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BOA
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What's Inside?

Front cover photo:
K.Bhandari

Important Phone Numbers

Emergency	911
Alberta Boiler Association	403 291 7070
Alberta Labour (Emergency)	403 297 2222
Buried Utility Locations	1 800 242 3447
City Of Calgary (All Departments)	311
Dangerous Goods Incidents	1 800 272 9600
Environmental Emergency	1 800 222 6514
Poison Centre	403 670 1414
Weather Information (24hr)	403 299 7878

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President's Message

I hope this message finds you and yours well and in good health

There is still a shortage of Knowledgeable Building Operators, not only Alberta but in all the provinces. I realize that this it is a problem that is occurring with all trades, the average age of a Red Seal Journeyman is 56 years old, the average age of a Building Operator is the same but I believe we are especially hard pressed because of our lack of exposure to the public as to what a Building Operator is, What do they do? how much do they earn? aren't they Janitors? (that's how the government describes us). Most people know what an electrician is, as well a plumber or an auto mechanic. Are all jobs explainable to the public and the career path easily followed from apprentice to Journeyman, as well the salaries that are commonly set by Unions as a standard, and followed closely by the industries in general, with slight variations. Hardly anyone knows what a Building Operator is, what they do, how much they earn, where the career path will take them. To try and explain the tasks and qualifications of the role is vague, even from other Building Operators. We need to have the public have a better an understanding of the rolls of a Building Operator so that it may become a career choice as any other discipline. The wages that are paid are reasonable, the benefits enjoyed by employees are acceptable, so it is up to our industry to market the discipline to make this roll as their career choice from school.

There are so many upsides to our industry that would appeal to student and younger people looking to finally settle down and earn a respectable living. The technology involved in operating facilities is "Top Drawer." The reason it is so advanced is the facilities are more and more being run and controlled by computerized management systems. The companies that build and support system controls have had some mega advancements in monitoring and data management. Buildings are large users of energy and the need to have management of them has never been greater.

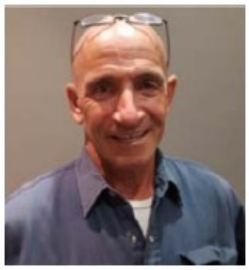
The Government has given directives and has set standards, given goals in control of carbon output. Since Commercial Buildings are one of the leading energy users in the country there has been money, time and effort being focused on control to bring a reduction in energy usage. Tenants are as well looking for companies that manage the facilities in all facets.

I believe this is the role of BOMA to assist in getting more "Boots on the Ground". The Property Managers are under pressure by the Tenants, Government as well as Investors to better the performance of their facilities. To meet these expectations and better manage the controls of these facilities there has been an output of controls to better manage the systems within the buildings. This can be exciting as well terrifying to some operators. Controls are becoming very sophisticated but at the same time they are falling to the Building Operators to manage them. I have said before we have "Smart Buildings" we need to have Smart Operators operating them.

Carbon reduction calculation, ESG, BOMA Best, LEED, are all standards and responsibilities that may come with the roles to the managers of the facilities. The Building Operators that operate these systems need proper and effective training all the way from schooling, education leading to certification and specific system knowledge in all aspects to be able to properly be a part of the support to a team.

I hope you will attend meetings; we also need your support. Next meeting is October 10, 2023.

Smiles))



With kind regards,

Les Anderson PE, RPA

TEST YOUR OPERATOR IQ!

Are you equally adept at troubleshooting problems in the boardroom and the boiler room? As the resident facility guru, there's a lot riding on whether or not you know the difference between sounds control and a sound investment.
Try our monthly Operator IQ challenge...*answers on page 27*

1. Hot water heating boilers must be equipped with a:

a) thermometer

b) fusible plug

c) return trap

d) blow down tank

e) steam pressure gage

2 How are stop valves, which are used on steam outlet connections of heating boilers, identified?

a) they are stamped

b) they have catalogue numbers

c) with identification numbers

d) with stickers

e) with metal tags

3. How many pressure relief valves shall a hot water heating boiler have?

a) none

b) at least one

c) at least two

d) at least three

e) at least four

4. If a boiler with an automatic feedwater system requires a large amount of water to be fed manually, this may indicate:

a) you are producing a great deal more steam

b) there is probably a leak in the system

c) there has been a drastic change in the water quality

d) your return lines are not working

e) the flow meter is not working properly

5. In a closed expansion tank system an air separator:

a) removes air from the system

b) is installed at the boiler inlet

c) is installed at the boiler outlet

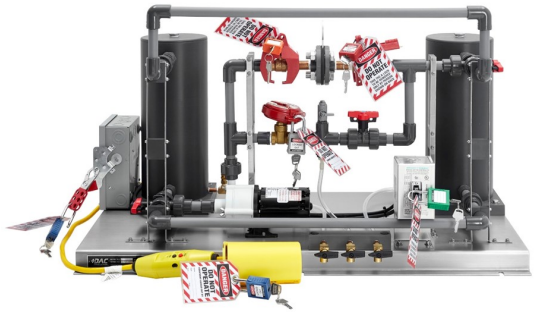
d) directs air into the expansion tank

e) is not required

Lockout Tagout Training

.Servicing or maintenance of machines or equipment where the unexpected start-up, activation or release of stored energy could cause injury.

- Operations where an employee is required to remove or bypass a guard or other safety device.
- Operations where an employee is required to place any part of his or her body into an area of the machine where work is actually performed upon the material being processed, or where a similar danger zone exists during the machine operating cycle.
- Work on equipment where an energy source itself poses a hazard to the employee (e.g., electrical systems) that must be controlled for the work to be performed safely.
- Entry into confined spaces, such as vats or tanks, where the supply lines for chemicals, gases or other materials into the space must be blocked and locked out to prevent the introduction of these materials into the space while employees are performing work.



If an employee's duties include performing work covered by this program, they must be trained as an authorized employee. The training for authorized employees involves both classroom and on-the-job training.

Training must be performed before the employee is assigned duties involving work that will require lockout/tagout (LOTO). An employee undergoing on-the-job training who has demonstrated the ability to perform duties safely at his or her level of training, and who is under the direct supervision of an authorized person, is considered to be an authorized person for the purpose of those duties.

Retraining will be performed whenever inspections conducted by the employee's supervisor indicate that an employee has not retained the necessary knowledge or skills to effectively use established lockout/tagout procedures. Retraining will also be performed whenever there is a change in job assignments, when new machines, equipment or processes are introduced that present a new hazard, or when the energy control procedures change. When an employee is to work on new or unfamiliar systems or equipment, the employee's supervisor must provide additional training on the hazards involved and the energy control procedures that are to be followed.

Training on Lockout Tagout Devices

If tagout devices are used, further training on tagout systems need to emphasize that:

- Tags are warning devices only and do not provide a physical restraint that lockout devices provide
- Tags must not be removed without the authorized employee's approval and should never be bypassed, ignored, or otherwise defeated
- Tags must be legible and understandable by all employees
- Tags must be able to withstand environmental conditions in the workplace
- Tags may give employees a false sense of security

Tags must be securely attached to prevent inadvertent or accidental detachment

Lockout/Tagout Training General requirements

- Training must ensure that the purpose and function of your energy control plan are understood and that employees gain the needed knowledge and

skills to safely apply, use, and remove hazardous energy controls. Minimum training must include:

- Authorized employees must be able to recognize:
- hazardous energy sources
- types and magnitudes of energy in the workplace
- methods and means necessary to isolate and control the energy

Affected employees must be instructed on the:

- purpose and use of your energy control procedures
- Other employees must be instructed about:
- the energy control procedure in general prohibitions relating to attempts to restart/ reenergize equipment

Lockout Tagout Training - Control of Hazardous Electrical Energy - Lockout and Other Methods was developed due to a lack of understanding and measurable consistency in the field regarding Lockout principles and also by the rapidly changing technology and automation related to complex industrial machinery. This standard establishes requirements and performance objectives for procedures, techniques, designs and methods for the effective control of Hazardous Energy.

Developing an Effective Lockout Program:

- Methods of Control
- Hazardous Energy Control Procedures (Placards)
- Lockout Procedures Elements
- Lockout Devices and Associated Hardware
- Elements of Energy Control
- Provisions for Energy Control Interruption
- Lock and Tag Removal Worker Absent
- Outside Contractors
- Individual Lockout
- Group Lockout
- Complex Group Lockout
- Shift or Personnel Changes
- Communication and Training

Other Hazardous Energy Control Methods:

- Appropriate tasks for other Control Methods
- Risk Assessments for Other Hazardous
- Energy Control Hierarchy of Other Hazardous
- Energy Control Implementation

Other Hazardous Energy Control Methods:

- Engineered Safeguards
- Control System Integrity
- Lockout and Other Control Methods-Decision Matrix
- Hazardous Energy Control Decision Logic

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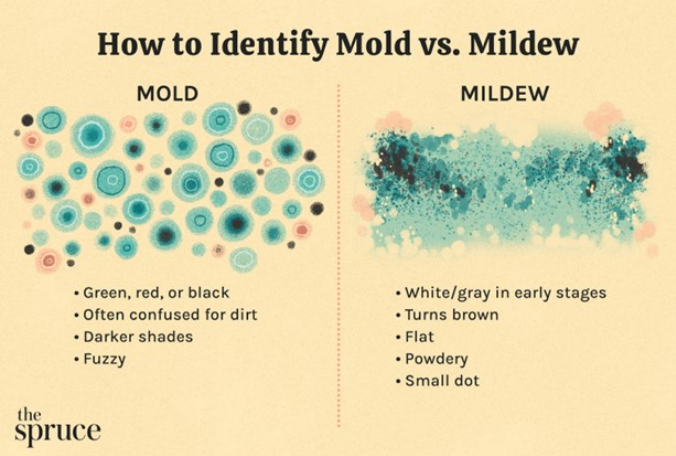
Moisture, Mold and Mildew

by Dave Picciano

Molds and mildew are fungi that grow on the surfaces of objects, within pores, and in deteriorated materials. They can cause discoloration and odor problems, deteriorate building materials, and lead to allergic reactions in susceptible individuals, as well as other health problems.

The following conditions are necessary for mold growth to occur on surfaces:

- temperature range above 40 deg. F and below 100 deg. F
- mold spores
- nutrient base (most surfaces contain nutrients)
- Moisture

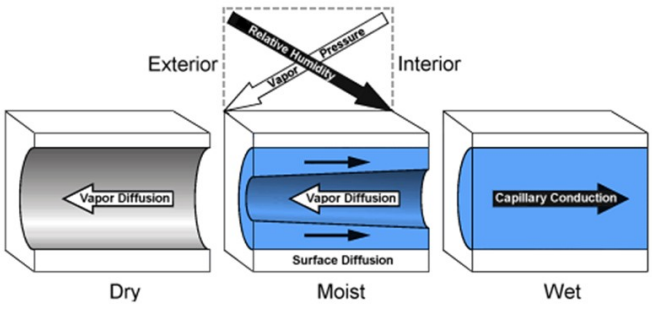


Human comfort constraints limit the use of temperature control. Spores are almost always present in outdoor and indoor air, and almost all commonly used construction materials and furnishings can provide nutrients to support mold growth. Dirt on surfaces provides additional nutrients. Cleaning and disinfecting with nonpolluting cleaners and antimicrobial agents provides protection against mold growth. Other sections of this document have discussed the importance of building maintenance and proper sanitation in preventing IAQ problems. However, it is virtually impossible to eliminate all nutrients. Moisture control is thus an important strategy for reducing mold growth.

Mold growth does not require the presence of standing water, it can occur when high relative humidity or the hygroscopic properties (the tendency to absorb and retain moisture) of building surfaces allow sufficient moisture to accumulate. Relative humidity and the factors that govern it are often misunderstood. This appendix is intended to give building managers an understanding of the factors that govem relative humidity, and to describe common moisture problems and their solutions.

Background on relative humidity, vapor pressure, and condensation

Water enters buildings both as a liquid and as a gas (water vapor). Water, in its liquid form, is introduced intentionally in

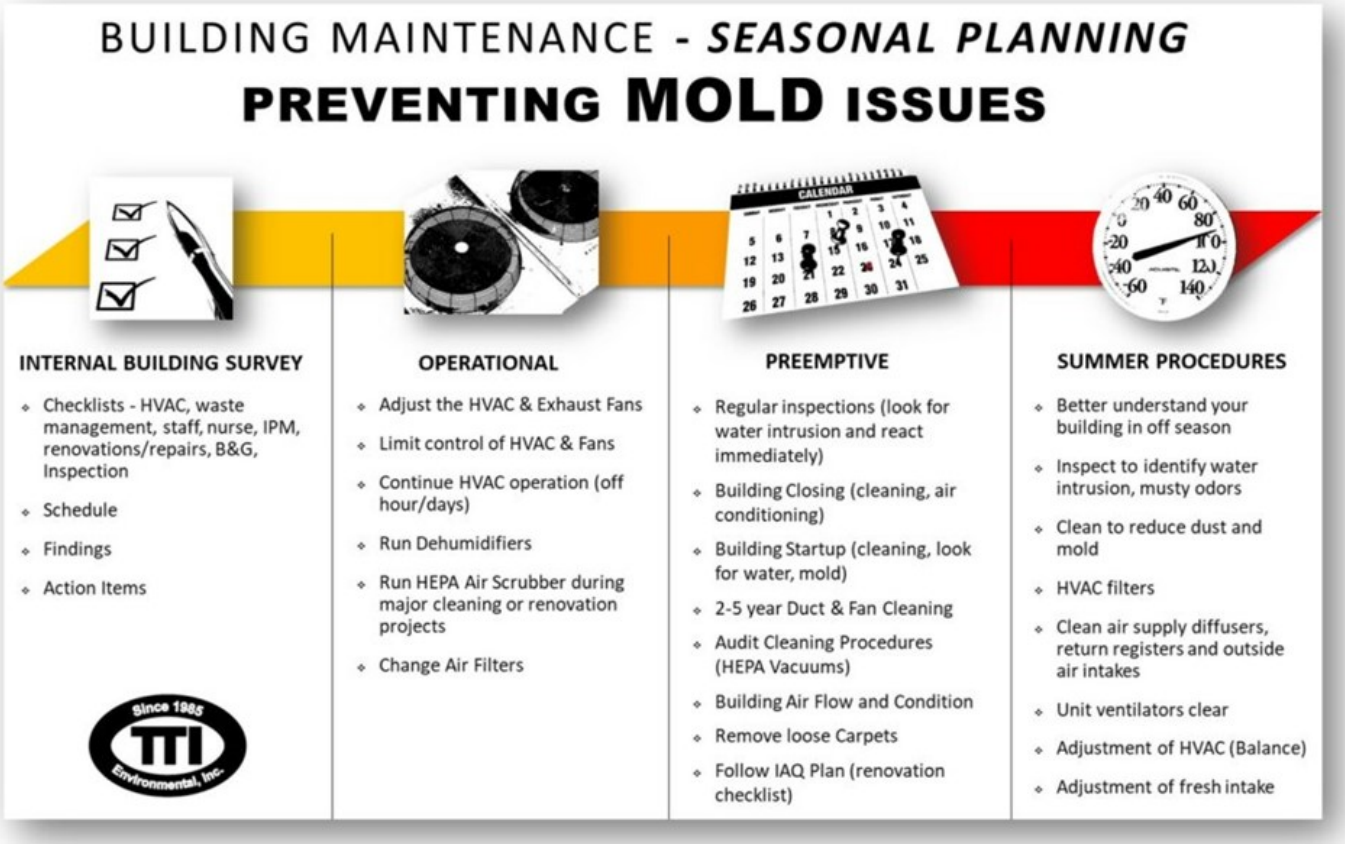


Moisture transport phenomena in the pores of a massive exterior wall in winter, for different levels of moisture content

bathrooms, kitchens, and laundries and accidentally by way of leaks and spills. Some of that water evaporates and joins the water vapor that is exhaled by building occupants as they breathe or that is introduced by humidifiers. Water vapor also moves in and out of the building as part of the air that is mechanically introduced or that infiltrates and exfiltrates through openings in the building shell. A lesser amount of water vapor diffuses into and out of the building through the building materials themselves. Figure C-1 illustrates locations of moisture entry.

The ability of air to hold water vapor decreases as the air temperature is lowered. If a unit of air contains half of the water vapor it can hold, it is said to be at 50% relative humidity (RH). As the air cools, the relative humidity increases. If the air contains all of the water vapor it can hold, it is at 100% RH, and the water vapor condenses, changing from a gas to a liquid. It is possible to reach 100% RH without changing the amount of water vapor in the air (its "vapor pressure" or "absolute humidity"). all that is required is for the air temperature to drop to the "dew point."

Relative humidity and temperature often vary within a room, while the absolute humidity in the room air can usually be assumed to be uniform. Therefore, if one side of the room is warm and the other side cool, the cool side of the room has a higher RH than the warm side. The highest RH in a room is always next to the coldest surface. This is referred as the "first condensing surface," as it will be the location where condensation first occurs, if the relative humidity at the surface reaches or only along the wall-ceiling joint. It is likely that the surface



of the wall is cooler than the room air because there is a void in the insulation or because wind is blowing through cracks in the exterior of the building.

Mold and mildew growth can be reduced where relative humidities near surfaces can be maintained below the dew point. This can be accomplished by reducing the moisture content (vapor pressure) of the air, increasing air movement at the surface, or increasing the air temperature (either the general space temperature or the temperature at building surfaces). Either surface temperature or vapor pressure can be the dominant factor in causing a mold problem. A surface temperature-related mold problem may not respond very well to increasing ventilation, whereas a vapor pressure-related mold problem may not respond well to increasing temperatures. Understanding which factor dominates will help in selecting an effective control strategy.

Consider an old, leaky, poorly insulated building. It is in a heating climate and shows evidence of mold and mildew. Since the building is leaky, its high natural air exchange rate dilutes interior airborne moisture levels, maintaining a low absolute humidity during the heating season. Providing mechanical ventilation in this building in an attempt to control interior mold and mildew probably will not be effective in this case. Increasing surface temperatures by insulating the exterior walls, and thereby reducing relative humidities next to the wall surfaces, would be a better strategy to control mold and mildew.

Reduction of surface temperature-dominated mold and mildew is best accomplished by increasing the surface temperature through either or both of the following approaches:

- Increase the temperature of the air near room surfaces either by raising the thermostat setting or by improving air circulation so that supply air is more effective at heating the room surface.
- Decrease the heat loss from room surfaces either by adding insulation or by closing cracks in the exterior wall to prevent wind-washing (air that enters a wall at one exterior location and exits another exterior location without penetrating into the building).

Vapor pressure-dominated mold and mildew can be reduced by one or more of the following strategies:

- source control (e.g., direct venting of moisture-generating activities such as showers) to the exterior
- dilution of moisture-laden indoor air with outdoor air that is at a lower absolute humidity
- dehumidification

Note that dilution is only useful as a control strategy during heating periods, when cold outdoor air tends to contain less moisture. During cooling periods, outdoor air often contains as much moisture as indoor air.

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Achieving Safety Goals

Any company that focuses on improving workplace safety aims to get their employees home in the same health they came into work or better every single day. For many companies, there are larger expressed goals attached to this effort. Often the main goal for many worksites or companies as a whole is to make it an entire year without any injuries. For other companies, it may just be no lost time injuries in a year. Despite what the goal is or the duration set, one thing is for certain- it takes focused effort every single day to achieve it.

Safety Goals Set by Companies

Safety records are tracked, days since last injury counters loom over employees' heads, and safety lunches are held quarterly to celebrate employee efforts in working safely. While these tools may be good reminders for a workforce that there is a goal set and there is progress being made, the honest truth is that it takes dedication by every single person on that team over a long period of time to achieve the larger goal. The enormity of these safety-related goals can overwhelm even the most optimistic employee.

The Only Way to Achieve a Big Safety Goal is One Task at a Time

After huge goals are set by companies regarding workplace safety, it is up to everyone's willingness to embrace that it is possible and act towards meeting the goal. The thought alone of making it a whole year without injury automatically shuts down

many individuals from even wanting to put care towards attempting to achieve it. To reduce the enormity of the goal, concrete actions need to be lined out every day to focus on preventing injuries one task at a time.

The best way to achieve a huge goal is to take small steps towards it every single day. For safety goals, it means doing one step, one work task, one safety guard, the right way each time it needs to be completed. Effort cannot be applied directly to the overall abstract goal that may be a year or two away. Effort can be applied by each individual to take action in the task they are doing that minute to complete it in a safe and correct manner.

Summary

Goals are good. Goals for safety in a workplace should be embraced by employees. After all, it is ultimately about making sure everyone goes home in the same health they arrived in or better when they return home. More important than the goal itself is the action needed in each moment to make your work task or workplace safe. While it takes a lot of effort by every single member of a workforce to achieve what seems to be a hard-to-reach safety goal, it is truly possible when you focus your efforts on the task at hand.

KenKen Puzzle

How to solve the Kenken puzzle:

(Answers on page 27)

- Fill in the numbers from 1 –6
- Do not repeat the number in any row or column
- The numbers in each heavily outlined set of squares, called cages, must combine (in any order) to produce the target number in the top corner using the mathematical operation indicated
- Cages with just one square should be filled in with the target number in the top corner
- A number can be repeated within a cage as long as it in the same or column

	1	7	9		4	3		5
	3	5		8	2		6	
					1			8
1		8	3		5		9	4
	4			7			1	
		2			9	8		7
2	6				7		5	3
	9			5	6	4		
		1		9			7	6

Ripple Effect

by James Piper

Well-designed - and maintained water treatment programs offer multiple benefits to facility executives

In their search for ways to improve the operating efficiency of their building's HVAC systems, facility executives are focusing attention on an important, unglamorous and often overlooked maintenance task: water treatment. To take full advantage of the many recent improvements in the design of energy-using systems, the heat transfer surfaces within the systems must be kept clean and free of scale. And the best method of accomplishing this is the comprehensive water treatment program. But helping to keep systems operating at peak efficiency is only one of the benefits of water treatment programs. Effective water treatment can enhance operating safety, protecting both personnel and equipment. Systems that have been operated with a well-designed water treatment program also have longer service lives than those where the quality of water being circulated has been ignored.

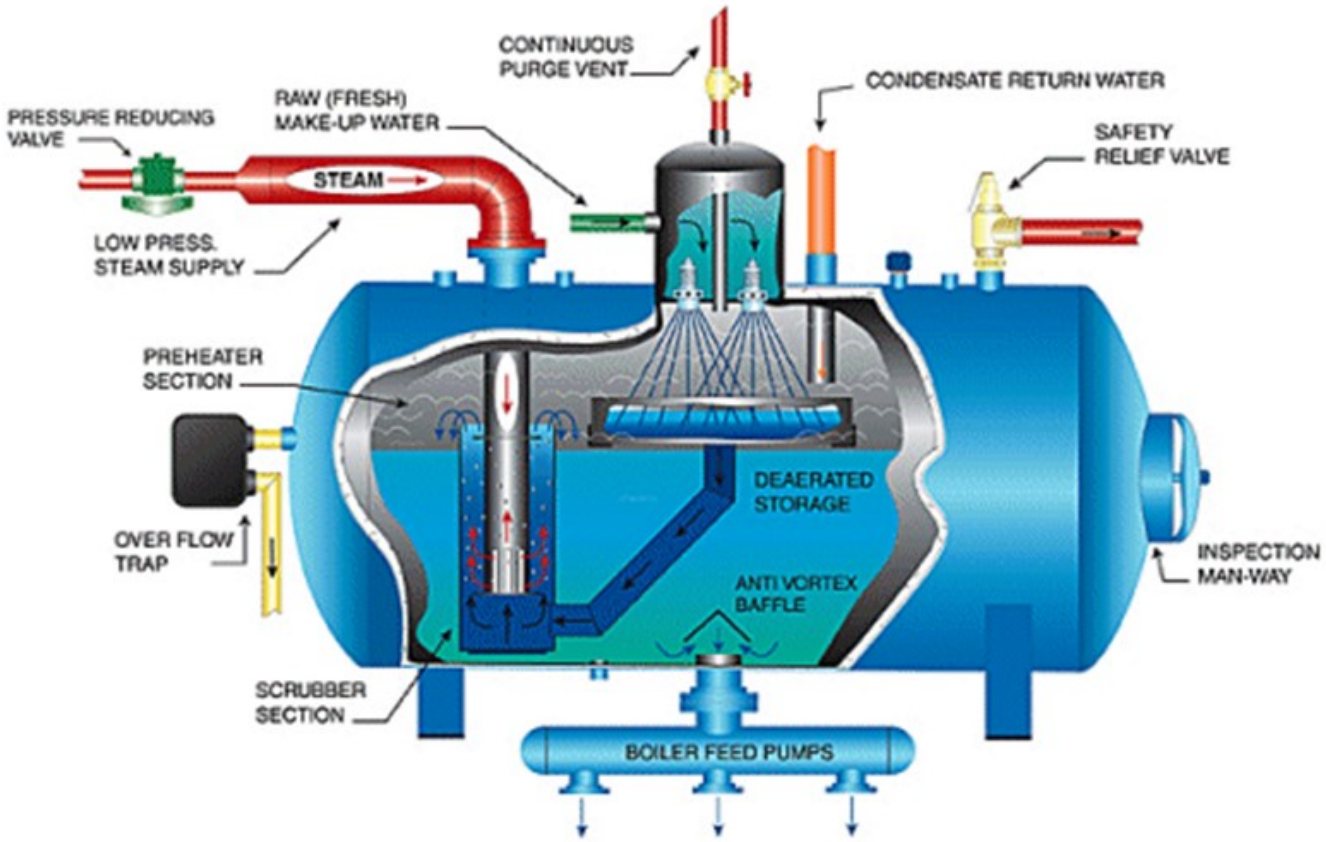
But when it comes to water treatment, one size does not fit all. Programs must be tailored to a specific application, including the type of system, the types of metals found in that system, the quality of the makeup water being introduced into the system and the rate at which makeup water is being added.

Water treatment programs also are not one -time efforts, which once initiated can be forgotten. Water treatment programs require continuous monitoring. Samples must be taken on a regular basis and analyzed to determine the specific contaminants that are present in the water

system and their concentrations. For chemical-based systems, the application of chemicals to the system must be monitored to ensure that only the needed level of chemicals is added to the system. Too high

a concentration level can be as hard on the system as one that is too low.

There are four basic steps in boiler water treatment programs: clarification, demineralization and softening, deaeration, and the addition of amines.

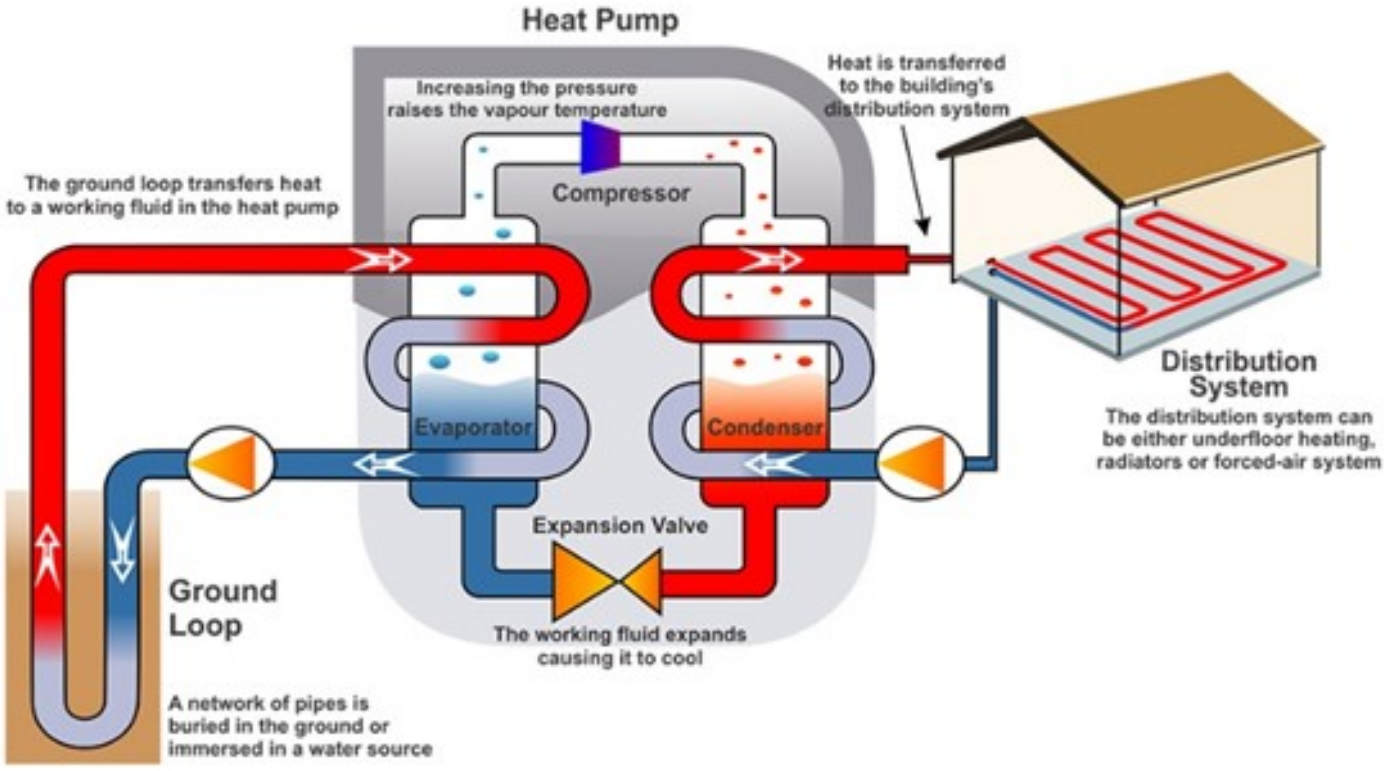


All circulating steam systems contain suspended solids. The solids can be introduced into the system by boiler makeup water, or they can come from piping and other components within the system. If these solids are allowed to remain in the system, they can interfere with the operation of steam traps and valves, or they can accumulate sufficiently to block portions of the system. Clarification, the first step in boiler water treatment, is designed to remove the larger suspended solids in the system. In most cases, removal can be achieved through the use of properly placed filters. To assist in removal of smaller suspended solids, chemical coagulants are added to the system to help clump these particles together so they can be captured by the filters.

The second step is demineralization and softening. All water contains certain levels of dissolved minerals or salts, such as silica, iron, calcium and magnesium, which tend to form scale on heat transfer surfaces. Scale decreases the energy efficiency of the system. Scale on boiler tubes can also result in the formation of localized hot spots that can lead to tube failure.

The two most common processes for demineralization and softening are lime-soda softening and ion-exchange. The water

treatment system based on the lime-soda process uses a form of hydrated lime to react with the calcium and magnesium bicarbonates in the boiler feedwater to form precipitates. These precipitates then can be removed by settlement or by filtration. The ionexchange process removes a number of ionized impurities, including calcium, magnesium, iron and manganese. The third step in boiler water treatment, deaeration, involves removal of dissolved gases from the boiler feedwater, including oxygen, carbon dioxide and hydrogen. These dissolved gases are highly corrosive to most components, including boiler tubes, steam piping, steam traps and especially condensate return systems. The most common deaeration systems use steam to heat the boiler's feedwater, causing dissolved gases to be carried off with vented steam.



The addition of amines to the boiler water is a treatment method designed to reduce corrosion within the condensate return system. All steam systems, including those with good water treatment programs, have oxygen and carbon dioxide in the condensate return system. As a result, corrosion will continue to take place. To help protect condensate return system components from this corrosion, afilming amine is added to the boiler feedwater. Carried throughout the system by the steam from the boiler, these amines form athin, protective layer on metal surfaces primarily in the condensate system, helping to reduce contact between the corrosive condensate and condensate system components.

Closed Loop Water Systems

There are two major concerns with closed loop heating and cooling systems: scale and corrosion. Scale, like scale in boiler systems,

is the result of precipitation of salts found in the water. These salts tend to adhere to heat transfer surfaces, are difficult to remove, and reduce the efficiency of the heat exchanger. Fouling factor is a measure of the resistance to heat transfer often used in evaluating chiller performance. In new chillers, the fouling factor is typically 0.0002 or lower. Even a thin layer of scale on the tubes can raise a chiller's fouling factor to 0.0025, resulting in an increase in chiller condensing temperatures by five degrees and an increase in overall compressor energy use by 20 to 25 percent. In most systems, scale is controlled by adding chemicals to reduce the calcium hardness of the water.

Corrosion is an electro chemical process that erodes metal surfaces in the closed loop system, including piping and chiller tubes. The rate at which corrosion takes place is primarily a result of the level of oxygen in the system, the degree of alkalinity or acidity of the circulating water, the temperature and velocity of the circulating water, and the concentration of dissolved and suspended solids in the water.

There are two types of corrosion: generalized and localized corrosion. The former attacks all metal surfaces in the system exposed to the water. Although generalized corrosion releases oxides that contribute to scaling, it is a relatively slow process and less of a concern than localized corrosion.

Localized corrosion attacks small areas on metal surfaces, resulting in rapid pitting and perforation. With the average chiller tube being less than 3/32 of an inch thick, localized corrosion can quickly eat through the material, resulting in the mixing of refrigerant and water. Controlling corrosion requires knowing what types of metals are used in the system, how susceptible they are to corrosion and what the operating conditions are in the system. Chemicals introduced to control corrosion must be carefully matched to the system requirements in order to avoid doing even more damage to the system. Once in place, the system must be continuously monitored through water sampling to ensure the proper mix is being used.

Cooling Towers

Cooling towers are natural dirt collectors. Leaves, dust, dirt and other contaminants easily enter condenser water systems through the cooling tower. Untreated, these contaminants accumulate, blocking piping and reducing the effectiveness of heat transfer surfaces. Equally important, the warm waters found in cooling towers and condensing water systems are perfect breeding grounds for micro-organisms such as legionellosis that, in addition to potentially blocking the chiller's heat exchangers, can pose a serious health risk to those who work close to or are exposed to wind-borne water droplets from the cooling tower. A comprehensive water treatment program is the most effective means of controlling both particulate and biological contaminants.

As with both boiler and closed loop systems, the water that is circulated in the system contains dissolved minerals that if left untreated will form scale on heat transfer surfaces, decreasing efficiency. What's more, cooling towers are open systems with a significant makeup water requirement. Evaporation, drift and the need to bleed off a portion of the circulating water result in an ongoing need for makeup water. For example, a typical cooling tower serving a 350-ton building chiller will lose three to five gallons of water per minute from evaporation and drift. This makeup water becomes an ongoing source for new dissolved minerals in the system.

Compounding the problems is the fact that few of the minerals present in the system are carried off by the evaporating water, resulting in a steady increase in the concentration of dissolved minerals in the circulating water.

While bleeding off a portion of the circulating water will help to limit their concentration, a water treatment program is required to keep their levels within acceptable limits.

There are three primary goals to cooling tower water treatment programs: controlling scale formation, reducing corrosion and minimizing the growth of microscopic organisms. In areas having hard water, scale control is the driving concern, while corrosion protection is the major concern in areas with soft water. Water treatment programs must evaluate the conditions that exist at the site to determine the type and quantity of chemicals that are required to bring water quality within the acceptable range. Systems typically continuously monitor water conditions in the condenser water system, adding the proper quality of chemicals required to control both scale and corrosion.

The most common method of controlling the growth of microscopic organisms is to add a biocide to the circulating water. Biocides can be either oxidizing or nonoxidizing depending on the particular needs of the system. They are added to the system typically through a small pump on a timer that introduces a set amount of the biocide on a regular schedule. Monitoring of the levels of growth in the system is required to ensure that the proper dose and schedule are being used.

Non-chemical Treatment

Although most water treatment programs are chemical based, there are alternatives. For example, electronic technology can be used for scale control and can play a role in controlling corrosion.

There are also alternatives to traditional chemical biocides. One is the use of ultraviolet light to kill organisms.

The systems operate continuously, eliminating under dosing and over dosing problems found in biocide-based systems. With no moving parts, the systems are practically maintenance-free. With no chemical requirements, ultraviolet-based systems have very low operating costs. Ultraviolet-light-based systems, when

combined with a filtration system at 40 to 50 microns, can provide performance that matches or exceeds that of biocide-based systems. However, UV systems leave no residual biocides in the water.

Another option is the use of copper-silver ionization. These systems use electrodes to generate parts per billion levels of copper and silver in the cooling tower water to kill micro biological life. They operate continuously and leave a residual in the water. At least one company says that it offers a non-chemical program for all aspects of cooling tower water treatment. That program combines copper-silver ionization, filtration and electronic scale control technology.

Implementation

Water treatment programs will require installation of specialized equipment, generally including chemical feeders, monitoring sensors and sampling ports. Once installed, equipment operation must be monitored. Water samples must be taken and analyzed, typically weekly. And adjustments will have to be made in the program to match changing water conditions.

Facilities have the option of implementing the program in-house or contracting all or part of the program out to firms that specialize in water treatment. If in-house personnel are used, they must be fully trained in all of the procedures involved in the water treatment program, including how to safely handle the chemicals involved. If the program is contracted out, it is important that a qualified contractor be selected, one that is experienced in working with systems similar to the ones in the facility. Regardless of the method of implementation, the result will be better performing and longer lasting systems.

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Restroom Renovations, Big Benefits

by Thomas A. Westerkamp - Maintenance Solutions

Upgrades can provide easier access, improved hygiene and water savings for managers who plan ahead

Restroom renovations are among the most common projects that institutional and commercial facilities undertake. These upgrades often are designed to bring these areas into compliance with access guidelines, and they give engineering and maintenance managers an opportunity to introduce new and water-saving technology.

Formulating plans for such work requires managers to determine the specific benefits of renovations, understand common trouble spots encountered in planning and carrying out upgrades, and taking steps to maximize the benefits and avoid the problems.

Odor, poor cleanliness and empty paper dispensers rank as the most common complaints from restroom visitors, so it stands to reason that eliminating sources of these complaints, while minimizing water-use and cleaning costs related to restrooms, would be a win-win strategy for the managers and restroom users. Managers can achieve both higher quality and lower costs.

Renovation benefits

Among the many benefits of restroom renovations are improved sanitation, greater comfort, easier access for all, and lower operating costs. Managers will need to take a closer look at each one in order to prioritize them.

Improved sanitation. Germs, bacteria and illnesses from person to person often spread via contact with unclean restroom fixtures, including toilets, urinals, sinks and paper-product dispensers. Every time a toilet is flushed, up to 10,000 bacteria and viruses can atomize into the air. It takes just one hour for germs on a sink handle to multiply by a factor of 16.

Greater comfort. A fresh, attractive restroom provides a more comfortable environment for the user and eases concerns that accompany using unsanitary or stale-smelling facilities. It also reflects well on the building owner and manager, as well as the organization in general.

Easier access. Many people take for granted the fact that restroom facilities are available and accessible in all modern buildings. This was not always true for those with disabilities, especially in older buildings not subject to post-ADA rules. As organizations upgrade older buildings, ease of access is becoming more accepted and even expected. Accessible restrooms generally are more

attractive and comfortable for all users. Many organizations even go beyond the letter of the law as owners and managers benefit from the resulting positive public relations.

Lower costs. Besides improving sanitation and minimizing odors, restroom renovations also can help control costs. For example, they can reduce water use, due to better-controlled flow times and volumes or the installation of waterless fixtures. Cleaner restrooms can lower costs by improving user health. Estimates of savings generated by improved employee absence are about $400 per absence, while a healthy employee on the job is 20 percent more productive than one who is sick, and he or she doesn't pose the risk of spreading illness.

The two most effective means of maximizing benefits and minimizing problems with restroom renovations are improved hygiene and standardized custodial procedures.

Improving hygiene

When it comes to hygiene, restroom fixtures are a major source of cross-contamination, in spite of custodial efforts to clean and disinfect daily because many users might contact the fixtures between cleanings. Products such as automatic hands-free fixtures can enhance both the perception and the reality of cleanliness. Among the most common examples of automated and

manual technology that can improve cleanliness and sanitation — while also improving compliance with ADA requirements — include these:

- **Odor control.** Automatic sanitizers release undertake this disinfectant with each flush. This cleansing between uses ensures that the fixture is clean and scale free with less need for labor-intensive manual cleaning.
- **Urinal and toilet flush valves.** Technicians can easily install new hands-free, sensor-operated flushers to existing fixtures. These units are battery-operated and require battery changes only once a year.
- **Sink faucets and soap dispensers.** These automatic touch-free devices eliminate a major source of cross-contamination by making hand washing much more sanitary. Properly installed, they meet ADA requirements.
- **Air dryers.** Touch-free automatic hand dryers work fast and can help maintain the high standards of a touch-free restroom.
- **Toilet-seat cleaning.** Automating this process provides a hands-free way for users to ensure

a higher degree of sanitation. A wave of a hand over the motion sensor activates a mechanism that automatically cleans, disinfects and dries the toilet seat in about 15 seconds. The entire process occurs without contact, ensuring sanitary conditions.

- **Waterless urinals.** In addition to being sanitary and odor-free because of their liquid-seal designs, these systems can substantially reduce annual water use.

Increased attention to design elements also can benefit the organization. For example, plastic stalls are tougher than metal and anchored to walls instead of floors, so they reduce cleaning time and resist graffiti and vandalism.

Also, floors using tile and grout require extra care, cleaning material and time to keep them sanitary. Special grout cleaning chemicals are needed periodically, their standing time is longer to penetrate the dirt embedded in the grout, and cleanup to remove excess liquid takes longer.

Replacing this flooring with seamless, one-piece epoxy flooring or a similar membrane will require less maintenance labor while maintaining a bright, pleasant appearance that is free from dingy, gray grout lines.

Standardized cleaning

Standardized custodial procedures have a very attractive payback because employees who maintain and improve the appearance of restrooms use the same methods and materials. Eliminating cleaning methods that are sometimes confusing and conflicting increases productivity.

Standardization begins with the way custodians are hired, and it continues through their daily practices. The hiring process is more effective if managers use a comprehensive job description, one that shows major responsibilities and duties, along with the job's physical and mental requirements. These minimum requirements ensure that each new custodial employee can handle job responsibilities and follow standard practices and schedules.

Standard practices include methods for doing each task based on daily and weekly schedules and longer-term priorities. Following standard practices, rather than each person using his or her own methods, ensures that workers take proper steps and adhere to proper frequencies.

The habits formed through use of standard practices ensure uniformity. These practices include the use of exact amounts and types of cleaners, supervised dilution rate, proper contact times for disinfectants, the use of mirrors to ensure proper cleaning under water rims, and proper frequency of mop solution changes rather than just pushing dirty water around.

Measuring success

Even after a thorough renovation, some deficiencies can go undetected or unidentified — especially the microbial kind — without professional assessment. Before managers tep, they should have a specific objective in mind, such as identifying the source of odors — by surface tests to determine quantity and type of bacteria present and effectiveness of cleaning solutions and methods — and eliminating the offending odor.

Testing performed by a professional that incorporates indoor-air sampling methods can give managers the extra measure of assurance that their efforts are effective in maintaining a pleasant, attractive, odor- and germ-free restroom environment. Besides all of the tangible costs and functional benefits, managers also will reap the intangible but often substantial benefit that a positive impression can make on building occupants and visitors.

Tackling Access Troubles

Among the challenges that maintenance managers often face when planning restroom renovations is ensuring compliance with access guidelines.

Renovation might entail meeting higher standards than were required before the upgrades, but managers should review all facets of the project and the adjacent facility areas to make sure that new building-code requirements are met.

These requirements start with signage showing the shortest route to the accessible facility and proper signage height from the floor, and they include:

- Upgrading from round doorknobs to lever handles
- Ensuring proper door swing clearances, into both the restroom and the stall
- Planning for proper height of fixtures, grab bars and dispensers.
- Hands-free fixture upgrades also might improve the facility for everyone and meet access guidelines.

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8	1	7	9	6	4	3	2	5
4	3	5	7	8	2	1	6	9
9	2	6	5	3	1	7	4	8
1	7	8	3	2	5	6	9	4
3	4	9	6	7	8	5	1	2
6	5	2	1	4	9	8	3	7
2	6	4	8	1	7	9	5	3
7	9	3	2	5	6	4	8	1
5	8	1	4	9	3	2	7	6

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