Section 2 Initial and Follow-Up Sampling by Outlet Type

The protocol for collecting initial and follow-up samples is generally the same for various drinking water outlets, with the exceptions of service connectors, ice makers, and water coolers. The initial and follow-up testing protocol, as well as the interpretation of test results, is described in Exhibits 16 through 22 for the following types of outlets:

- **Service connections**
- **Drinking water fountains** *(four types)*
  - **Bubblers or drinking water fountains (without central chillers):** water is supplied to the bubbler or fountain directly from the building's plumbing.
  - **Bubblers or drinking water fountains (with central chillers):** a central chiller unit cools water for a number of drinking water fountains or bubblers in the building.
  - **Water coolers:** devices are equipped with their own cooling and storage systems; water is supplied to the device from the building's plumbing.
  - **Bottled water dispensers:** type of water fountain whose water is supplied from bottled water.
- **Ice making machines**
- **Water faucets.**

Please note that sampling ID codes have been indicated in the descriptions of the sampling protocol for each outlet type, and they are denoted on the plumbing diagrams that follow in Exhibits 25 and 26 *(see pages 80 and 81)*. These sampling ID codes have been included for illustrative purposes only. When you conduct testing in your facility, you will assign unique numbers for every sample you collect *(see discussion under the general requirements section above)*.

Following the instructions for collecting initial and follow-up samples and for interpreting test results are instructions for conducting sampling of the interior plumbing of buildings (Exhibit 23). Instructions are included for sampling laterals, loops and headers, and riser pipes. These types of samples are necessary if follow-up outlet samples show lead levels above 20 ppb.

Finally, Exhibit 28 gives an overview of the sampling process presented in this guidance manual.

EPA's lead testing protocol for schools and non-residential buildings emphasizes that first-draw or initial samples should be taken from all drinking water outlets. Follow-up samples should then be collected at only those outlets where initial test results revealed lead levels greater than 20 ppb.

Exhibit 16 Service Connection Sampling

Service Connection Sampling

Until recently, lead pipes up to 2 1/2 inches in diameter were used for service connectors in some locations. Other materials used for service connectors include copper, galvanized steel, plastic, and iron. Lead service connectors can produce significant lead levels in your drinking water.

To test water in your service connector, locate the tap **closest to the service connector.** This is especially important for larger facilities where more than one service connection is present.

Sample Collection Procedures:

- **Sample 1S (Service Connection)**

  Take this sample before the facility opens. 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. Because water warms slightly after standing in the interior plumbing, this colder water represents the water that has been standing just outside of the building and in contact with the service connector.

- **Sample 1M (Water Main)**

  This sample is representative of the water that has been standing in the distribution main. It will help pinpoint whether the service connector is the source of any lead. Take the sample from the same location as sample 1S. Let the water run, and feel the temperature of the water. When you feel the water change from warm to cold, allow the water to run an additional 3 minutes and then collect the sample.

Interpreting Test Results:

- **If the lead level of Sample 1S (service connector) significantly exceeds 5 ppb (for example, 10 ppb) and is higher than in sample 1M,** lead is contributed from the service connector. Check for the presence of a lead service connector by scratching it with a knife or key. Lead is soft and dull gray in appearance. When scratched, it will be shiny. In the absence of a lead service connector, lead goosenecks or other materials containing lead in line with the service connection may be the source of the contamination. Usually, no significant amount of lead (above 5 ppb) comes from the distribution main (i.e., water from the public water supplier or private water source).

- **If the lead level of Sample 1M (water main) significantly exceeds 5 ppb (for example, 10 ppb),** lead in the water may be attributed to the source water, sediments in the main, or to lead in the distribution system such as from lead joints used in the installation or repair of cast iron pipes. If the water supplied is from a well, lead may also be getting into the water if the materials of construction of the well pump contain lead alloys.

- **If the lead level of Samples 1S and 1M are very low (close to 5 ppb),** very little lead is being picked up from the service line or the distribution main. If any of your other initial screening samples indicate a problem with lead contamination, the source of that contamination is the interior plumbing and/or outlets themselves (or sediments containing lead that are trapped in the plumbing or on screens). The problem is not the water supply or the service connection.

Examples:

- Sample 1S (20 ppb) exceeds Sample 1M (5 ppb) = 15 ppb of lead is contributed from the service connector; the lead amount in the main (Sample 1M) does not exceed 5 ppb; therefore, you may want to check for a lead service connector or gooseneck depending upon results of lead testing at other outlets in the building; if you reduce lead at the connection, lead levels may be reduced throughout the remainder of the building.

- Sample 1M is 10 ppb and Sample 1S is 10 ppb = very little lead is contributed from the service line; source of lead is most likely the water main.

- Sample 1S (7 ppb) and Sample 1M (6 ppb) are close to 5 ppb = very little lead (1 ppb) is being picked up in the water from the service line or the distribution main; very little lead is contributed from the source water; if other outlets show significantly higher lead levels, the source of the contamination is the interior plumbing and/or the outlets themselves.

For sample locations, see Exhibit 25: Plumbing Diagram for a Single-Level Building and Exhibit 26: Plumbing Diagram for a Multilevel Building.

Exhibit 17 Drinking Water Fountains: Bubblers Without Central Chiller

Drinking Water Fountains: Bubblers Without Central Chiller

Do not close the shut-off valves to the water fountains to prevent their use. Minute amounts of scrapings from the valves will produce inaccurate results showing higher than actual lead levels in the water. Take all samples with the taps fully open.

Sample Collection Procedures:

- **Initial Screening Sample 1A**

This sample is representative of the water that may be consumed at the beginning of the day or after infrequent use. It 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.

Take this sample before the facility opens and before any water is used. Collect the water immediately after opening the valve without allowing any water to run into the drain. Take follow-up samples from those bubblers where test results indicate lead levels over 20 ppb.

- **Follow-Up Sample 2A**

This sample is representative of the water that is in the plumbing upstream from the bubbler (from the bubbler back toward the service connector and the water main). Take this sample before the facility opens and before any water is used. Let the water from the fountain run for 30 seconds before collecting the sample.

Interpreting Test Results:

To determine the source of lead in the water, compare the test results of Samples 1A and 2A.

- **If the lead level in Sample 1A is higher than that in Sample 2A,** a portion of lead in the drinking water is contributed from the bubbler.

- **If the lead level in Sample 2A is very low (close to 5 ppb),** 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.

- **If the lead level in Sample 2A significantly exceeds 5 ppb (for example, 10 ppb),** lead in the drinking water is also contributed from the plumbing upstream from the bubbler.
- **If the lead level in Sample 2A exceeds 20 ppb,** EPA recommends sampling from the header or loop supplying water to the lateral to locate the source of the contamination. *(Sampling instructions for interior plumbing can be found in Exhibit 23.)*

Example 1:

- Sample 1A (31 ppb) exceeds Sample 2A (7 ppb) = 24 ppb of lead is contributed from the bubbler.
- Sample 2A (7 ppb) does not significantly exceed 5 ppb = very little lead (2 ppb) is being picked up from the plumbing upstream from the bubbler; the majority of the lead in the water is contributed from the bubbler.
- Sample 2A (7 ppb) does not exceed 20 ppb = sampling from header or loop supplying water to the lateral is not necessary.
- **Possible Solution:** Replace fixture, valves, or fittings on bubbler with lead-free device (request results of lead leaching tests from distributors or manufacturers of any fixtures you intend to purchase); retest water for lead after new materials installed.

Exhibit 18 Drinking Water Fountains: Bubblers With Central Chiller

Drinking Water Fountains: Bubblers With Central Chiller

> Do not close the valves to the water fountains to prevent their use. Minute amounts of scrapings from the valves will produce inaccurate results showing higher than actual lead levels in the water. Take all samples with the taps fully open.

Sample Collection Procedures:

- **Initial Screening Sample 1B**

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

  Take this sample before the facility opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to run into the drain. Take follow-up samples from those water fountains where test results indicate lead levels over 20 ppb.

- **Follow-Up Sample 2B**

  This sample is representative of the water that is in the plumbing upstream from the bubbler. Take this sample before the facility opens and before any water is used. Let the water from the fountain run for 30 seconds before collecting the sample.

Interpreting Test Results:

To determine the source of lead in the water, compare the test results of Samples 1B and 2B.

- **If the lead level in Sample 1B is higher than that in Sample 2B,** a portion of lead in the drinking water is contributed from the bubbler.
- **If the lead level in Sample 2B is very low (close to 5 ppb),** 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.

- **If the lead level in Sample 2B significantly exceeds 5 ppb (for example, 10 ppb),** lead in the drinking water is also contributed from the plumbing upstream from the bubbler.
- **If the lead level in Sample 2B exceeds 20 ppb,** EPA recommends sampling from the chiller unit supplying water to the lateral to locate the source of the contamination. (See Sample Collection Procedures and Interpretation of Test Results for Central Chiller Unit below.)

Example 1:

- Sample 1B (25 ppb) exceeds Sample 2B (3 ppb) = 22 ppb of lead is contributed from the bubbler.
- Sample 2B (3 ppb) is close to 5 ppb = very little lead (2 ppb) is being picked up from the plumbing upstream from the bubbler; the majority or all of the lead is contributed from the bubbler.
- **Possible Solution:** Replace bubbler valve, fittings and/or fixture with lead-free materials (request results of lead leaching studies from manufacturers of brass products before purchasing to ensure that harmful amounts of lead will not be leached); retest water once new materials installed.

Example 2:

- Sample 1B (38 ppb) exceeds Sample 2B (21 ppb) = 17 ppb of lead is contributed from the bubbler.
- Sample 2B (21 ppb) significantly exceeds 5 ppb = about 21 ppb of lead is being contributed from the plumbing upstream from the bubbler.
- Sample 2B (21 ppb) exceeds 20 ppb = sampling from the chiller unit supplying the water to the lateral is necessary to locate the source of the contamination *(see instructions and examples below for sampling chiller units).*

For sample locations, see Exhibit 27: Water Supply to Water Fountains and Bubblers from Central Chiller.

Sample Collection Procedures—Central Chiller Unit:

- **Follow-Up Sample 3B**

  This sample is representative of water that has been in contact with the plumbing supplying water to the chiller. Take this sample before the facility opens and before any water is used. Take the sample from a tap or valve as close to the inlet of the chiller as possible. Collect the water immediately after opening the tap or valve, without allowing any water to waste.

- **Follow-Up Sample 4B**

  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.

  Take the sample from a tap or valve as close to the outlet of the chiller as possible. Collect the water immediately after opening the tap or valve, without allowing any water to waste.

Interpreting Test Results—Central Chiller Unit:

- **If the lead level in Sample 2B is higher than that in Sample 4B,** lead is contributed from the plumbing supplying the water from the chiller to the bubbler.

- **If the lead level in Sample 4B is higher than in Sample 3B,** a portion of the lead may be coming from the chiller. Note: Sludge and sediments containing high levels of lead may accumulate in chiller tanks. If the test results indicate that lead is contributed from the chiller unit, check for the presence of debris and sludge. Remove any of these materials from the chiller, flush the chiller unit, and resample the water.

- **If the lead level in Sample 3B exceeds 20 ppb,** EPA recommends additional sampling from the distribution system supplying water to the chiller to locate the source of contamination. *(Refer to Exhibit 23 on Sampling Interior Plumbing for testing information.)*

- **If the lead level in Sample 3B is very low (close to 5 ppb),** 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 and the plumbing downstream from the chiller.

Example 1:

- Sample 2B (21 ppb) exceeds Sample 3B (10 ppb) = 11 ppb of lead is contributed from the plumbing supplying the water from the chiller to the bubbler.
- Sample 3B (10 ppb) exceeds Sample 4B (4 ppb) = a portion of the lead (6 ppb) may be coming from the chiller; check for and remove any debris and sludge in the chiller unit; flush the unit, and resample the water.
- Sample 4B (4 ppb) does not exceed 20 ppb = additional sampling from the distribution system supplying water to the chiller is not necessary.
- Sample 4B (4 ppb) is very close to 5 ppb = very little lead is picked up from the plumbing upstream from the chiller; the majority or all of the lead in the water can be attributed to the chiller and the plumbing downstream from the chiller.
- **Possible Solutions:** Flush the chiller unit and plumbing; if lead levels are still high, replace plumbing supplying water from the chiller to the bubbler; replace the bubbler fixture, fittings, and valves with lead-free materials; and/or clean sludge and debris from chiller unit. Retest water for lead once changes have been made.

Example 2:

- Sample 2B (45 ppb) exceeds Sample 4B (28 ppb) = 17 ppb of lead is being contributed from the plumbing supplying water from the chiller to the bubbler.
- Sample 4B (28 ppb) exceeds Sample 3B (21 ppb) = 7 ppb of lead is contributed by the chiller.
- Sample 3B (21 ppb) exceeds 20 ppb = additional sampling from the distribution system supplying water to the chiller is necessary to locate the source of the contamination *(see Exhibit 23 on Sampling Interior Plumbing for instructions)*.
- **Possible Solution:** Flush the chiller unit and plumbing; retest the water. Depending upon the results of testing of the distribution system supplying water to the chiller, possible solutions include replacing upstream plumbing; replacing bubbler fixtures, valves, or fittings with lead-free materials; and flushing the chiller unit outlet and interior plumbing. Retest water for lead after changes have been made.

  For sample locations, see Exhibit 27: Water Supply to Water Fountains and Bubblers from Central Chiller.

Exhibit 19 Drinking Water Fountains: Water Coolers

Drinking Water Fountains: Water Coolers

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

Sample Collection Procedures:

Two types of water coolers are used: the wall-mounted and the free-standing types. Water in these coolers is stored in a pipe coil or in a reservoir. Refrigerant coils in contact with either of these storage units cools the water. Sources of lead in the water may be the internal components of the cooler, including a lead-lined storage unit; the section of the pipe connecting the cooler to the lateral pipe; and/or the interior plumbing of the building.

Prior to testing, check the make and model numbers of your water coolers and compare them to EPA's listing of coolers that have lead parts or lead-lined tanks *(see Appendix C for a summary of the water cooler issues and EPA's list of affected coolers)*. If you have a Halsey Taylor cooler that is on EPA's list of coolers with lead-lined tanks, consult Halsey Taylor for information on their replacement/refund program and associated testing directions. Contact information is provided in Appendix C.

Regardless of whether your water cooler appears on EPA's listing, initial testing should be conducted.

- **Initial Screening Sample 1C**

  This sample is representative of the water that may be consumed at the beginning of the day or after infrequent use. (Although in some areas of infrequent use, the water may not have been used in more than 18 hours, the sample is still representative of the normal water consumption pattern.) The sample consists of water that has been in contact with the interior plumbing, the valve and fittings, the storage unit, and the section of plumbing closest to the outlet of the unit.

  Take this sample before the facility opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to waste. Take follow-up samples from those water coolers whose test results indicate lead levels greater than 20 ppb.

In conducting follow-up testing with water coolers be aware of the following:

- Some water coolers manufactured before 1988 may have storage tanks lined with materials containing lead. You should contact the manufacturer of any water cooler units you have purchased or are planning to purchase for written guarantees that no lead has been used in the unit. *A list of brands and model numbers of coolers that contain lead has been prepared by EPA and is summarized in Appendix C.*

- Sediments and debris containing lead on screens or in the plumbing frequently produce significant lead levels *(see Follow-Up Sample 4C).*

- Lead solder in the plumbing can also contribute to the problem.

- **Follow-Up Sample 2C**

  This water sample is representative of the water that is in contact with the plumbing upstream of the cooler. Take this sample **after the facility closes.** Let the water from the fountain run for 15 minutes before collecting the sample. **You must flush the cooler for 15 minutes to ensure that no stagnant water is left in the storage unit.**

- **Follow-Up Sample 3C**

  Take this sample **before the facility opens** and before any water is used. **This sample must be taken the morning after you collect Follow-Up Sample 2C.** Collect the water immediately after opening the faucet without allowing any water to waste.

  Because the water in the cooler was flushed the previous afternoon, this sample is representative of the water that was in contact with the cooler overnight, not in extended contact with the plumbing upstream. As such, it may differ from Initial Screening Sample 1C.

Interpreting Test Results:

- **If the lead level in Sample 3C is higher than that in Sample 2C,** the water cooler may be contributing lead to the water.

- **If the lead level in Sample 3C is higher than that in Sample 2C AND the lead level in Sample 1C is higher than that in Sample 3C,** the plumbing upstream from the water cooler may also be contributing lead to the water.

- **If the lead level in Sample 3C is identical or close to that of Sample 2C,** the water cooler probably is not contributing lead to the water.

- **If the lead level in Sample 1C is higher than that in Sample 3C AND if the lead levels in Sample 2C and 3C are similar,** the plumbing upstream from the cooler or the plumbing connection leading to the cooler, or both, is contributing lead to the water.

- **If the lead level in Sample 2C is in excess of 10 ppb and is equal to or greater than the lead levels in Samples 1C and 3C,** the source of the lead may be sediments contained in the cooler storage tank, screens, or the plumbing upstream from the cooler.

Sample Collection Procedures—Additional Water Cooler Testing

- To verify the source of lead, take the following steps:

  (1) Take a 30-second flushed sample from a tap upstream from the cooler or compare Sample 2C results 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 5 ppb), the source of lead may be sediments in the cooler or the plumbing connecting the cooler to the lateral or lead solder in the plumbing between the taps.

  (2) If the flushed samples from the upstream outlets have lead levels in excess of 5 ppb, then the cooler and the upstream plumbing may both contribute lead to water.

- To confirm whether the cooler is the source of lead, take **Follow-Up Sample 4C.**

  Turn off the valve leading to 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 by sending a sample of the debris to the laboratory for analysis.

  Some coolers also have a screen installed at their **outlet.** Carefully remove the bubbler outlet by unscrewing it. Check for a screen and debris and have a sample of any debris analyzed.

  Some coolers are equipped with a drain valve at the **bottom of the water reservoir.** Water from the bottom of the water reservoir should be sampled and any debris analyzed.

Collect Sample 4C from the disconnected plumbing outlet in the same manner as you collected Sample 1C. Compare the results from Sample 4C to the other sample results.

Interpreting Additional Water Cooler Test Results:

- **If the lead level in Sample 4C is less than 5 ppb,** then lead is coming from the debris in the cooler or the screen.
- **If the lead level in Sample 4C is significantly higher than 5 ppb,** the source of lead is the plumbing upstream from the cooler.

Example 1:

- Sample 1C (54 ppb) = the plumbing upstream from the cooler and/or the water cooler is contributing lead.
- Sample 3C (40 ppb) exceeds Sample 2C (5 ppb) = the water cooler is contributing 35 ppb of lead.
- Sample 3C (40 ppb) exceeds Sample 2C (5 ppb) **and** Sample 1C (54 ppb) exceeds Sample 3C (40 ppb) = the plumbing upstream from the cooler is contributing 14 ppb of lead.
- Sample 2C (5 ppb) is less than 10 ppb and Sample 2C is less than Sample 1C (54 ppb) and Sample 3C (40 ppb) = the source of lead is not sediments contained in the cooler storage tank, screens, or plumbing upstream from the cooler.
- **Possible Solutions:** Replace the cooler with one that contains lead-free components, and retest the water or find an alternative lead-free drinking water source; locate source of lead from plumbing and eliminate it *(routine flushing is not applicable as a potential remedy for water coolers—see discussion of this issue in Section 4 of Part 1 of this guidance document for further information).*

Example 2:

- Sample 3C (42 ppb) exceeds Sample 2C (41 ppb) **and** Sample 1C (44 ppb) exceeds Sample 3C (42 ppb) = the plumbing upstream from the cooler is contributing 2 ppb of lead to the water.
- Sample 3C (42 ppb) is close to Sample 2C (41 ppb) = the water cooler probably is not contributing lead to the water.
- Sample 1C (44 ppb) exceeds Sample 3C (42 ppb) **and** Sample 3C and Sample 2C (41 ppb) are close = the plumbing upstream from the cooler or the plumbing connection to the cooler, or both, is contributing lead to the water.
- Sample 2C (41 ppb) exceeds 10 ppb **and** Sample 2C is less than Sample 1C (44 ppb) and Sample 3C (42 ppb) = source of lead is not likely sediments contained in the cooler storage tank or screens.
- Sample 4C (43 ppb) significantly exceeds 5 ppb = the source of lead is the plumbing upstream from the cooler.
- **Possible Solutions:** Move the cooler to an area in the building where plumbing is free of lead, and retest the water; replace the plumbing upstream from the cooler with lead-free materials, and retest the water; or provide an alternative lead-free water source such as bottled water *(flushing is not applicable as a potential remedy for water coolers—see discussion of this issue in Section 4 of Part 1 of this guidance document for further information).*

  For sample locations, see Exhibit 25: Plumbing Diagram for a Single-Level Building and Exhibit 26: Plumbing Diagram for a Multilevel Building.

Exhibit 20 Drinking Water Fountains: Bottled Water Dispensers

Drinking Water Fountains: Bottled Water Dispensers

Sample Collection Procedures:

- **Initial Screening Sample 1D**

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

  Take this sample before the facility opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to waste. Take follow-up samples from those bottled water dispensers where test results indicate lead levels over 20 ppb.

- **Follow-Up Sample 2D**

  Collect this sample directly from the bottle that supplies the water to the unit. This will enable you to determine the source of lead in the water.

Interpreting Test Results:

- **If the lead level in Sample 1D is higher than that in Sample 2D,** lead may be coming from the dispenser unit.

- **If the lead level in Sample 2D is identical or close to that in Sample 1D,** the source of lead is the bottled water.

Note: Public water systems must ensure that water delivered to customers is minimally corrosive to avoid lead being added to the water as a result of customer plumbing. The FDA, which regulates the interstate sale of bottled water, has proposed a 5 ppb standard for lead in bottled water. This standard is expected to go final in May 1994. EPA recommends that you contact your distributor for written assurance that the bottled water does not exceed Federal and State bottled water standards.

Example 1:

- Sample 1D (23 ppb) exceeds Sample 2D (5 ppb) = 18 ppb of lead is contributed from the dispenser unit.
- **Possible Solution:** Replace dispenser unit with one that is made of lead-free materials and retest.

Example 2:

- Sample 1D (24 ppb) and Sample 2D (23 ppb) are close = the source of lead is the bottled water.
- **Possible Solutions:** Purchase another type of bottled water for which the distributor provides written assurance that lead levels do not exceed Federal and State lead standards, or find other alternative lead-free water source. Retest after any remedy has been employed.

Exhibit 21 Ice Making Machines

Ice Making Machines

Sample Collection Procedures:

- **Initial Screening Sample 1E**

  Fill a suitable container (250 mL or larger, wide-mouthed bottle or Whirlpak 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 lab.

  If the lead level in Sample 1E exceeds 20 ppb, collect a follow-up sample to determine if the source of the lead is the plumbing or the ice making machine itself.

- **Follow-Up Sample 2E**

  Disconnect the ice maker from the plumbing and look for a screen at the inlet. Remove the screen. If debris is present, forward a sample of the debris to the laboratory for analysis. The laboratory will determine whether lead solder is present. If the debris contains lead, the screen should be cleaned routinely.

  Collect the sample from the disconnected plumbing as close to the ice maker as possible. Fill the sample container with 250 mL of water.

Interpreting Test Results:

- **If the lead level in Sample 2E is close to 5 ppb,** the source of the lead in the ice is the ice maker.
- **If the lead level in Sample 2E significantly exceeds 5 ppb (for example, 10 ppb),** lead is also contributed from the plumbing upstream from the ice maker.
- **If the lead level in Sample 2E exceeds 20 ppb,** EPA recommends sampling from the distribution system supplying water to the ice maker. *Refer to Exhibit 23 on Sampling Interior Plumbing for instructions.*

Example 1:

- Sample 1E is 22 ppb and Sample 2E (6 ppb) is close to 5 ppb = source of the lead (16 ppb) is the ice maker.
- **Possible Solutions:** Replace plumbing components in ice maker with lead-free materials; clean debris from plumbing and screen at inlet to ice maker; replace with lead-free ice maker; retest after any remedy has been employed.

Example 2:

- Sample 1E = 22 ppb and Sample 2E (21 ppb) significantly exceeds 5 ppb = lead is contributed from the plumbing upstream from the ice maker.
- Sample 2E (21 ppb) exceeds 20 ppb = sampling from the distribution system supplying water to the ice maker is recommended *(see Exhibit 23 for instructions)*.

Exhibit 22 Water Faucets (Taps)

Water Faucets (Taps)

Sample Collection Procedures:

- **Initial Screening Sample 1F**

  This sample is representative of the water that may be consumed at the beginning of the day or after infrequent use. It consists of water that has been in contact with the fixture and the plumbing connecting the faucet to the lateral pipes.

  Take this sample before the facility opens and before any water is used. Collect the water immediately after opening the faucet without allowing any water to go to waste. Follow-up samples should be taken from those water faucets where test results indicate lead levels over 20 ppb.

- **Follow-Up Sample 2F**

  This sample is representative of the water that is in the plumbing system upstream from the faucet. Take this sample before school opens and before any water is used. Let the water from the faucet run for 30 seconds before collecting the sample.

Interpreting Test Results:

- **If the lead level in Sample 1F is higher than that in Sample 2F,** the source of lead is the water faucet and/or the plumbing upstream from the faucet.

- **If the lead level in Sample 2F is very low, close to 5 ppb,** very little lead is coming from the plumbing upstream from the faucet. The majority or all of the lead in the water is from the faucet and/or the plumbing connecting the faucet to the lateral.

- **If the lead level in Sample 2F significantly exceeds 5 ppb (for example, 10 ppb),** lead may be contributed from the plumbing upstream from the faucet.

Example 1:

- Sample 1F (39 ppb) exceeds Sample 2F (6 ppb) = 33 ppb of lead is contributed from the water faucet.
- Sample 2F (6 ppb) is close to 5 ppb = very little lead is coming from the plumbing upstream from the faucet; the majority of the lead is coming from the faucet and/or the plumbing connecting the faucet to the lateral.
- **Possible Solutions:** Replace faucet with lead-free device (request copies of lead leaching studies from manufacturers of brass faucets and fixtures before purchasing); replace plumbing connecting the faucet to the lateral with lead-free materials; flush outlet and connecting plumbing each day; apply point-of-use device designed to remove lead; find alternative water source such as bottled water or other lead-free location in the building; retest after any remedies are employed.

Example 2:

- Sample 1F (49 ppb) exceeds Sample 2F (25 ppb) = source of lead (24 ppb) is the water faucet and the plumbing upstream from the outlet (25 ppb).
- Sample 2F (25 ppb) significantly exceeds 5 ppb = lead may be contributed from upstream from the faucet; evaluate lead test results conducted upstream from the faucet to ascertain potential contributions of lead from the upstream piping. To pinpoint location test interior plumbing *(see instructions for sampling interior plumbing in Exhibit 23)*.
- **Possible Solutions:** Replace faucet with lead-free device (request copies of lead leaching studies from manufacturers of brass faucets and fixtures before purchasing); replace plumbing connecting faucet to the lateral with lead-free materials; replace suspected portion of interior plumbing with lead-free materials; flush the outlet and interior plumbing each day; apply point-of-use device designed to remove lead; find alternative water source such as bottled water or water from other lead-free location in the building; retest after any remedies are employed.

For sample locations, see Exhibit 25: Plumbing Diagram for a Single-Level Building and Exhibit 26: Plumbing Diagram for a Multilevel Building.

Exhibit 23 Sampling Interior Plumbing

Sampling Interior Plumbing

In general, if lead levels exceed 20 ppb in follow-up samples taken from drinking water outlets, additional samples from designated sample sites in the interior plumbing should be collected. Samples should be taken from laterals, loops and/or headers, and riser pipes. The configuration of interior plumbing will vary depending on the layout of a given building. *See Exhibits 25 and 26 for sample diagrams of the interior plumbing in single-level and multilevel buildings.*

Sampling should proceed systematically upstream from initial follow-up sample sites. The goal of this type of sampling effort is to isolate those sections of the interior plumbing that contribute lead to the water. This is achieved by comparing the results of interior plumbing samples with the results of previously collected outlet samples.

LATERALS

Laterals are the plumbing branches between a fixture or group of fixtures (e.g., taps and water fountains).

Sample Collection Procedures:

- **Sample 1G**

  Open the tap that has been designated as the sample site for the lateral pipe. Let the water run for 30 seconds before collecting the sample. Collect a 250 mL sample. The purpose of flushing the water is to clear the plumbing between the sample site and the lateral pipe. This action will ensure collection of a representative sample.

  Note: Sample 1G corresponds to follow-up samples taken from other outlets such as 2A, 2E and 2F. Compare the results of these samples from outlets upstream and downstream of Sample 1G for additional information on the source of the lead within the interior plumbing.

Interpreting Test Results:

- **If the lead level in Sample 1G exceeds 20 ppb,** collect additional samples from the plumbing upstream (i.e., from the service line, the riser pipe, the loop, or header supplying water to the lateral).

Note: High lead levels may also be caused by recent repairs and additions using lead solders or by sediments and debris in the pipe. Debris in the plumbing is most often found in areas of infrequent use, and a sample should be sent to the laboratory for analysis.

- **If the lead level of Sample 1G is the same as the lead level in a sample taken downstream from Sample Site 1G,** lead is contributed from the lateral or from interior plumbing upstream from the lateral. Possible sources of lead may be the loop, header, riser pipe, or service connection.

- **If the lead level in Sample 1G is very low,** close to 5 ppb, the portion of the lateral upstream from Sample Site 1G and the interior plumbing supplying water to the lateral are not contributing lead to the water.

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

Example:

- Sample 1G (22 ppb) exceeds 20 ppb = collect additional samples from the plumbing upstream to further pinpoint the source of lead (i.e., from the service line, the riser pipe, the loop, or the header supplying water to the lateral); see instructions below for collecting these types of samples.

- Sample 1G (22 ppb) significantly exceeds 5 ppb and is less than downstream site (35 ppb) = a portion of the lead (13 ppb) is contributed downstream from the sample site.

- Sample 1G (22 ppb) is not similar to downstream site (35 ppb) but both exceed 20 ppb = lead is contributed from the lateral or from interior plumbing upstream from the lateral; possible sources of lead may be the loop, header, riser pipe, or service connection; further sampling is necessary.

- **Possible Solution:** Following the collection of additional samples from plumbing upstream to pinpoint sources of lead, replace plumbing with lead-free materials; retest water for lead.

  For sample locations, see Exhibit 25: Plumbing Diagram for a Single-Level Building and Exhibit 26: Plumbing Diagram for a Multilevel Building.

LOOPS AND/OR HEADERS

A loop is a closed circuit of a plumbing branch that supplies water from the riser to a fixture or a group of fixtures. A header is the main pipe in the internal plumbing system of a building. The header supplies water to lateral pipes.

EPA recommends that water samples from each loop and/or header be collected because use patterns may vary among locations within a building. Construction materials may also vary among loops, especially in larger buildings where additions and repairs have been made to the original structure.

Sample Collection Procedures:

- **Sample 1H (header) or 1I (loop)**

  Locate the sampling point furthest from the service connection or riser pipe on the floor. Open the faucet and let it run for 30 seconds before collecting this sample. Fill the sample container with 250 mL of water. 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 ensuring collection of a representative sample.

Interpreting Test Results:

- **If the lead level is over 20 ppb,** collect additional samples from the plumbing upstream supplying water to the loop or header. Compare the sample results with those taken from the service line or the riser pipe that supplies water to the loop and/or header.

  High lead levels may also be caused by recent repairs and additions using lead solders or by sediment and debris in the pipe. Debris in the plumbing is most often found in areas of infrequent use, and a sample should be sent to the lab for analysis. The laboratory will provide instructions on how to package and handle the sediment.

- **If the lead level of Sample 1H or 1I is equal to the lead level in a sample taken downstream from Sample Site 1H or 1I,** the lead is contributed from the head or the loop and from interior plumbing upstream from the header or loop. Possible sources of lead may be the loop, header, riser pipe, or service connection.

- **If the lead level in Sample 1H or 1I is close or equal to 5 ppb,** the portion of the header or loop upstream from Sample Site 1H or 1I and the interior plumbing supplying water to

the header or loop are not contributing lead to the drinking water. The source of lead is downstream from the sample site.

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

Example:

- Sample 1H or 1I (23 ppb) exceeds 20 ppb = collect additional samples from the plumbing upstream supplying water to the loop or header; compare the results with those taken from the service line or the riser pipe that supplies water to the loop and/or header.
- Sample 1H or 1I (23 ppb) significantly exceeds 5 ppb and Sample 1H or 1I is less than downstream site (25 ppb) = a small portion of the lead (2 ppb) is contributed downstream of the sample site.
- **Possible Solution:** Following the collection of additional samples upstream from the header or loop to pinpoint source of lead, replace affected plumbing with lead-free materials; retest water for lead.

For sample locations, see Exhibit 25: Plumbing Diagram for a Single-Level Building and Exhibit 26: Plumbing Diagram for a Multilevel Building.

RISER PIPES

A riser is the vertical pipe that carries water from one floor to another.

Sample Collection Procedures:

- **Sample 1J**

Open the tap closest to the riser pipe. Let the water run for 30 seconds before collecting the sample. Fill the sample container with 250 mL of water. The purpose of flushing the water is to clear the faucet and plumbing between the sample site and the riser pipe. This approach will ensure collection of a representative sample.

Interpreting Test Results:

- **If the lead level in Sample 1J exceeds 20 ppb,** collect additional samples from the plumbing upstream from the riser. High lead levels in the riser pipes may also be caused by recent repairs and additions using lead solder.
- **If the lead level of Sample 1J equals the lead level in a sample taken downstream from Sample Site 1J,** the source of the lead is the riser pipe or the plumbing and service connection upstream from the riser pipe.
- **If the lead level in Sample 1J is close or equal to 5 ppb,** the portion of the riser pipe and plumbing upstream from Sample Site 1J and the service connection are not contributing lead to the water. The source of the lead is downstream of the sample site.
- **If the lead level in Sample 1J significantly exceeds 5 ppb (for example, 10 ppb) and is less than the lead level in a sample taken downstream from Sample Site 1J,** a portion of the lead is contributed downstream from the sample site.

Example:

- Downstream Site is 25 ppb, Service Connection Sample is 4 ppb, and Sample 1J (6 ppb) is less than 20 ppb = additional samples from upstream need not be collected; 21 ppb of lead is contributed from the downstream site.
- Sample 1J (6 ppb) is not equal to downstream site (25 ppb) = source of lead is not the riser pipe or the plumbing and service connection upstream from the riser pipe.
- 1J (6 ppb) is close to 5 ppb = the portion of the riser pipe and plumbing upstream from Sample Site 1J and the service connection are not contributing lead to the water; the source of lead is downstream of the sample site.
- **Possible Solution:** Following the collection of samples from interior plumbing downstream from the riser pipe and the affected outlet to pinpoint the source of lead, replace affected plumbing with lead-free materials; retest water for lead.

For sample locations, see Exhibit 25: Plumbing Diagram for a Single-Level Building and Exhibit 26: Plumbing Diagram for a Multilevel Building.

Exhibit 24 Summary of Samples

Summary of Samples

Initial Screening Samples	*Follow-Up Samples*	*Type of Outlet or Plumbing*
1S	1M	Service Connection to Distribution Main
1A	2A	Bubblers Without Central Chiller
1B	2B	Bubblers With Central Chiller
-	3B, 4B	Central Chiller Unit
1C	2C, 3C, 4C	Water Coolers
1D	2D	Bottled Water Dispensers
1E	2E	Ice Making Machines
	2F	Water Faucets (Taps)
		INTERIOR PLUMBING
-	1G	Laterals
-	1H	Headers
-	1I	Loops
-	1J	Risers

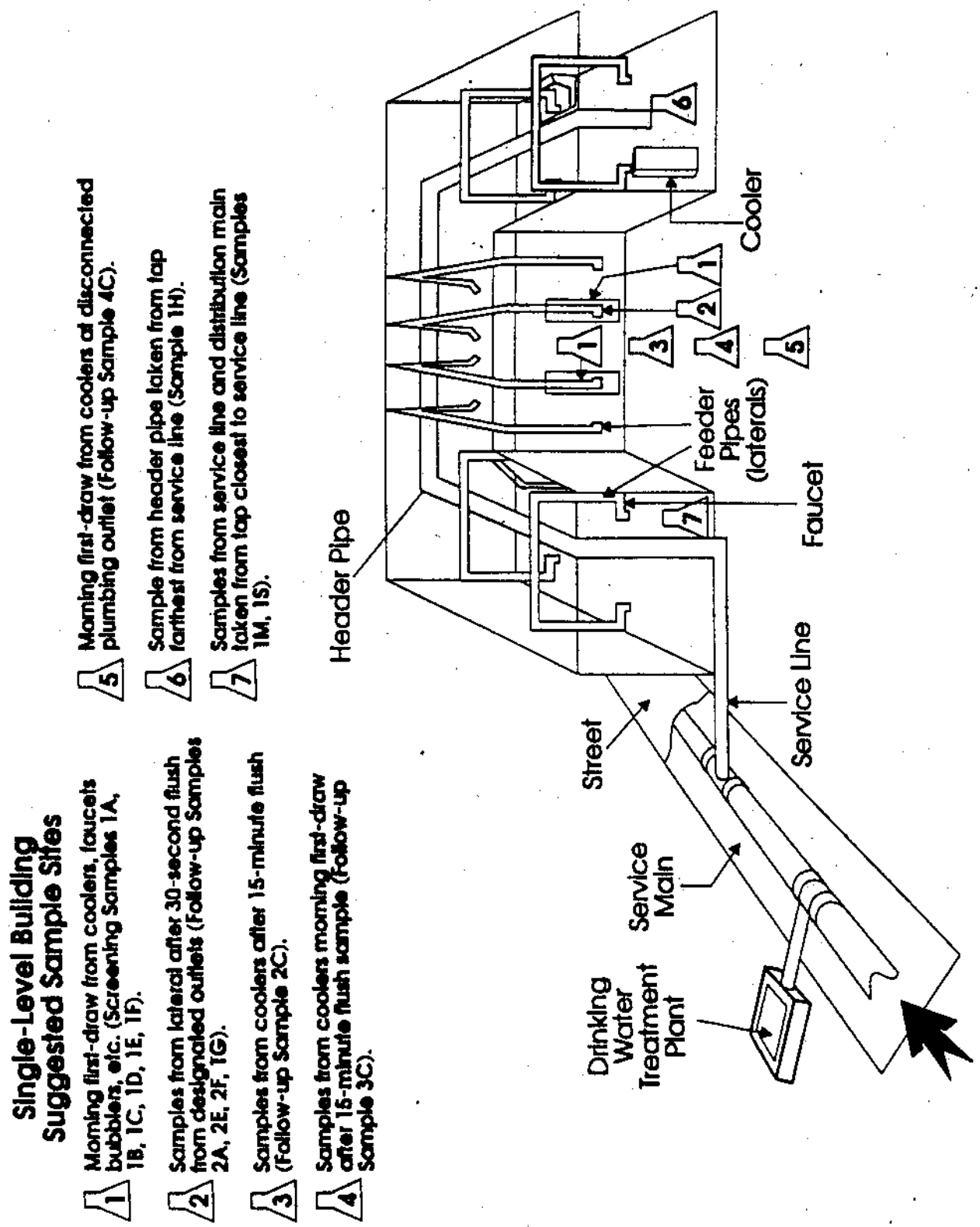

Exhibit 25 Plumbing Diagram for a Single-Level Building

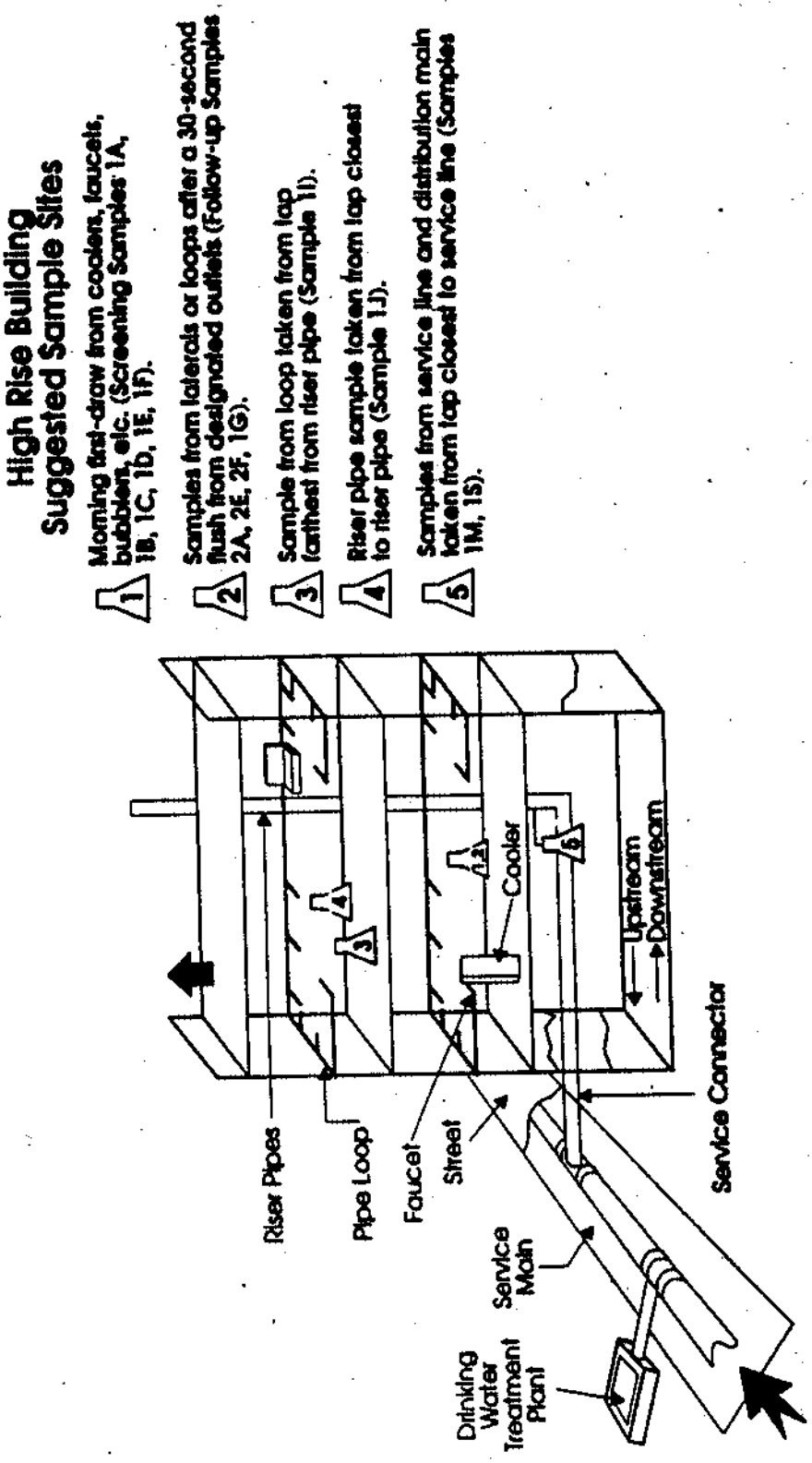

Exhibit 26 Plumbing Diagram for a Multilevel Building

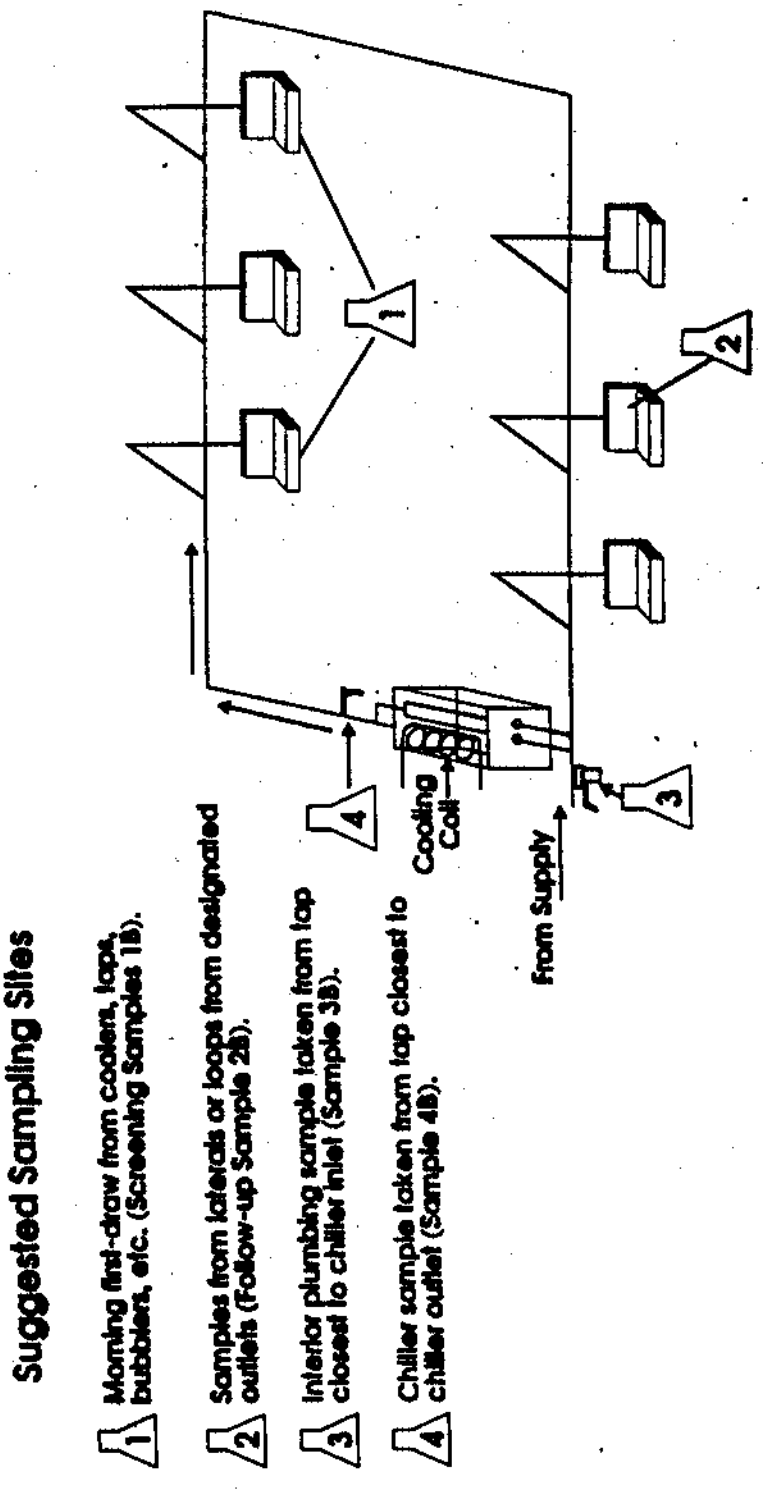

Exhibit 27 Water Supply to Water Fountains and Bubblers from Central Chiller

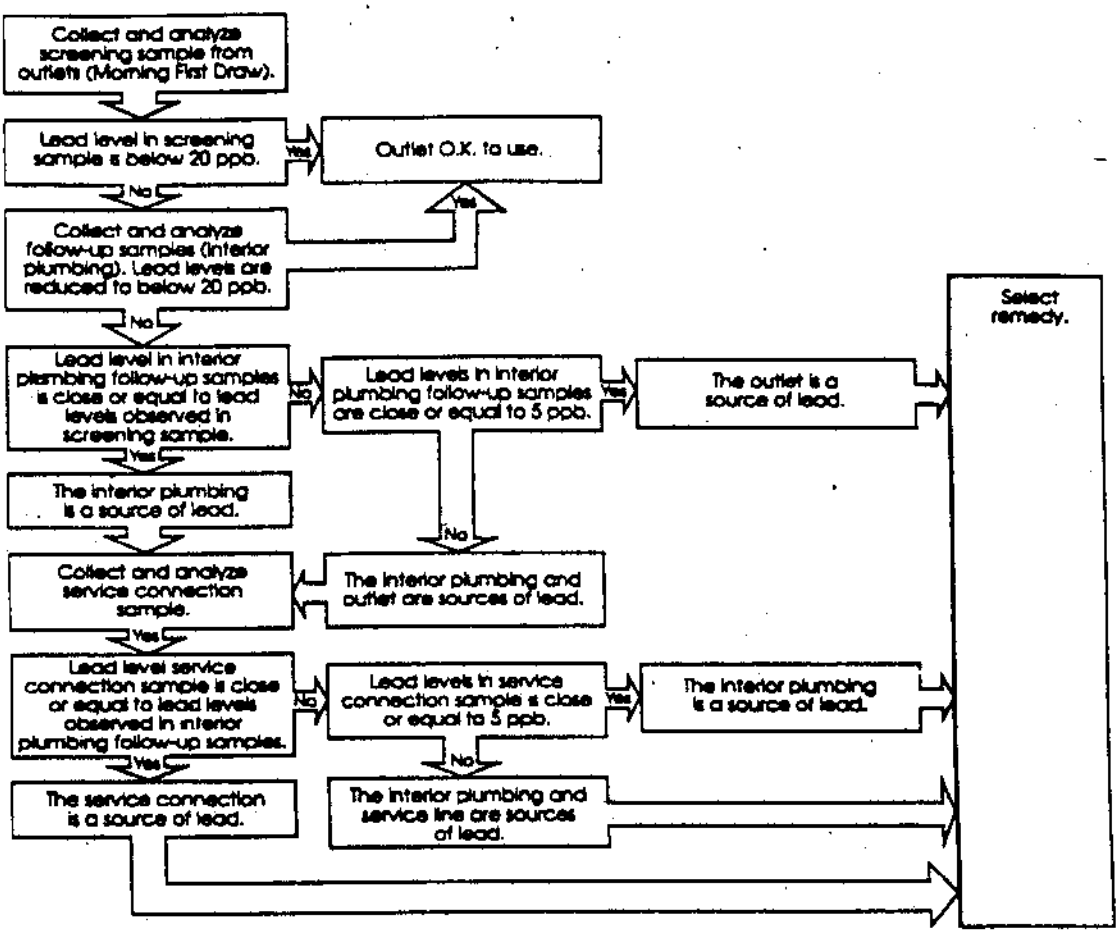

Exhibit 28 Overall Sampling Strategy