DRAF

Suggested Sampling Procedures to Determine Lead in Drinking Water in Buildings Other Than Single Family Homes

June 1988

Office of Drinking Water
401 M. Street S.W.
Washington, D.C. 20460

Suggested Sampling Procedures to Determine Lead in Drinking Water in Buildings Other Than Single Family Homes.

PURPOSE

This guidance is to be used to determine the levels and sources of lead in drinking water in buildings other than single family homes. A separate sampling protocol to determine the lead level in drinking water in single family homes has also been prepared by the Environmental Protection Agency (EPA), and is available upon request. The methods outlined in this sampling protocol are similar to the sampling procedures used by water suppliers to determine compliance with the requirements of the Safe Drinking Water Act (SDWA). However, this guidance is not to be used for the purpose of determining whether a supplier meets the Federal standards. This sampling protocol is designed to identify the sources of lead in drinking water and to assist in the evaluation of potential remedies.

This protocol has been field tested and found to provide results which are generally reliable. Experience in the laboratory and in the field indicates that lead levels observed in drinking water at a particular sample site may vary over time. This may affect the repeatibility of the analytical results of samples taken at various times from the same sample site. However, in instances where lead levels significantly above 20 parts per billion (ppb) are encountered, the results of repeat analyses indicate that, in general, lead levels will continue to stay above 20 ppb in subsequent samples taken from the same site. Conversely, similar trends are observed in instances where lead levels significantly below 20 ppb are encountered. Therefore, in general, variations of lead levels in the water are not expected to significantly influence the outcome of the conclusions that may be drawn regarding the source of the lead in the drinking water. EPA requests your comments on this protocol, particularly if you determine ways to improve it to better detect or track down sources of high lead levels in drinking water.

EPA recommends that the sampling program be done in two steps. The first step involves the collection and analysis of screening samples from drinking water outlets within the building. The purpose of this first step is to identify the outlets which

provide drinking water with lead levels of concern. The second step of the process involves the collection and analysis of follow-up samples from outlets where lead levels of concern have been identified and, if necessary, additional samples from the interior plumbing within the building. The purpose of the follow-up samples is to pinpoint the sources of lead in the drinking water. Once the sources of contamination are known, appropriate remedial actions toward their elimination may be taken.

EPA recommends that establishment of sample sites be prioritized on the basis of likelihood of contamination of the drinking water by lead and the sensitivity of the consumer towards lead. In general, the larger the number of samples collected and analyzed, the better the assessment of the source and extent of the presence of lead in drinking water. Sample sites which are most likely to have lead contamination include: 1) areas of low flow and/or infrequent use (where long contact time between the water and the plumbing occurs); 2) areas of recent construction and repair with lead solder or materials containing lead; 3) areas where the plumbing is used to ground electrical circuits and; 4) areas where corrosive water having low pH and alkalinity is distributed. The special sensitivity of infants, children and pregnant women towards lead means that sampling for lead in drinking water should be most extensive in newly constructed schools and child care centers.

If results of analyses of samples taken from the selected sites indicate extensive contamination of the drinking water by lead, additional sampling from other sites deemed less vulnerable to lead contamination may be indicated.

INTRODUCTION

In general, elevated lead levels do not occur in drinking water that is delivered from water supplies via distribution mains to buildings. Lead levels in the drinking water delivered from the main seldom exceed 5 ppb. The primary source of lead is the corrosion of service connections and of the pipes, fixtures and other parts of plumbing systems which distribute the water within the buildings.

The extent of lead contamination in the water supplied to a building is affected by a number of factors including: the corrosivity of the water; the amount of lead contained in the plumbing, the faucets, or apparatus dispensing the water; the contact time of the water with materials containing lead; and whether or not electrical systems are grounded to the water pipes.

Because of the variability of flow rates and materials used in a building's plumbing, lead contamination in the drinking water will not occur uniformly throughout a facility. Large variations in lead levels in the drinking water may be observed among individual outlets in a building where the sources of contamination differ. In instances where the source of the contamination is at the beginning of the distribution system, such as from lead service connections, high lead levels in the drinking water may be widespread throughout the plumbing of the building. High lead levels in the drinking water may also be found in sections of the distribution system where the water is infrequently used.

GENERAL CONSIDERATIONS

In order to determine, with a minimum number of samples, whether water in a particular building contains a high amount of lead, approach the task systematically. Prior to sampling, study the layout of the plumbing system of the building. Locate service intakes, headers, laterals, fixture supply pipes, drinking water fountains, central chiller units, storage tanks, riser pipes and different drinking water loops. Examples of various plumbing configurations in buildings are illustrated in the attached diagrams.

Ultimately the number of samples taken from a building is dependent upon the size of the building, the number of outlets used to supply drinking water, and the extent of the contamination. More outlets with elevated lead levels will require correspondingly more follow-up samples to pinpoint the source of contamination.

Owners of offices or businesses leasing only part of a building or shopping center will sample the potable water outlets only within the premises they occupy. In that case, additional sampling may not be necessary if the source of the contamination is limited to the fixtures and the plumbing connections to the fixture supply pipes within the rental unit. However, if the results of the analyses indicate that the source of the contamination is not limited to the plumbing within the premises, additional follow-up sampling in the building may be necessary to pinpoint the location of the sources of lead in the drinking water.

EPA recommends that one collect and analyze samples in two steps, especially in large buildings where the number of samples to be taken is large. In the first step, the initial sampling should be done at the outlets such as faucets and

fountains used for drinking water. This initial round of collection and analysis of screening samples will pinpoint the location of sites which provide water having lead levels of concern. EPA recommends that action be taken to limit exposure or reduce lead in water supplies in instances where the lead levels exceed 20 parts per billion (ppb). [Note: ppb is often expressed as micrograms per liter (ug/L)]. In instances where the lead levels exceed 50 ppb, EPA recommends that the drinking water fountain or the tap be taken out of service immediately until remedial action is taken to remove the contamination. Such remedial actions may include setting up a program to flush the water, implementing treatment to reduce the corrosivity of the water, eliminating the sources of lead from the plumbing system or reducing other causes of lead contamination such as eliminating grounding of electrical systems on water pipes. Lead levels in drinking water at schools and day care centers should be kept at the minimum since children exposed to lead are at greater health risk than adults.

In the second step of the sampling program, follow-up samples need only be taken from sites where the analytical results indicate levels of concern in the drinking water. The purpose of the follow-up samples is to pinpoint the source of lead contamination and to facilitate plans for appropriate remedial action.

Ultimately, the choice to perform the sampling in one or two steps is up to the personnel performing the sampling. For small facilities with relatively few sites to be sampled, it may be feasible to perform all of the sampling at once. A flow chart outlining the overall general sampling strategy is attached.

LABORATORY ANALYSIS AND HANDLING OF SAMPLE CONTAINERS

The water samples collected should be analyzed by a State-certified laboratory which uses EPA approved methods. Contact your local water utility or your State or local health department for information and assistance. In some instances, these authorities will test your water samples for you. If not, they can refer you to a qualified laboratory. Discuss the proposed sampling procedures with the laboratory or State agency who will perform the analyses of the samples.

The laboratory should provide you with a sufficient number of appropriate sample containers. Make sure that you follow the instructions provided for handling the sample containers carefully. Failure to follow the instructions may result in

erroneous sample results. Do not rinse the sample containers before filling. The laboratory has prepared the container to receive the samples you will take and it may contain a chemical needed to preserve the samples properly until they reach the laboratory. Avoid any contact with this chemical. Be careful not to overfill the sampling containers with water.

SUGGESTED SAMPLING PROCEDURES

The sampling procedures outlined here may be used to determine the source of lead in water obtained from specific components that are used to distribute, process, store and provide drinking water in buildings and public facilities. These include water fountains, faucets, central chiller units, internal plumbing and service connections. Comparison of the analytical results of the samples collected will provide information on the presence and distribution of sources of lead contamination in a building or a public facility.

Collect the samples before the facility is open for business and before any water is used. Ideally the water should sit in the pipes unused for at least 8 hours, but not more than 18 hours before the sample is taken. Make sure that no water is withdrawn from the taps or fountains from which the samples are to be collected prior to sampling. Samples collected from the designated sites after they have been used will show erroneous results indicating lower lead levels in the water than may be actually encountered. Samples collected in the morning after vacations, weekends or holidays will contain higher lead levels than the samples collected after allowing water to be in contact with the plumbing for 8 to 18 hours. If the facility is open continously, collect the samples immediately after the period during which water consumption is the lowest. Label all of the sample bottles with the location of the sample site. Also note the manufacturer's name and model number of water fountains, central chillers and any other water dispensing outlets from which samples are taken.

SECTION I - Drinking fountains

There are four main types of drinking water fountain systems. They include the following configurations:

1. Water is supplied to the drinking fountain directly from the building plumbing. This type of fountain is often called a bubbler.

2. A central chiller unit cools water for a number of drinking fountains (bubblers) in the building.

3. The water fountain is equipped with its own cooling system. This type of water fountain is often called a water cooler. The water to the cooler is supplied from the building plumbing.

4. Water to the drinking fountain is supplied from bottled water. This type of water fountain is often called a bottled water dispenser.

SAMPLING PROCEDURES

Note: Do not close the valves to the water fountains to prevent their use. Minute amounts of scrapings from the valves will result in erroneous results indicating higher than actual lead levels in the water. Take all samples with the taps fully open.

1. Bubblers without central chiller.

All samples should contain 250 mL of water.

Initial screening sample (number 1A):

Take this sample before the facility is open for business and before any water is used. Collect it immediately after opening the faucet without allowing any water to waste prior to sampling.

This water sample consists of water that has been in contact with the bubbler valve and fittings and the section of plumbing closest to the outlet of the unit. It is representative of the water that may be consumed at the beginning of the day or after infrequent use.

Follow-up samples should be taken from those water fountains where the results of analysis indicate elevated lead levels in excess of 20 ppb.

Follow-up sample (number 2A):

Let the water run from the fountain for 30 seconds before collecting the water sample. This water sample represents the water that is in the plumbing upstream from the bubbler.

Interpretation of the results:

In order to determine the source of lead in the water, compare the results of the analyses of samples 1A and 2A.

1. If the comparison of the analytical results indicates that:

- lead levels in sample 1A are higher than in follow-up sample 2A, a portion of lead in the drinking water is from the bubbler.

- the lead level in sample 2A is identical or close to the lead level observed in sample 1A, the majority or all of the lead in the drinking water may be from the plumbing upstream from the bubbler. EPA recommends additional sampling from the distribution system supplying water to the lateral to locate the source of contamination. Refer to the sections entitled, Interior Plumbing and Service Connections.

- the lead level in sample 2A is very low (close to 5ppb), very little lead is picked up from the plumbing upstream from the outlet. The majority or all of the lead in the water is from the bubbler.

2. Bubblers supplied with water from central chiller.

All samples should contain 250 mL unless otherwise specified.

Initial screening sample (number 1B):

Take this sample before the facility is open for buisness and before any water is used. Collect it immediately after opening the faucet without allowing any water to waste prior to sampling.

This sample consists of water that has been in contact with the bubbler valve, the fittings, and the section of plumbing attached to the unit. This water sample is representative of the water that is consumed at the beginning of the day or after infrequent use.

Follow-up samples should be taken from those bubblers where the analysis indicates lead levels in excess of 20 ppb.

Follow-up sample (number 2B):

Let the water run from the fountain for 30 seconds before collecting the water sample. This water sample represents the water that is in the plumbing supplying the water from the chiller to the bubbler.

Interpretation of the results:

In order to determine the source of lead in the water, compare the results of the analyses of samples 1B and 2B. If comparison of the analytical results indicates that:

- the lead level in sample 1B is higher than in sample 2B, a portion of lead is from the water fountain.

- the lead level in sample 1B is identical or close to the lead level observed in sample 2B, the majority or all of the lead in the drinking water may be contributed from the lateral plumbing supplying the water from the chiller, and from the plumbing supplying water to the chiller. EPA recommends additional sampling (samples 3B and 4B) from the chiller unit supplying water to the lateral to locate the source of contamination.

- the lead level in sample 2B is very low (close to 5ppb), very little lead is picked up from the plumbing upstream from the outlet. The majority or all of the lead in the water is contributed from the bubbler.

Central Chiller Unit

Follow-up sample (number 3B):

Take this sample from the plumbing which supplies water to the chiller. Take the sample from a tap or valve as close to the inlet of the chiller as possible. Collect this sample immediately after opening the faucet without allowing any water to waste. This water sample represents water that has been in contact with the plumbing upstream from the chiller.

Follow-up sample (number 4B):

Take this sample from as close to the outlet of the chiller as possible. Collect it immediately after opening the faucet or valve without allowing any water to waste. This water sample

consists of water that has been in contact with the chiller unit and the plumbing upstream which supplies water to the chiller. Often, water supplied to the bubblers is recirculated to the chiller unit. In this instance, sample 4B consists of a mixture of water from the water supply and recirculated water from the plumbing supplying water to the bubblers.

Interpretation of the results:

If the comparison of the analytical results indicates that:

- the lead level in sample 2B is higher than in sample 4B, lead is contributed from the plumbing supplying the water from the chiller to the water fountain.

- the lead level in sample 4B is greater than the lead level in sample 3B, a portion of the lead in the drinking water may be coming from the chiller.

[Note: If the lead level in sample 3B taken from the supply line (which supplies water from the interior plumbing to the chiller) exceeds 20 ppb, EPA recommends additional sampling from the distribution system supplying water to the chiller to locate the source of contamination. Refer to the section on Interior Plumbing and Service Connection.]

- the lead level in sample 3B taken from the supply line is very low (close to 5ppb), very little lead is picked up from the plumbing upstream from the chiller. The majority or all of the lead in the water may be attributed to the chiller unit.

3. Water Coolers

The two most commonly used types of water coolers are the wall mounted and the free standing. Water in the cooler is stored in a pipe coil or in a reservoir. Refrigerant coils in contact with either of these cool the water. Lead in water in these coolers may come from internal components of the cooler, the section of the pipe connecting the cooler to the lateral, and/or from the interior plumbing.

Note: All samples should contain 250 mL unless otherwise specified.

Initial Screening sample (number 1C):

Take this sample before the facility is open for business and before any water is used. Collect this sample immediately after opening the faucet without allowing any water to waste prior to sampling.

This water sample is representative of water that has been in contact with the bubbler valve, the fittings, the storage unit, the section of plumbing attached to the unit and the interior plumbing. This water sample is also representative of the water that is consumed at the beginning of the day or after infrequent use. Follow-up samples should be taken from those water coolers where the results of analysis indicate lead levels in excess of 20 ppb.

Follow-up sample (number 2C):

Collect this sample after the facility closes at the end of the day. Let the water run from the fountain for 15 minutes, then collect the 250 mL sample. This amount of time is needed to assure that the storage unit of the cooler is thoroughly flushed and no stagnant water, which may contain lead as a result of extended contact time with the plumbing, is left in the storage unit. Make sure that no water is taken from the cooler before follow-up sample 3C is collected next morning.

Follow-up sample (number 3C):

Collect this sample the next morning in the same manner as you collected sample number 1C. Remember, do not allow any water to run prior to sampling. This water sample is representative of the water that was in contact with the cooler overnight.

Interpretation of results:

1. If the comparison of analytical results indicates that:

- the lead level in sample 3C is higher than in sample 2C, the water cooler is contributing lead to the water.

- the lead level in sample 3C is higher than in sample 2C, and the lead level in sample 1C is higher than in sample 3C, both the plumbing upstream from the cooler and the cooler are contributing lead to the water.

2. If the comparison of analytical results indicates that:

- the lead levels in samples 2C and 3C are identical and close to 5 ppb, the water cooler is not a source of lead.

- the lead levels in samples 2C and 3C are identical, close to 5 ppb, and in sample 1C is higher than in sample 3C, the plumbing upstream from the cooler and/or the plumbing connection leading to the cooler are/is contributing lead to the water.

3. If the lead level in sample 2C is in excess of 10 ppb and is equal to or greater than the lead levels observed in samples 1C and 3C, the source of the lead may be sediments contained in the cooler storage tank or in the plumbing upstream from the cooler. To verify the source of lead, take the following steps. First, take a flushed sample from a tap upstream from the cooler or compare sample 2C with the results obtained from follow-up samples taken from outlets upstream from the cooler. If low lead levels are found in these samples (close to 5ppb), the source of lead may be the sediments in the cooler or the plumbing connecting the cooler to the lateral. Second, take follow-up sample 4C, which is outlined below. If the flushed samples from the upstream outlets have lead levels in excess of 5ppb, then the cooler and the upstream plumbing may both contribute lead to the water. To confirm whether the cooler is a source of lead, take and analyze sample 4C.

Follow-up sample (number 4C):

Turn off the valve leading into the cooler. Disconnect the cooler from the plumbing and look for a screen at the inlet. Remove the screen. If there is debris present, check for the presence of lead solder in the debris by forwarding a sample to the laboratory for analysis. Some coolers also have a screen installed at their bubbler outlet. Carefully remove the bubbler outlet by unscrewing it and check for the presence of a screen and for debris. If there is debris present, forward a sample to the laboratory for analysis. Collect sample 4C from the disconnected plumbing outlet in the same manner as you collected sample number 1C. Compare the analytical results obtained from this sample (number 4C) with the results obtained from the other samples. Some coolers are equipped with a drain valve at the bottom of the water reservoir. In this case, a sample from the bottom of the water reservoir should also be taken and analysed for the presence of lead. Check for the presence of debris in this water.

Interpretation of Results

- If the lead level in sample 4C is close to 5 ppb, then the lead is from sediments in the cooler or the screen.

- If the lead level in sample 4C is close to the lead level in sample 2C, then the source of lead is from the plumbing or materials in the distribution system located upstream from the cooler.

- If the lead level in sample 4C is significantly greater than 5 ppb but less than the lead level in sample 2C, the source of lead is from the cooler and in the plumbing upstream from the cooler.

4. Bottled Water Dispensers

All samples should contain 250 mL unless otherwise specified.

Initial screening sample (number 1D):

Take this sample before the facility is open for business and before any water is used. Collect it immediately after opening the faucet without allowing any water to waste prior to sampling. This water sample consists of water that has been in contact with the dispenser valve and the fittings incorporated to the outlet of the unit. It is representative of the water that is consumed at the beginning of the day or after infrequent use.

Follow-up sample (number 2D):

If analysis indicates that the initial screening sample (number 1D) contains lead levels in excess of 20 ppb, collect a water sample directly from the bottle supplying the water to the unit to determine the source of lead in the water. If the lead level in sample 1D is higher than in sample 2D, contribution of lead to the water from the dispenser unit may be suspect.

Note: The present regulatory requirements specify 50 ppb as the maximum contaminant level for lead. Therefore, at the present time, lead levels in the water of up to 50 ppb are legally acceptable. However, EPA does not recommend drinking any water containing lead levels above 20 ppb.

Section II - Ice making machines.

All samples should contain 250 mL unless otherwise specified.

Initial screening sample (number 1E):

Fill a suitable container (250 mL or larger, wide mouthed bottle or Whirl-Pak TM) prepared by the laboratory at least three quarters full of ice. Do not touch the ice with your hands. Use the non-metal scoop or disposable plastic gloves provided by the laboratory.

If the analytical results indicate high lead levels in the samples taken from the ice making machine, take an additional sample (number 2E) to ascertain whether the source of the lead in the water is in the plumbing or in the ice making machine.

Follow-up sample (number 2E):

Disconnect the icemaker from the plumbing and look for a screen at the inlet. Remove the screen. If there is debris present, check for the presence of lead solder in the debris visually and by forwarding a sample for analysis to the laboratory. Collect a sample from the plumbing as close to the ice maker as possible.

Interpretation of results:

If comparison of analytical results indicate that:

- the lead level in sample 2E is close to 5ppb, the source of lead is in the ice making machine.

- the lead level in sample 2E is identical or close to that of sample 1E, the source of lead is in the plumbing upstream from the icemaker. If the lead level in sample 2E exceeds 20 ppb, additional sampling from the distribution system supplying water to the ice making machine is recommended to locate the source of contamination. Refer to the section on Interior Plumbing.

Section III - Water faucets

All samples should contain 250 mL unless otherwise specified.

Initial screening sample (number 1F):

Collect this sample immediately after opening the faucet. Do not allow any water to run into the sink prior to sampling. This water sample represents the water that has been standing in the faucet and the plumbing connection to the lateral during the night or during infrequent use.

Follow-up samples should be taken from all water faucets whose samples contained lead levels in excess of 20 ppb.

Follow-up sample (number 2F):

Let the water run from the faucet for 30 seconds before collecting the water sample. This water sample represents the water that is in the lateral plumbing.

Interpretation of the results:

In order to determine the source of lead in the water, compare the results of the analyses of samples 1F and 2F.

1. If the comparison of the analytical results indicates that:

- the lead levels in sample 1F is higher than in sample 2F, the source of lead is the water faucet and/or the plumbing connection to the lateral.

- the lead level in sample 2F is identical or close to the lead level observed in sample 1F, the majority or all of the lead in the drinking water may be attributed to the lateral plumbing. EPA recommends additional sampling from the distribution system supplying water to the lateral to locate the source of contamination. Refer to the section entitled Interior Plumbing and Service Connections.

- the lead level in sample 2F is very low (close to 5 ppb), very little lead is picked up from the plumbing upstream from the faucet. The majority or all of the lead in the water is contributed from the faucet and/or the plumbing connection to the lateral.

Section IV - Interior Plumbing

The configuration of the interior plumbing can vary depending on the layout of the building. See the attached diagrams for an example. In high-rise buildings, the water is elevated to the floors by one or more riser feed pipes. Water supply distribution from the riser feed pipes is usually achieved through several different drinking water loops. In addition, in some buildings water may be stored in a tank prior to distribution. In single story buildings, the water goes from the service connection via main plumbing branches (often called headers). The headers, in turn, supply water to the laterals. Water is supplied to the faucets, drinking fountains, and other outlets through smaller plumbing connections from the laterals and loops.

In general, if lead levels above 20 ppb are encountered in the follow-up samples taken from the drinking water outlets, additional samples from designated sample sites in the interior plumbing should be taken. The sampling should proceed systematically upstream from the initial follow-up sample sites, isolating sections of the interior plumbing suspected to be contributors to lead in drinking water. Comparison of analytical results obtained from the designated sample sites and the analytical results already available should provide information about the sources of lead in from the interior plumbing of the building.

1. Laterals

All samples should contain 250 mL unless otherwise specified.

Sample number 1G:

Open the tap that has been designated as the sample site for the collection of the water from the lateral pipe. Let the water run for 30 seconds before collecting the sample. The purpose of flushing the water is to clear the plumbing between the sample site and the lateral pipe. This will assure the collection of a representative sample.

Note: Sample 1G is identical to follow-up samples taken from other outlets such as 2A, 2E, and 2F. Results of analysis of follow-up samples from outlets upstream and downstream from sample site 1G may provide additional information about the source of lead in the water in portions of the lateral which are upstream and downstream from sample site 1G.

Interpretation of results:

If lead levels above 20 ppb are encountered, collect additional samples from the plumbing upstream (the service line, the riser pipe, the loop or header supplying water to the lateral). High lead levels may also be caused by recent repairs, by additions using lead solders, and by particulate matter and debris in the pipe (particulate matter will adsorb lead from the water). Debris in the plumbing is most likely to be found in areas of infrequent use. A sample of this debris should be forwarded to the laboratory for analysis of lead content.

If the comparison of analytical results indicates that:

- the lead level in sample 1G is equal to the lead level in a sample taken downstream from sample site 1G, the lead is contributed from the the lateral or from interior plumbing upstream from the lateral. Possible sources of lead may be from loop, header, riser pipe or service connection.

- the lead level in sample 1G is close or equal to 5ppb, neither the portion of the lateral upstream from sample site 1G nor the interior plumbing supplying water to the lateral is contributing lead to the drinking water.

- the lead level in sample 1G significantly exceeds 5ppb (for example 10ppb), and is less than the lead level in a sample taken downstream from sample site 1G, the source of a portion of the lead is downstream from the sample site.

2. Loops and/or headers

Because of different use patterns in various locations within a building, EPA recommends that water samples from each individual loop and/or headers be collected. Experience indicates that construction materials may vary among loops. This may be especially true in larger facilities and high-rise buildings where subsequent additions and repairs have been made.

All samples should contain 250 mL unless otherwise specified.

Sample number 1H (header) or sample 1I (loop):

Locate the sampling point which is furthest from the service connection or a riser pipe on a floor. Open the faucet and let it run for 30 seconds before collecting this sample. The purpose of flushing the water is to clear the faucet and plumbing between the sample site and the loop and/or header pipe, thus assuring the collection of a representative sample.

Interpretation of results:

If lead levels above 20 ppb are encountered, collect additional samples from the plumbing upstream that supplies water to the loop or header. High lead levels may also be caused by recent repairs, by additions using lead solders, and by particulate matter and debris in the pipe (particulate matter will adsorb lead from the water). Debris in the plumbing is most likely to be found in areas of infrequent use. A sample of this debris should be forwarded to the laboratory for analysis of lead content.

If the comparison of analytical results indicates that:

- the lead level in sample 1H (or 1I) is equal to the lead level in a sample taken downstream from sample site 1H (or 1I), the source of lead is the header (or the loop) or the interior plumbing upstream from the header (or from the loop). Possible sources of lead may be the loop, header, riser pipe or service connection.

- the lead level in sample 1H (or 1I) is close or equal to 5ppb, the portion of the header (or loop) upstream from sample site 1H (or 1L) and the interior plumbing supplying water to the loop or header are not contributing lead to the drinking water. The source of lead is downstream from the sample site.

- the lead level in sample 1H (or 1I) significantly exceeds 5ppb (for example 10ppb), and is less than the lead level in a sample taken downstream from sample site 1H (or 1I), the source of a portion of the lead is downstream from the sample site.

1. Riser pipes

All samples should contain 250 mL unless otherwise specified.

Sample number 1J

Open the tap closest to the riser pipe. Let the water run for 30 seconds before collecting the sample. The purpose of flushing the water is to clear the faucet and plumbing between the sample site and the riser pipe. This will assure the collection of a representative sample.

Interpretation of results:

If lead levels above 20 ppb are encountered, collect additional samples from the plumbing upstream from the riser pipe. High lead levels in the riser pipe may also be caused by recent repairs and by additions using lead solder.

If the results indicate that:

- the lead level in sample 1J is equal to the lead level in a sample taken downstream from sample site 1R, the riser pipe and/or the plumbing and service connection upstream from the riser pipe are the sources of lead.

- the lead level in sample 1J is close or equal to 5ppb, neither the portion of the riser pipe and plumbing upstream from sample site 1R nor the service connection is contributing lead to the drinking water. The source of lead is downstream from the sample site.

- the lead level in sample 1J significantly exceeds 5ppb (for example 10ppb), and is less than the lead level in a sample taken downstream from sample site 1J, a portion of the lead is contributed from downstream of the sample site.

Section V - Service Connections

The service connection is the plumbing connection between the distribution main in the street and the plumbing in the building. In some locations, lead pipes have been used for service connections. This practice has ended only recently. In general, lead pipes up to 2 1/2 inches in diameter have been used for lead service connectors. Other materials used for service connectors include copper, galvanized steel, plastic, and iron. Take the service line sample from the tap closest to the service line. This is especially important in larger facilities where more than one service connection is present.

Collection of Samples

All samples should contain 250 mL unless otherwise specified.

Sample 1K:

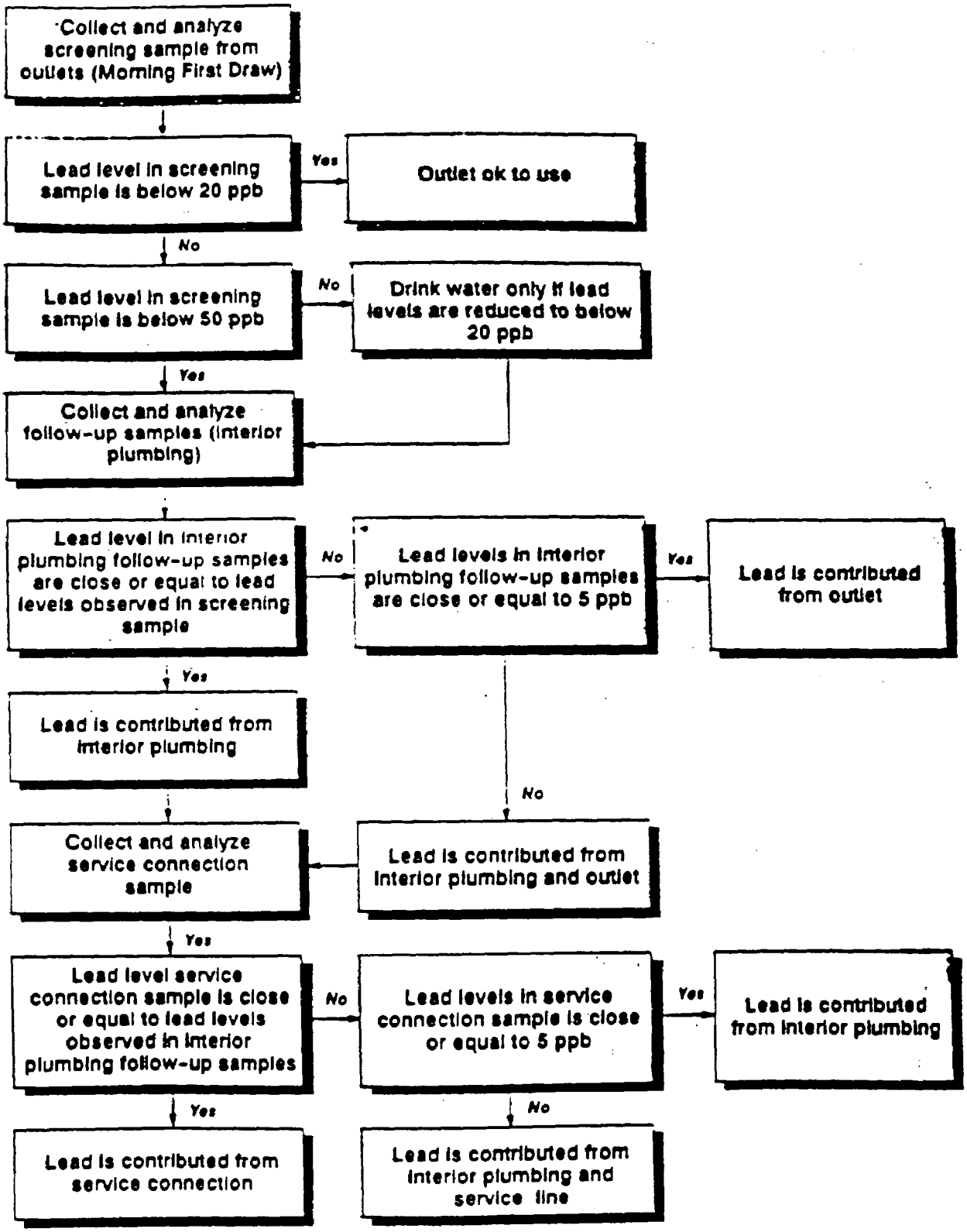
Open the tap closest to the service connection. Let the water run and feel the temperature of the water. As soon as you feel the water change from warm to cold, collect the sample. Since water warms slightly after standing in the interior plumbing, this cold water sample represents the water that had been standing just outside of the building and in contact with the service line.

Interpretation of the results:

- If high lead levels are observed in sample 1K, the service line is most likely made of lead. However, in the absence of a lead service line, lead goosenecks or other appurtenances containing lead in line with the service connection may be the source of contamination. No significant amount of lead above 5 ppb is expected to be contributed from the distribution main. To verify this, an additional sample of the water in the distribution main may be taken by allowing the water to run for three minutes after the first observed temperature change before collecting this sample.

- If the lead level in sample 1G is very low (close to 5 ppb), very little lead is picked up from the service line. The majority or all of the lead levels observed in samples taken from locations in the building indicate that the source of lead is from the interior plumbing and outlets.

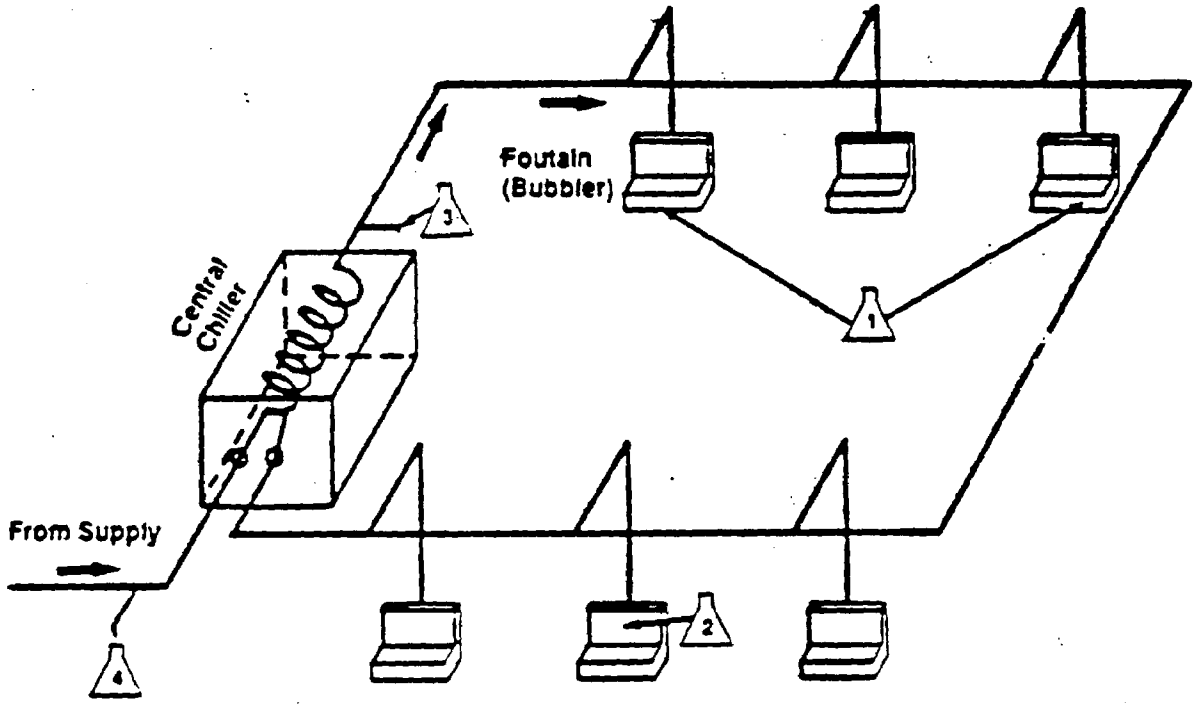
Overall Sampling Strategy



* *Outlet*
- *Drinking Fountain*
- *Bubbler*
- *Faucet*

* *Interior Plumbing*
- *Laterals*
- *Headers*
- *Loops*
- *Plumbing Connections*
- *Riser Pipes*

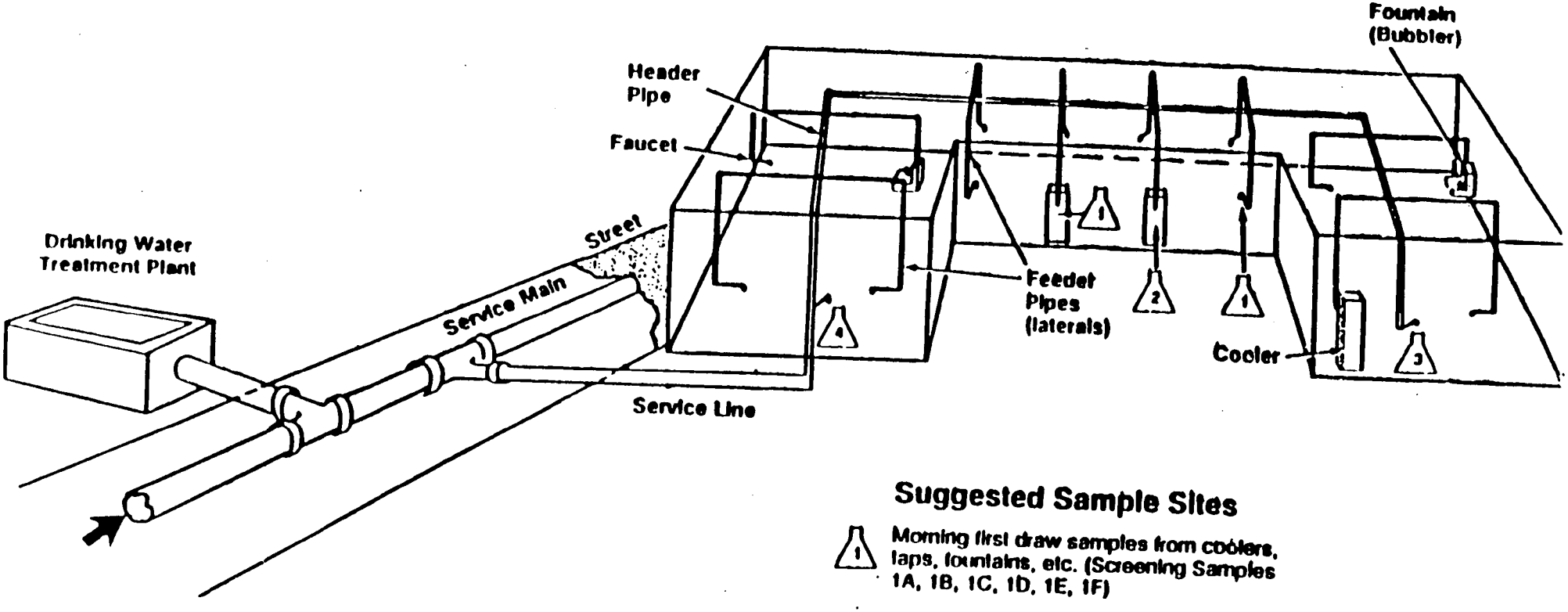
Water Supply to Water Fountain and Bubblers from Central Chiller



Suggested Sample Sites

1. Morning first draw sample from coolers, taps, fountains, etc. (Screening Samples 1B)
2. Sample from lateral or loop from designated outlet (Follow-up Sample 2B)
3. Chiller sample taken from tap closest to chiller outlet (Sample 4B)
4. Interior plumbing sample taken from tap closest to chiller inlet (Sample 3B)

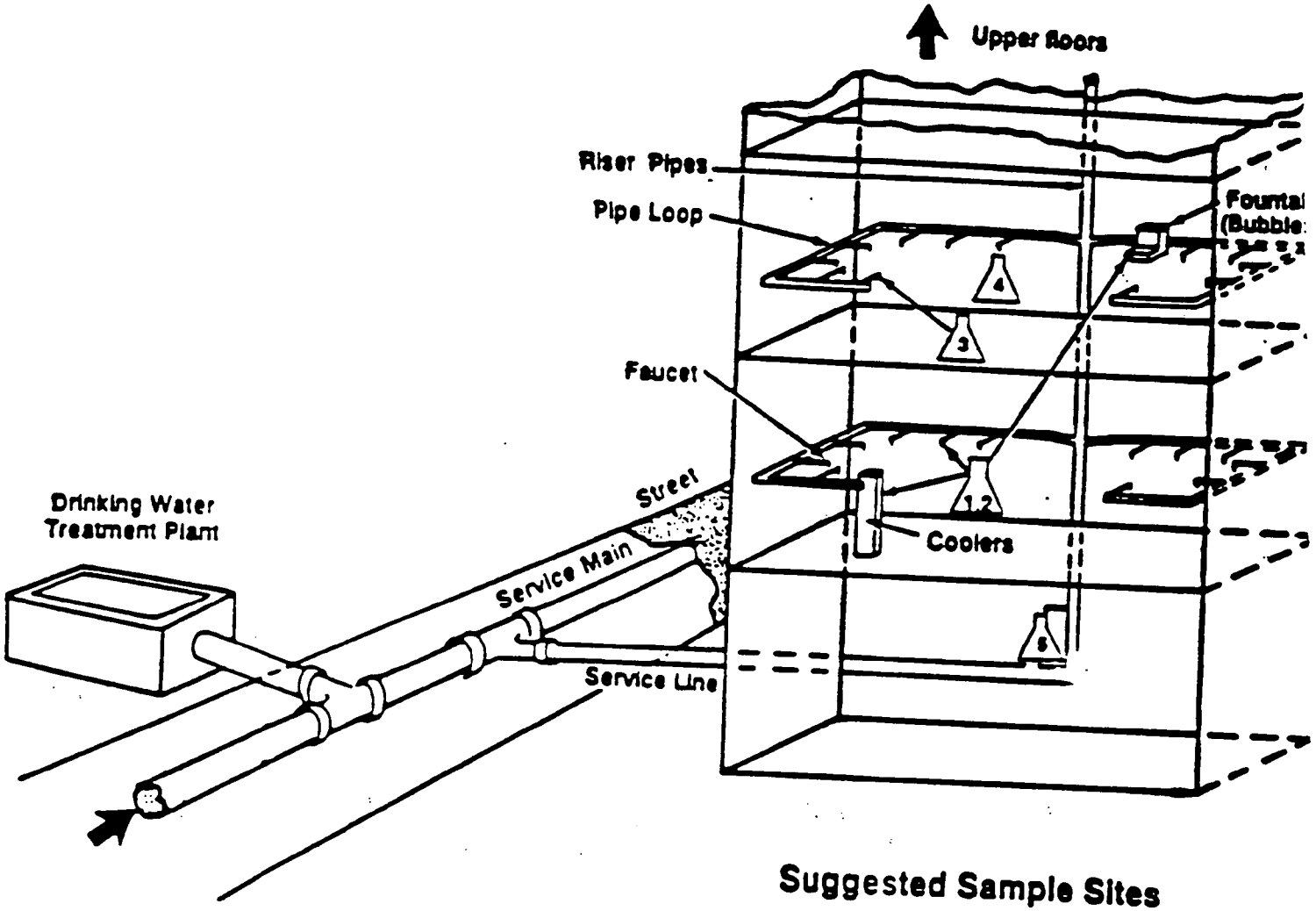
Single-Level Building



Suggested Sample Sites

1. Morning first draw samples from coolers, taps, fountains, etc. (Screening Samples 1A, 1B, 1C, 1D, 1E, 1F)
2. Samples from lateral after 30 second flush from designated outlet (Follow-up Samples 2A, 2E, 2F, 2G)
3. Sample from header pipe taken from tap farthest from service line (Sample 1H)
4. Service Line sample taken from tap closest to service line (Sample 1K)

High Rise Building



Suggested Sample Sites

1. Morning first draw samples from coolers, taps, fountains, etc. (Screening Samples 1A, 1B, 1C, 1D, 1E, 1F)
2. Samples from loop – tap after a 30 second flush from designated outlet (Follow-up Samples 2A, 2E, 2F, 2G)
3. Sample from loop taken from tap farthest from riser pipe (Sample 1I)
4. Riser pipe sample taken from tap closest to riser pipe (Sample 1J)
5. Service Line sample taken from tap closest to service line (Sample 1K)