 gpm. This gave the basin a capacity of 1.3 million gallons. Maximum flow of surface water from Bridge Creek is 8,000 gpm and 7,300 gpm represents 91.25% of maximum flow available.

The tracer study began at 9:35 a.m. and samples were collected at 15 minute intervals at the CT basin outlet. Samples were also collected at the outlets of Overturf reservoir and Awbrey reservoir which serve as "first customer." Crew members transported the samples to Awbrey reservoir where a mini lab was set up and Beverley Sunderlin, laboratory manager, conducted conductivity tests. Sampling frequency was increased to every five minutes when the calculated time of arrival of the tracer approached.

THE Bend Water Division was extremely interested in the performance of the CT basin because we have spent considerable resources on this project and it represents a vital portion of our disinfection process. Samples were collected from this site even though the CT basin does not represent a "first customer."

*Continued on page 4*

**Bend** *(Continued from page 1)*

***Inside this issue:***



*Roger Prowell, B.S., has been in charge of the Bend water system for six years. His degree is in education and he is a certified operator in water distribution, level 3.*

*Asbestos was found in the drinking water of Monmouth OR in February. This is the text of the latest fact sheet that was sent to city officials for distribution to residents.* Ed.

# Asbestos in Monmouth Drinking Water

Update - 3/24/93

This fact sheet provides an update on the Monmouth water system. It outlines recent actions by the city and the Health Division and also provides additional information compiled by the Division in response to questions raised by city water users.

The city has retained an engineering consultant and has received a recommended plan for treating the water supply to reduce corrosivity and begin rehabilitation of the asbestos cement pipes. This plan is being implemented now and consists of three steps:

1. Raise pH of water to 7.5-8.0 using sodium hydroxide, a standard water treatment compound.
2. After new pH is established, the piping system will be thoroughly flushed to remove loose asbestos fibers.
3. Begin addition of zinc chloride or zinc sulfate, standard water treatment compounds, to rehabilitate and protect pipe interior surfaces.

Additional sampling for asbestos will continue in order to monitor fiber levels as the treatment plan continues. Several weeks to several months of treatment may be needed before fiber reductions occur.

The city has set up two locations where filtered water is available to city water users (fire station and city shops). The Health Division has provided information to the city on home water filters whose ability to remove asbestos fibers has been verified by an independent third party (the Division does not have the capability to independently verify manufacturer claims). Information was obtained from the National Sanitation Foundation (Ann Arbor, MI) and the state of California and is available at City Hall.

**What is Asbestos?**

Asbestos is the generic name for a group of six naturally occurring minerals (chrysotile, amosite, crocidolite, tremolite, actinolite, anthophyllite) that are characterized by fibers or bundles of fine single fibers. This group can be broken into two families, based on the structure of the asbestos fiber, known as serpentine and amphobile. The only member of the serpentine family member known as asbestois chrysotile. Chrysotile is light green to white in color and consists of pliable, curly fibrils that may occur in bundles. Chrysotile makes up over 90% of the asbestos found in construction material. The amphiboles family consists of amosite, crocidolite, tremolite, actinolite, and anthophylite. This type of asbestos is needlelike in shape and has been shown to be more hazardous in animal studies because the fibers tend to accumulate in the body.

Chrysotile asbestos was heavily used in many industries up until the early 70's because these thin, yet strong, fibers are chemically inert and heat resistant. In the last decade it became apparent that the benefits of asbestos are seriously offset by the health risks to workers who were exposed to high levels and to a lesser degree, the users of asbestos-containing products. Some miners and other workers occupationally exposed to high levels of airborne asbestos have developed a lethal form of cancer known as mesothelioma. Based on this evidence, the U.S. EPA banned asbestos from being used in the manufacture of insulation, asbestos-cement (A/C) piping and most other industrial and consumer products. Many products that contain asbestos remain in use.

**What Type of Asbestos Was Found In Monmouth's Drinking Water?**

Asbestos cement (A/C) piping was used extensively nationwide in water systems until the early 1980's. Under certain water quality conditions (high corrosivity), A/C pipe can deteriorate over time and asbestos fibers can be released into drinking water. The Oregon Health Division and city of Monmouth received confirmation in March, 1993 that levels of chrysotile asbestos (greater than 10 microns in length) in Monmouth's water ranged from 12 to 146 million fibers per liter in the drinking water. This is 1.7 to 21 times higher than the maximum contaminant level (MCL) which is set at 7 million fibers/liter.

The type of fibers found in Monmouth's water supply are 95% chrysotile. Even though chrysotile is one of the least hazardous forms of asbestos, the levels found in the water exceeded the MCL. Based on these findings, the Health Division and the city of Monmouth have advised the public to not use city water for drinking or cooking, until the problem can be corrected in the pipes.

**What Does EPA's Standard Mean?**

The EPA's standard is called a maximum contaminant level (MCL) and is set at 7 million fibers/liter (only fibers **greater** than 10 microns in length are counted). This standard is based on the results of a National Toxicology Program (NTP) animal study showing an association between the ingestion of asbestos fibers

greater than 10 microns in length and non-cancerous gastrointestinal tumors in male rats. A parallel ingestion study by NTP using fibers which were less than 10 microns did not show any effect in either male or female rats. This is why the current standard regulates only the longer fibers.

According to EPA's calculation, consumption of approximately 2 quarts (2 liters) of water per day at this MCL over a lifetime (70 years) would result in one excess case of cancer per million people exposed. The Health Division does not believe that exposure to excessive levels of asbestos fibers in Monmouth is likely to have been occurring for more than 20 years (as a worse case scenario) since the A/C pipes were installed in the 1960s and 1970s. It is most likely that it took a few years before the pipes began to corrode, releasing asbestos into the drinking water. Therefore, the risks of illness from asbestos associated with drinking Monmouth's water are extremely low if not zero.

The Oregon Health Division reviewed the vital records files to see if there has been any change in cancer deaths among Monmouth residents which might be linked to asbestos such as cancer of the digestive tract. During the period 1983-1991, there have been no cases of cancer deaths of the digestive tract.

**What About Inhalation Exposure?**

Some people have expressed concern about possible inhalation exposure to asbestos when taking showers, doing laundry, or in performing other household activities. The Health Division considered recommending restricting other water uses in the homes; however, the limited research that has been done looking at airborne asbestos does not support such an action.

In one study, air monitoring was performed in Woodstock, NY, where the water supply contained over several billion asbestos fibers/liter. In this study, air samples were taken in homes before and after running a steamy shower for 15 minutes. Levels of airborne asbestos were compared to homes in communities that did not have asbestos in the water. Results from this study showed that there were **slight** increases in airborne asbestos in homes using contaminated water; however, it was not considered a health risk because fibers were less than 1 micron in length and the levels detected did not exceed those commonly found in urban areas. The short fibers are not considered harmful by the EPA because they are less likely to accumulate in the body.

The Health Division recognizes concerns about possible exposure to airborne asbestos in homes. We plan to take air samples in the near future and are currently designing a sampling protocol. The Health Division does not believe that there is reason for high concern about inhalation exposure. However, if people want to take extra precautions to further reduce exposure, the following steps can be taken.

1. Take baths rather than showers since there is less chance for asbestos to become airborne.
2. When using the dryer, keep the utility door closed and be sure that the dryer is vented to the outside. When cleaning lint from the screen, use a squirt bottle to lightly dampen both sides of the screen before removing the lint. Place the lint in a plastic bag before discarding in your trash.
3. Use wet dusting and damp mopping when cleaning homes. This will minimize the chances for any asbestos-containing dust from becoming airborne in the home. In addition, steam-cleaning or shampooing carpets is recommended over dry vacuuming.
4. Avoid the use of steam rooms and only use bottled water in humidifiers.

**Is the Water Safe for Pets?**

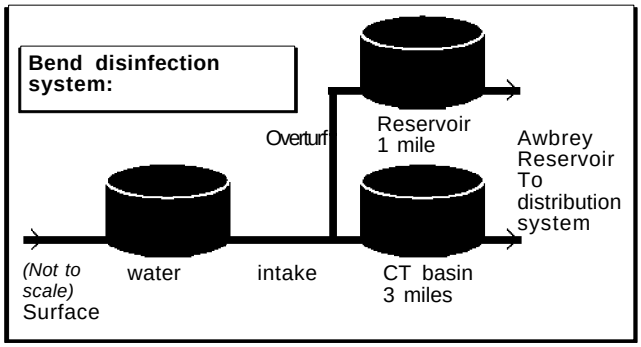
Given the lack of information about the sensitivity of animals to asbestos-related diseases, it may be prudent to use bottled water for pets as well.

## Staff notes

Dolores Melone retired in March after more than twenty years with the Health Division. Dolores maintained Drinking Water Section's computerized database of water system owners, operators, addresses, water sources and system size. The database allows DWS to notify operators of changes in monitoring requirements by system size and type. We wish her well.

Robin Peterson has been promoted to Dolores' former position. He has been responsible for entering water quality reports into the computer and general clerical duties. Congratulations, Robin.

The Bend distribution system is controlled so that approximately 37.5% of the surface water flows to Overturf reservoir (3 MG) and 62.5% flows to Awbrey reservoir (5 MG) The configuration of the system is CT basin, three miles of transmission main to Overturf where the water is controlled then one mile of transmission main to Awbrey reservoir.




Conductivity results showed the CT basin has a "T" factor of .668 with a water level of 26 feet and inlet flow of 7,300 gpm with a time of 120 minutes. At Overturf reservoir, the water was controlled to allow 2,740 gpm into this reservoir. Conductivity results show that with the reservoir at 50% of capacity, the total time from the CT basin inlet to the outlet of this reservoir was 276 minutes. Flow into Awbrey Reservoir was 4,560 gpm.

Conductivity test results show total time of 249 minutes from the CT basin inlet to the outlet of Awbrey reservoir.

**Summary:**

| *Total time:* | *Overturf* | *Awbrey* |
|---|---|---|
| CT basin: | 120 minutes | 120 minutes |
| CT basin to outlet: | 156 minutes | 129 minutes |
| Total: | 276 minutes | 249 minutes |

This detention time in the system gives Bend adequate disinfection with chlorine residuals of .90 to 1.00 ppm.

N additional benefit of the CT basin is that surface water is typically at least 2-3 degrees warmer (the result of friction loss and insulation) at the CT basin compared to that at the intake near Tumalo Falls about 10 miles distant. Analysis of our records on demands and temperatures indicate that early spring will be the period when CT calculations with a residual of 1.00 ppm will be about 190. For our system this occurs when warm weather creates large demands in the city and snow melt holds water temperatures down. This tracer study demonstrates that adequate disinfection time can be achieved by the combination of baffled reservoirs, transmission time and unbaffled reservoirs and, with them, Bend can meet the requirements of the Surface Water Treatment Rule.

The Water Division conducted several tracer studies on the system during the testing of different baffle systems. Several things we learned make the testing more efficient. We found that using the same personnel to do the same job reduced confusion and made the operation go smoothly; and that mixing and testing a large amount of tracer solution provided adequate time to handle breakdowns and maintenance of equipment. Careful labeling and tracking of samples was handled by trained people who were in radio contact with the other sampling stations and the lab facilities.

## Initial Lead and Copper Monitoring Complete

***By Chris Hughes***

Monitoring for lead and copper for rounds one and two has been completed for Oregon's five large systems (over 50,000 population); the results are below. Round one sampling took place January-June, 1992, and round two, July-December, 1992.

90% sample results

| System | Population | Lead | | Copper | |
|---|---|---|---|---|---|
| | | *Round 1* | *Round 2* | *Round 1* | *Round 2* |
| Eugene | 135,000 | 0.0145 | 0.009 | 0.37 | 0.274 |
| Medford | 60,429 | ND | ND | 0.794 | 0.865 |
| Portland | 402,000 | 0.044* | 0.053* | 1.8* | 1.3 |
| Salem | 116,000 | 0.0148 | 0.009 | 1.300 | 0.99 |
| Tualatin Valley W.D. | 121,457 | 0.028* | 0.029* | 1.41* | 0.988 |

* Exceeds the action level (lead: 0.015 mg/l; copper: 1.3 mg/l)

Eugene, Portland, Salem and Tualatin Valley Water District must conduct studies to optimize corrosion control. Medford is considered optimized and has been approved for reduced monitoring.

Round one monitoring for medium systems (3,301 to 50,000 population) has also been completed. Oregon has 84 medium systems and 77 have reported. The statistics for round one:

| | | |
|---|---|---|
| Report received | 92% | (77 of 84) |
| Systems exceeding lead A.L. | 25% | (19 of 77) |
| Systems exceeding copper A.L. | 16% | (12 of 77) |
| Systems exceeding both A.Ls. | 10% | (8 of 77) |

Round two monitoring for the medium systems began in January and runs through June, 1993. Only those systems which did not exceed an action level are required to conduct monitoring for round two.

Small systems (25 - 3,300 population) must begin round one monitoring in July, 1993. This requirement applies to all community and nontransient noncommunity systems. A guidance document which describes the monitoring requirements in detail was sent to each small system. If you did not receive it or have any questions about the monitoring requirements, please contact the Health Division Drinking Water Section or your local county Health Department.

# Phase II and V Update

The recent finding of asbestos in Monmouth's water was the first identification in an Oregon water system of one of the contaminants under the new standards and monitoring required by Phase II and V. Testing began in January; first quarter results were to be reported by April 10. Many have been received but others were held up due to questions regarding analytical methods and reporting formats. These have been temporarily resolved and we expect the backlog of work to be completed and reported.

The laboratories and our staff have been busy answering questions from system personnel on monitoring requirements. Many were frustrated to find all our phone lines busy when you called. We hope you persisted and got answers to most questions.

Some of your questions pointed out again the complexity of the requirements and the need to keep in mind their intent. When selecting sample sites, take care to get the most complete picture of the water quality. We cannot identify the sites in each individual system that will provide the most information to protect the health of users. You will have to use your best judgement. We ask that you clearly identify the site you chose on the form you submit to the lab so that it appears on the report and remains a part of your water system records.

## AWWA Takes Cross Connection Reins

As a result of Measure 5 budget cuts, the Oregon Health Division (OHD) last year lost funding for the Cross Connection certification program. Because of the importance of cross connection, however, the OHD has recognized a program designed by the Pacific Northwest Section, American Water Works Association (PNWS/AWWA) to continue certification statewide.

At their fall meeting, the PNWS-AWWA Board of Trustees approved a motion to provide certification support through December 31, 1993. In the interim, Oregon water purveyors will work through the legislature to reauthorize a program administered by the Health Division.

To fund the PNWS-AWWA program, there will now be a $20 fee for either certification or renewal. Individuals who are both Testers and Inspectors will pay half for the second certification, i.e., $30 for both.

Other support services, including the sale of test form booklets, the state list of approved assemblies and lists of approved Testers and gauge tags, will be handled through the PNWS-AWWA office by the Section Secretary/Treasurer, Judy Grycko (phone 503/246-5845). Ms Grycko will also maintain a list of water purveyors by area who can answer technical questions.

Purveyors who submit quarterly reports will continue to send them to the Health Division, Drinking Water Section. The OHD will also continue to provide liaison to the Plumbing Board and the PNWS-AWWA Cross Connection Committee.

# Help for Small Systems

***Jim Boydston, P.E.,former manager, Drinking Water Section, OHD***

The Pacific Northwest Section of the American Water Works Association (AWWA) has formed a Small Systems Compliance Support committee to provide assistance to small water systems. AWWA recognized that small systems which do not meet all the new regulations will reflect poorly on the industry. Made up primarily of retired operators and utility managers, the committee will help small systems that ask for assistance to find answers to problems of management and operation.

The committee is ready to respond to requests for help from small and very small systems. It cannot provide engineering or direct operational assistance but is ready to offer advice on questions of regulatory interpretations, sources of funding, contacts for technical advice, etc. Systems need not be members of AWWA to receive help.

The work of the committee is being coordinated with the Oregon Health Division and the Oregon Association of Water Utilities (OAWU) to prevent duplication or conflicting advice. Requests for help from the committee can be forwarded through AWWA (246-5845), OAWU (364-8269) or directly to the chairman of the committee, Jim Boydston (375-3483). Written requests should be sent to Boydston at 4307 Orchard Hts. Rd. NW, Salem 97304.

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Department of Human Resources
P.O. Box 14450
Portland OR 97214-0450

Application to Mail at Second-Class Postage Rates is Pending at Portland OR

David E. Leland, Manager 503 / 731-4010

# Training Calendar

**Lead and copper workshop, sponsored by OAWU/OHD:**
May 26, 8-noon Baker City council chambers, 1655 1st St.

CEUs will be given. Attendees are requested to bring their copy of the lead and copper guidance document.

**Water System Training courses**
Drinking Water Section, OHD; contact Claudia Stiff, 731-4317

| *Date* | *County / other location* |
|---|---|
| June | Wasco/Sherman/Hood River |
| June | Deschutes/Crook/Jefferson |
| July | Douglas/Lane |
| August | Lincoln |
| September | Pendleton/Klamath Falls |
| October | Polk/Yamhill |
| November | Tillamook/Clatsop/Columbia |

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Please send requests for article topics or manuscripts of your articles to John Gram, editor (503 / 731-4010).

This issue's contributors include Chris Hughes, and Dave Leland of Oregon Health Division, Roger Prowell, city of Bend Water Division and Jim Boydston, civilian. (39-93/221387)