MULTI-UNIT RESIDENTIAL BUILDINGS

Tune-Ups for Energy and Water Efficiency

DOMESTIC HOT WATER SYSTEMS

This document is a tool to help reduce energy and water costs and improve comfort in a high-rise residential building through low-cost and no-cost tune-up measures. It is intended for both rental apartment and condominium buildings (multi-unit residential buildings [MURBs]). A comprehensive tune-up can cut energy and water costs by 20%. A comprehensive tune-up would include the building envelope, heating and cooling systems, lighting and appliances, domestic hot water systems and other systems.

This document will:

- *suggest opportunities to tune up systems and equipment—along with more detail as to what the tune-ups involve and whether or not a contractor should be hired;*
- *describe the benefits of tune-up procedures; and*
- *offer some tips on additional actions to consider, including cost-effective retrofit opportunities.*

This document will not:

- *describe in detail how the building is constructed;*
- *replace the operations and maintenance manuals provided by the manufacturers of specific equipment; and*
- *serve as a complete building repair guide or substitute for publications dealing with specific topics (healthy homes, energy efficiency, etc.).*

This document is intended as a guideline only and is not intended to replace professional advice.

Tuning up domestic hot water systems

Most MURBs in Canada have central systems for supplying domestic hot water (DHW). Gas-fired and electric systems make up the majority of these central systems (DHW Type A). In-suite electric water heaters are another type of DHW system found in Canadian MURBs (DHW Type B). Central hot water systems with electric heat are common in some regions (DHW Type C) and oil-fired systems are also found in Atlantic Canada (DHW Type D).

Procedures

Why tune up the DHW system?

DHW uses more energy in a MURB than it does in a typical commercial building. It typically represents the second largest energy consumption in MURBs. Furthermore, many of the procedures for tuning up a DHW system will save water as well as energy, further reducing your operating costs.

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PROCEDURE

1 Tune up gas-fired DHW tank

Description

Tune up a gas-fired tank water heater by testing and improving combustion efficiency and by adding insulation to the tank and distribution piping.

Most of the following tune-ups that involve burners, controls, heat exchangers and venting systems should be done by a qualified contractor. Such tune-ups are described to familiarize property owners and managers, and custodial staff with the opportunities to improve water heating system performance.

Benefits

Benefits of boiler testing include:

- reduced fuel consumption and lower energy costs;
- increased DHW capacity;
- extended life for boilers and heaters;
- reduced time to heat water; and
- cleaner boiler operation for increased reliability.

Benefits of insulation include:

- lower heat loss from DHW pipes and tanks, and therefore lower energy costs;
- reduced water costs, due to less need to run water until pipes warm up;
- improved hot water distribution;
- increased occupant satisfaction; and
- cooler temperatures in boiler rooms.

Implementation

Buildings with centralized domestic hot water systems will have one or more tank-type water heaters. Typically, large buildings will install a number of water heaters rather than a single large one. If they are gas-fired, you can save energy by testing their combustion efficiency and making adjustments to improve it.

Combustion efficiency testing for the water heaters typically found in MURBs is needed to ensure proper operation.

You can also install extra insulation around the tank and distribution piping in many cases. The insulation should last for the life of the system. Replace it if it gets wet or becomes worn.

Boiler service should be undertaken by a qualified tradesperson. Tank insulation should be installed by a professional insulation contractor. Consult the “Where to turn” section of this procedure.

Boiler efficiency checks

Most of these checks require the expertise of a qualified contractor but on-site staff can use this listing to be familiar with the type of service done:

1. *Check fresh air supply.* Air openings to the boiler room from outside must be kept wide open and free of restrictions to air flow. Sufficient fresh air supply is necessary to ensure optimum combustion and efficiency.
2. *Check flue gas venting.* Check that the vent has no obstructions and is in good condition. Proper venting is essential to ensure efficient combustion. Insufficient draft or overdraft promotes hazards and inefficient burning.
3. *Check burner condition.* Dirty burners or burner orifices will cause the boiler output rate and thermal efficiency to decrease.
4. *Check heat transfer surfaces.* Internal and external buildup of soot and scale on the heating surfaces reduces heat transfer efficiency.
5. *Combustion analysis.* Perform a flue gas analysis. (Note: For atmospheric—natural draft—boilers, the gases must be sampled before the draft hood.) The following information is typically obtained and recorded in order to determine boiler combustion efficiency: flue gas temperature and concentrations of O_2, CO, CO_2, inlet fuel pressure; draft pressure and water temperatures entering and leaving the boiler.

Boiler efficiency tune-ups

Task 6 should be undertaken by a qualified contractor. The information is provided to assist building staff in supervising the project.

6. *Tune-ups:* As part of routine maintenance, or if the combustion efficiency determined by the flue gas analysis is less than the boiler manufacturer's recommendation, have one or more of the following corrective actions taken to improve combustion and heat transfer efficiency:
   - **a)** Clean the burners.
   - **b)** Clean the fire side of the heat exchanger.
   - **c)** Descale the water side of the heat exchanger.
   - **d)** For atmospheric (natural draft) boilers, adjust the draft and/or fuel pressure in the manifold.
   - **e)** For forced draft boilers, check and adjust the air and gas flow rates.
   - **f)** Ensure the combustion air grille is clean and that dampers (if installed) are operational and have gaskets in good condition. Clean and lubricate the damper actuator (if installed).

Insulating the tank

7. DHW tanks should be insulated.
8. All insulation should be applied according to the manufacturer's specifications and in compliance with applicable codes and standards.

Insulating distribution piping

9. Distribution piping should be insulated.
10. Give priority to uninsulated piping located in unheated areas such as basements, attics and parking garages. Also give priority to larger pipes.
11. All insulation should be applied according to the manufacturer's specifications and in compliance with applicable codes and regulations.

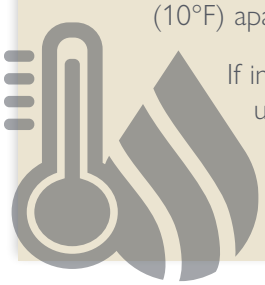
Cautions

- Water heating boiler service must be done by a qualified contractor.
- Combustion air must be provided as specified in the installation code.
- Air shortage problems occur mostly with natural draft boilers.
- Visual inspections should be performed every few months to check for the following undesirable conditions:
  - A soft, lazy yellow flame instead of the normal hard, blue flame
  - Dirty or sooty heat exchanger surfaces
  - Damaged combustion chamber walls
  - Backdrafting
  - Flame roll out
  - Condensation in boiler vent
- Tank insulation and extensive pipe insulation jobs should be done by a professional insulation contractor. Tank and pipe insulation must meet smoke generation and flame spread requirements. Consult with a qualified contractor or local building code authorities.
- Always review provincial building regulations regarding fire safety requirements before applying insulation materials.
- For work conducted in the top floor ceiling, tops of pipe riser shafts should also be plugged and sealed to prevent air movement up the shafts (see the Building Envelope Systems module for further information).

SHORT-CYCLING WATER HEATERS

You may find that your water heaters fire repeatedly for very short periods. This is called short-cycling. This not only uses more energy, but also wears the equipment out faster. Boiler controls always have a differential between the temperature at which the boiler turns on and the temperature at which it turns off. If this is adjustable, it should be set to at least 3°C (5°F) and preferably 6°C (10°F).

If you have multiple water heaters, they should not all have the same firing setpoints. The temperature setpoints should be at least 3°C (5°F) and preferably 6°C (10°F) apart.



If in doubt about how to undertake this procedure, consult your boiler service company or a controls contractor.

Where to turn

Boilers should be serviced by a qualified contractor.

Building maintenance staff members can undertake small pipe insulation jobs themselves, with materials purchased at a building supply store. However, only insulation products meeting flame spread and smoke generation requirements can be used. Consult local building and fire code authorities.

Larger insulation jobs, particularly insulation of the tank itself, should be done by a professional insulation contractor.

PROCEDURE

2 Tune up electric DHW tank heater

Description

Tune up an electric tank water heater by adding insulation to the tank and distribution piping. Individual electric tank water heaters in the suites can also be insulated, the sediment drained, the temperature setting checked, and heat traps installed.

Benefits

- lower heat loss from DHW pipes and tanks, and therefore lower energy costs;
- reduced water costs, due to less need to run water until pipes warm up;
- improved hot water distribution;
- increased occupant satisfaction; and
- cooler temperatures in boiler rooms.

Implementation

Buildings with centralized domestic hot water systems will typically have one or more tank-type water heaters. To reduce losses, you can install extra insulation around the tank and distribution piping in many cases. The insulation should last for the life of the system. Replace it if it gets wet or becomes worn. Tank insulation should be installed by a professional insulation contractor. Consult the "Where to turn" section of this procedure.

Draining the tank to remove sediment

1. With in-suite tanks, sediment can build up in the tank, reducing tank efficiency. Periodically drain the tank completely to reduce sediment buildup. Annual draining is often recommended, but this can be adjusted depending on the amount of sediment that accumulates in the tank. Installing good quality ball valves and removable connectors on the water supply to the tank and the hot water pipe from the tank can make this task much easier. A good quality ball valve on the drain itself is also very helpful as the plastic valves provided with the tank often leak after being opened and closed.

Insulating the tank

2. DHW tanks should be insulated.
3. For uninsulated or partially insulated central hot water tanks, consult a qualified contractor.
4. All insulation should be applied according to the manufacturer's specifications and in compliance with applicable codes and standards.
5. In-suite electric tanks can be retrofitted with additional insulation "blankets" made for such applications.

Insulating distribution piping

6. Distribution piping should be insulated.
7. Give priority to uninsulated piping located in unheated areas such as basements, attics and parking garages. Also give priority to larger pipes.
8. All insulation should be applied according to the manufacturer's specifications and in compliance with applicable codes and regulations.

Cautions

- Tank insulation and extensive pipe insulation jobs should be done by a professional insulation contractor.
- Always review provincial building regulations regarding fire safety requirements before applying insulation materials. Tank and pipe insulation must meet smoke generation and flame spread requirements. Consult with a qualified contractor or local building code authorities.
- For work conducted in the top floor ceiling, tops of pipe riser shafts should also be sealed to prevent air movement up the shafts (see the Building Envelope Systems module for further information).
- Before undertaking any work on an electric water heater, ensure that power is disconnected at the electrical panel. Disconnecting the power before draining is particularly important—the heating elements are likely to burn out if they are allowed to operate without water around them.
- If the existing tank is old and the drain valve has not been opened in several years, it is best not to attempt to drain the tank until it is due for replacement, as corrosion may prevent reclosing the valve. Otherwise, plan to replace the valve as a part of the tune-up.

HEAT TRAPS

For in-suite tanks, where heat traps are not already built into the tank by the manufacturer, these should be added to the hot and cold water service pipes when replacing or servicing a tank. This type of heat trap is a rearrangement of the plumbing to add two horizontal U-bends to each of the two pipes running into the top of the tank. These U-bends (resembling the drain traps found under sinks) force the water to drop and then rise. This prevents the siphoning of hot water out of the tank when it is not in use. These should be at least 15 cm (6 in.) in height. This work must be done by a plumber.

Where to turn

Building maintenance staff members can undertake modest pipe insulation jobs themselves, with materials purchased at a building supply store. Building maintenance staff members can also insulate individual tank water heaters in the suites.

Larger insulation jobs, particularly insulation of the tank itself, should be done by a professional insulation contractor.

PROCEDURE

3 Tune up oil-fired DHW tank heater

Description

Tune up an oil-fired tank water heater by testing and improving combustion efficiency and by adding insulation to the tank and distribution piping.

Most of the following tune-ups that involve burners, controls, heat exchangers and venting systems should be done by a qualified contractor. Such tune-ups are described to familiarize property owners and managers, and custodial staff with the opportunities to improve water heating system performance.

Benefits

Benefits of boiler testing include:

- reduced fuel consumption and lower energy costs. Oil is a dirtier fuel than natural gas and tends to clog burners and coat heat exchangers with soot. Efficiency can drop by as much as 15% in one year;
- increased DHW capacity;
- extended life for boilers and heaters;
- reduced time to heat water; and
- cleaner boiler operation for increased reliability.

Benefits of insulation include:

- lower heat loss from DHW pipes and tanks, and therefore lower energy costs;
- reduced water costs, due to less need to run water until pipes warm up;
- improved hot water distribution;
- increased occupant satisfaction; and
- cooler temperatures in boiler rooms.

Implementation

Buildings with centralized domestic hot water systems will typically have one or more tank-type water heaters. If they are oil-fired, you can save energy by testing their combustion efficiency and making adjustments to improve it. Combustion efficiency testing for the water heaters typically found in MURBs should be done on an annual basis. In between, you should conduct visual checks to confirm that the combustion has not changed.

You can also install extra insulation around the tank and distribution piping in many cases. The insulation should last for the life of the system. Replace it if it gets wet or becomes worn.

Boiler service should be undertaken by a qualified tradesperson. Tank insulation should be installed by a professional insulation contractor. Consult the “Where to turn” section of this procedure.

Boiler efficiency checks

Most of these checks require the expertise of a qualified contractor.

1. *Check fresh air supply.* Air openings to the boiler room from outside must be kept wide open and free of restrictions to air flow. Sufficient fresh air supply is necessary to ensure optimum combustion and efficiency.
2. *Check flue gas venting.* Check that the vent has no obstructions and is in good condition. Proper venting is essential to ensure efficient combustion. Insufficient draft or overdraft promotes hazards and inefficient burning.
3. *Check burner condition.* Dirty burners or burner orifices will cause the boiler output rate and thermal efficiency to decrease.
4. *Check heat transfer surfaces.* Internal and external buildup of soot and scale on the heating surfaces creates an insulating effect that reduces heat transfer efficiency.
5. *Combustion analysis.* Perform a flue gas analysis. (Note: For atmospheric—natural draft—boilers, the gases must be sampled before the draft hood.) The following information is typically obtained and recorded in order to determine boiler combustion efficiency: flue gas temperature and concentrations of O_2, CO, CO_2, inlet fuel pressure, draft pressure and water temperatures entering and leaving the boiler.

Boiler efficiency tune-ups

Task 6 should be undertaken by a qualified contractor. The information is provided to assist building staff in supervising the project.

6. *Tune-ups:* As part of routine maintenance, or if the combustion efficiency determined by the flue gas analysis is less than the boiler manufacturer's recommendation, have one or more of the following corrective actions taken to improve combustion and heat transfer efficiency:
   - **a)** Clean the burners. Inspect the burners for wear. Oil burners wear faster than gas burners and will occasionally need to be replaced.
   - **b)** Clean the fire side of the heat exchanger.
   - **c)** Descale the water side of the heat exchanger.
   - **d)** Oil pressure is provided by a pump. Check the pump to ensure it is working well.
   - **e)** For forced draft boilers, check and adjust the air and oil flow rates.
   - **f)** Ensure the combustion air grille is clean and that dampers (if installed) are operational and have gaskets in good condition. Clean and lubricate the damper actuator (if installed).

Insulating the tank

7. DHW tanks should be insulated.
8. All insulation should be applied according to the manufacturer's specifications and in compliance with applicable codes and standards.

Insulating distribution piping

9. Distribution piping should be insulated.
10. Give priority to uninsulated piping located in unheated areas such as basements, attics and parking garages. Also give priority to larger pipes.
11. All insulation should be applied according to the manufacturer's specifications and in compliance with applicable codes and regulations.

Cautions

- Boiler service must be done by a qualified contractor.
- Combustion air must be provided as specified in the installation code.
- Air shortage problems occur mostly with natural draft boilers.
- Regular visual inspections should be performed to check for the following undesirable conditions:
  - A dirty, unstable flame, instead of the normal clear yellow or orange flame
  - Dirty or sooty heat exchanger surfaces
  - Damaged combustion chamber walls
  - Backdrafting
  - Flame roll out
  - Condensation in boiler vent
- Tank insulation and extensive pipe insulation jobs should be done by a professional insulation contractor.
- Always review provincial building regulations regarding fire safety requirements before applying insulation materials. Tank and pipe insulation must meet smoke generation and flame spread requirements. Consult with a qualified contractor or local building code authorities.
- For work conducted in the top floor ceiling, tops of pipe riser shafts should also be plugged and sealed to prevent air movement up the shafts (see the Building Envelope Systems module for further information).

SHORT-CYCLING WATER HEATERS

You may find that your water heaters fire repeatedly for very short periods. This is called short-cycling. This not only uses more energy, but also wears the equipment out faster. Boiler controls always have a differential between the temperature at which the boiler turns on and the temperature at which it turns off. If this is adjustable, it should be set to at least 3°C (5°F) and preferably 6°C (10°F).

If you have multiple water heaters, they should not all have the same firing setpoints. The temperature setpoints should be at least 3°C (5°F) and preferably 6°C (10°F) apart.

If in doubt about how to undertake this procedure, consult your boiler service company or a controls contractor.

Where to turn

Boilers should be serviced by a qualified tradesperson.

Building maintenance staff members can undertake modest pipe insulation jobs themselves, with materials purchased at a building supply store. Insulation flame spread and smoke generation characteristics must be suitable for the application. Consult with local building authorities if unsure.

Larger insulation jobs, particularly insulation of the tank itself, should be done by a professional insulation contractor.

PROCEDURE

4 Tune up DHW circulation pump and motor

Description

Tune up the circulator pump and motor for the centralized domestic hot water system in your building, by lubricating and cleaning it, replacing seals and other parts as needed, and tuning up the motor when needed. Annual pump servicing should be sufficient for larger pumps. For pumps below 2 hp, intervals of two years or longer will be more appropriate. The motor should be serviced every fifth time the pump is serviced.

The simplest tune-up involves a "touch and listen" test to determine if the motor is running hot or if there is excessive vibration and noise coming from the motor, drive assembly or pump. If so, a call to a qualified service contractor will be in order.

The following tune-ups can be relatively complex, time-consuming and must be done quickly to limit the amount of time the hot water system is out of service. It is recommended that the following tune-ups be performed by a qualified contractor. The tune-ups are described to inform building staff members of the opportunities and to enable them to specify and supervise the work.

Benefits

- The primary benefit of regular pump tune-ups is longer equipment life. A well-maintained pump and motor will likely last 20 years. Poor maintenance could easily cut this time in half.
- Poor maintenance will cause increased electricity use as a result of higher friction losses.
- Poor maintenance may also result in increased leaks.
- Poor maintenance may also result in unexpected breakdowns, causing loss of hot water to the occupants.

Implementation

Buildings with centralized domestic hot water systems may have one or more circulator pumps to provide the hot water to the suites. The pumps in use in your building may be of various brands and types. Locate and have the motor's manual on hand for the servicing contractor.

Preparation

1. Consult the pump service manual to determine what tools are needed. Obtain a seal replacement kit for the pump.
2. Notify the users of the system involved that there will be an interruption of service.
3. Stop the pump and disconnect the power supply to the motor.
4. Close valves in the suction and discharge pipes.
5. Release the pressure from the pump and its surrounding piping system.
6. Following the service manual, the pump will be disassembled to gain access to the seals. Many modern pumps have a rear pull-out design that makes this easier.

Maintaining the pump seals and bearings

7. Pumps may have either packing gland seals or mechanical seals. Packing glands are multiple rings of flexible, low-friction packing material compressed against the shaft and pump casing. Forced lubrication is usually provided between the shaft and the rings. Mechanical seals consist of spring-loaded rings of a rigid, low-friction material sliding against finely finished mating surfaces.
8. If the pump has packing gland seals, have the stuffing box glands checked for free movement and the packing inspected. Drain and refill oil-lubricated bearings and check oil wicks—if the wicks are scored, burnt or waxy, replace them. Check the quantity and consistency of grease in grease-lubricated bearings. Lubricate packing gland bolts.
9. If the pump has mechanical seals, clean, inspect and lubricate the bearings and their seals. Some modern pumps feature slip-on shaft sleeves to make seal maintenance easier. Examine the clearances and surfaces to ensure that the seals are still maintaining the critical tolerances that stop leakage and prevent air from being drawn into the system. Check shaft movement.
10. Consider replacing the seals while you have the pump disassembled. They may not need replacement quite yet, but it's much easier to do when the pump is already apart.
11. Be very careful when installing seals. Don't touch the surfaces with dirty hands. Use soapy water to slide the seals onto the shaft, not a petroleum lubricant. Don't run the pump while the seal is dry.

Maintaining other parts of the pump

12. Clean the impeller.
13. Check and clean seal liquid lines.
14. Check and clean any associated strainers and coolers. If strainers are severely clogged with debris, consider having the system flushed. This can be a problem particularly with new systems, if the installers neglected to flush out construction debris before start-up.
15. Reassemble the pump.

Maintaining the pump motor

16. The motor that drives the pump will require less frequent lubrication than the pump itself—again, consult the service manual. In most cases, the motor should not require lubrication more than once every five years.
17. Most motors in this application will have roller or ball bearings. Generally they use grease as a lubricant. Some are sealed and need no maintenance, but others must be repacked with grease.
18. Follow the manufacturer's recommendations on the type of grease to use. Bearings should be about 1/3 full to avoid overgreasing. To ensure that the bearing is not overgreased, allow excess grease to run out of the drain plug for about 10 minutes after starting and before replacing the grease plug. Avoid mixing different types of grease, as some types are incompatible.
19. Some motors in this application may use plain bearings, made of a soft metal such as bronze. Oil is used to lubricate plain bearings. An oil ring is used to transport oil from the oil reservoir to the top of the shaft. If there is a sight plug in the top of the bearing, use it to confirm that the oil ring is working.

20. Keep the reservoir filled to the proper level with the grade and type of oil specified by the manufacturer. Do not mix different types of oil, as some are incompatible with others.
21. If the motor is of the open type, make sure the ventilation screens and shrouds are clean and unobstructed, that the motor is free of dirt and grease, and that the windings are free of dust, dirt, oil, grease or moisture. If the environment is dirty or damp, and it is impossible to keep the motor clean, consider replacing it with a totally enclosed motor.

Completing the job

22. Open the servicing valves to fill the pump with working fluid.
23. Reconnect the power.
24. Check pump and driver alignment. If the pump and motor are misaligned, correct the situation using shims under the motor.
25. Recalibrate all associated instrumentation.
26. Check pump performance against design ratings.
27. Replace worn out components and adjust impeller clearance if tests indicate the pump has lost performance.
28. Pump maintenance should occur either annually or semi-annually, depending on run hours, load, operating environment and other factors. A good look at the pump parts during servicing should tell you if it needs more (or less) frequent servicing.

Cautions

- Notify the people affected before you turn a pump off for servicing. Occupants may have to make special arrangements if they will be without hot water.
- Working on a pump can be dangerous. There is a risk of electrical shock. Make sure the power is off—if the pump is connected to an emergency standby source of power, make sure that is off too. If the power supply includes capacitors, do not touch the terminals.
- If you do not feel comfortable undertaking this procedure yourself, you can hire a contractor or you can seek training.

Where to turn

Building operations staff can obtain training on pump repair. There are training institutes and courses available on the Internet. You may also want to approach your pump dealer for suggestions.

UPGRADING PACKING GLANDS

If your pump currently has packing gland seals, mechanical seals would reduce the friction losses by a factor of six. For most pumps, they are a cost-effective replacement. Furthermore, mechanical seals are available that are specially made to fit into pumps that were originally fitted with packing gland seals.

PUMP SIZING

Many pumps are oversized for the application. Consider having an expert measure the load on your pump and determine whether a smaller pump and motor would do the job. Sometimes the resizing can be accomplished by trimming the impeller of the existing pump.

ENERGY-EFFICIENT MOTORS

Motors cost much more to run over their lifetime than they cost to buy. If the time has come to replace your pump motor, consider buying an energy-efficient motor to replace it.

PROCEDURE

5 Adjust temperature in a DHW system

Description

Tune-up the operation of a DHW system by adjusting the DHW temperature.

Benefits

- Heat loss in the distribution piping system will be reduced, lowering energy costs.
- Savings from the change in normal supply temperature will be approximately 1% for each degree reduction.
- Reduced water temperatures may help prevent the risk of scalding.

Implementation

In a building with centralized DHW systems, you should set the hot water supply temperature to the lowest safe level that will provide satisfactory supply of hot water to all occupants. In many buildings, the domestic hot water temperature is set too high, which increases energy consumption and costs and also poses a scalding risk.

Adjusting the normal supply temperature

1. Temperature reductions should be limited to 2°C (4°F) increments at two-week increments until desired temperature is reached.
2. During the time of lowest demand (that is, nighttime), turn on the furthest hot water tap and measure the water temperature using an accurate thermometer.
3. Readjust the DHW water temperature control setpoint until the water temperature from the same tap is at least 46°C (115°F).
4. Repeat during the time of maximum demand. If the thermometer reads lower than 46°C (115°F), raise the control setpoint until that temperature is reached.

Cautions

- *Legionella pneumonophilia,* the bacteria that cause legionnaire disease, can colonize hot water systems maintained below 46°C (115°F). Service water heater temperatures of 60°C (140°F) are recommended, however, only in conjunction with measures designed to ensure that water delivery temperature at each fixture is no more than 49°C (120°F). This can be accomplished by mixing service water heater water with return water to reduce the temperature of water delivered to the building.
- DHW supply temperatures that are too high pose a scalding risk. DHW supply temperatures above 49°C (120°F) will increase this risk.
- A lack of insulation on distribution piping may result in a large water temperature drop by the time it reaches taps furthest from the boiler. Complaints and significant water and energy waste may result.

Where to turn

Building operations staff can do the reduction of normal DHW supply temperature.

PROCEDURE

6 Adjust the DHW pressure

Description

Adjust the water pressure at the top floor so that it will not fall below 170 kPa (25 psi) during times of maximum demand, and will not rise above 240 kPa (35 psi) during times of minimal demand.

Benefits

- High water pressure can increase hot and cold water use as a result of leakage of fixtures and pipe fittings under high pressure and excessive water forced through fixtures when they are operating.
- This procedure will reduce the energy consumption of booster pumps and DHW heaters.
- It will also reduce water consumption.
- High water pressure hazards and nuisance leaks will be reduced.

Implementation

In a building with domestic hot and cold water booster pumps, water pressure should be adjusted to minimize energy and water consumption.

A qualified service water contractor may be required to perform some of the following tasks.

Adjusting the water pressure

1. Checking and adjusting water pressure requires the following instrumentation and controls:
   - **a)** A pressure gauge on the hot and cold water lines at the top floor of each pressure zone, located as close as possible to the plumbing fixture farthest from each booster pump and/or the service water entrance.
   - **b)** A pressure gauge at the discharge of each booster pump, and at the service water entrance.
   - **c)** A pressure-regulating valve at the service water entrance.
2. Pressure gauges should be calibrated by comparison with a gauge of known accuracy to ensure that they are working properly.
3. Adjust water pressure when water use is as low as possible, for example, between 12 p.m. and 5 a.m.
4. Recheck water pressure during periods of high water demand, for example, between 7 and 8 a.m.
5. A satisfactory system would have a maximum flow pressure of no more than 275 kPa (40 psi) during low water use periods, and a flow pressure of at least 170 kPa (25 psi) during times of high water usage.
6. Larger differences in pressure may indicate undersized piping or piping that is restricted by lime.
7. Typical pressure-regulating valves are adjusted manually with a handle (more expensive models may have a dial readout showing the pressure setting). Adjust the valve at times of low use. Always begin by adjusting only a small amount and assessing the change.

Cautions

- Water pressure lower than 170 kPa (25 psi) could lead to occupant complaints.
- Water pressure lower than 170 kPa (25 psi) can result in unsatisfactory rinse cycles in washing machines, as well as longer filling times for sinks, bathtubs and water closet flush tanks.
- Pressure above this level will cause excessive flow rates and waste of water in showers, toilets, rinse cycles of dishwashers and washing machines, and any operation where water flows freely to the drain.
- A qualified plumbing tradesperson is required for this procedure.

Where to turn

This work should be done by a qualified plumbing tradesperson.

Other Publications About Multi-Unit Residential Buildings

Multi-Unit Residential Buildings – Tune-Ups for Energy and Water Efficiency Series

- *Building Envelope Systems* (OPIMS 69067)
- *Domestic Hot Water Systems* (OPIMS 69069)
- *Electrical Systems* (OPIMS 69072)
- *Heating and Cooling Systems* (OPIMS 69074)
- *Other Water Systems* (OPIMS 69076)
- *Ventilation Systems* (OPIMS 69078)

Multi-Unit Residential Buildings – Energy and Water Efficiency Series

- *Heating and Ventilation Systems* (OPIMS 68752)
- *Lighting Systems* (OPIMS 68754)
- *Building Envelope* (OPIMS 68756)
- *Domestic Hot Water* (OPIMS 68758)
- *Renewable Energy* (OPIMS 68760)
- *Electrical Systems* (OPIMS 68762)
- *Water Conservation* (OPIMS 68764)

Energy and Water Efficiency in Multi-Unit Residential Buildings: A User Guide for Property Managers and Owners (OPIMS 68979)

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