4.0 SUGGESTED INTERIM GUIDANCE ON FACILITIES MANAGEMENT OF VENTILATION AND PLUMBING SYSTEMS [5/16/20]

The following guidance is provided for use by camp facilities management and operators in preparation for occupying their buildings or sites during the ongoing COVID-19 pandemic. Although many camps are based on the premise of personal enrichment for campers through immersion and enjoyment of the outdoors, special steps must be taken at this time to ensure that it is done thoughtfully and safely.

The guidance presented here goes beyond simple preparations of a cabin or recreational hall for occupancy and is based upon guidance issued by the American Society of Heating, Ventilating, and Air Conditioning Engineers (ASHRAE) and the U.S. Centers for Disease Control and Prevention (CDC). It includes information on operating building systems and steps that can be taken to check and confirm effective operation of camp facilities. The recommendations provided below are based on ASHRAE’s “Post-Epidemic Conditions” advisory guidance1 and the CDC guidance2,3 for reopening buildings after prolonged shutdown or reduced operation.

Although much of the camp experience is based on housing that utilize basic ventilation and plumbing schemes, the manner in which the buildings are opened, prepared, and accepted for occupancy is critical in providing a safe experience for the campers, counselors, and other staff. Because many of the facilities rely on natural ventilation to meet the needs of its occupants, the need for ensuring maximum effectiveness is more challenging than ever. This is especially true in light of the need to minimize the possibility for airborne infection to occur and spread in the camp environment. Maintenance of a safe camp environment will require adherence to basic principles of air movement and ventilation, a commitment to maintenance, and sometimes, creativity. Also, as camps continue to expand their offerings, there are other facilities at camps that may utilize more advance mechanical systems to provide both localized (room level) and building-wide ventilation and thermal comfort and they are addressed here as well.

The following guidance is broken into a timeline that addresses when each activity should be undertaken in order to have a successful camp opening and camp session. Of course, it cannot be emphasized enough that every camp is different and this is a guide, not a rigid playbook. Also,

no matter how successful an opening may be, it is the ongoing commitment to maintenance and ongoing verification of performance goals that will determine the overall success of the program.

**GENERAL RECOMMENDATIONS**

- Assemble a Building Readiness Team that includes key individuals and companies who play a role in the setup and operation of all the camp building systems. The types of service providers that may be required include, but are not limited to, the following:
  - **Camp Owner and/or Operator** to specify the goals and objectives to be supported by the physical environment and to provide guidance as to how the buildings are typically operated.
  - **Maintenance Manager and Support Staff** to review current system condition and operation and to ensure it is ready for opening.
  - **Mechanical Contractor** may be used to supplement the in-house staff to implement repairs to the building mechanical systems that may be identified through the implementation of this guidance.
  - **Building Controls Contractor** to provide specialized support with modification or repair to the mechanical systems controls.

**One Month Before Opening**

- Perform and inventory of mechanical systems in all camp buildings (supply fans, exhaust fans, ceiling fans, etc.) and verify their operational status.
- Ensure windows and doors are operational and insect screens and animal guards are in place.
- Perform an inventory of heating, ventilating, and cooling (HVAC) systems and document the types and MERV (minimum efficiency reporting value) rating of particulate air filters installed in the systems. This inventory in combination with HVAC performance data can be used for assessing the potential of upgrading the systems to higher efficiency filtration systems, if desired.
- Verify sensor calibration for demand-based ventilation instrumentation, airflow measurement instrumentation, and temperature control instrumentation.
- If the on-site facility manager does not have the appropriate skill set, engage a mechanical service company to inspect and assess the operational capabilities of all mechanical systems including supply and exhaust fans, refrigeration equipment, water heaters, boilers, pumps etc.

**Two Weeks Before Opening**

- Check controls and operation of hot water boilers, steam generators, and heat exchangers to ensure that set points are consistent with those required during normal operation. Confer with the local authorities about requirements for start-up of domestic water systems.
Check the fuel source for boilers and hot water generators to make sure it is on and available. Confirm that the flues and make-up air paths are open prior to engaging these devices.

Review programming of central HVAC systems to provide flushing two hours before and two hours after occupancies. This includes operating the exhaust fans as well as opening the outside air dampers.

Inspect HVAC system components to verify proper function. Inspection should include the following elements:
- Fan belt(s) are appropriately tensioned to ensure full airflow is provided to space(s).
- Outdoor air and other damper linkages are fully connected and operational.
- Heating and cooling coil valves and valve actuators are connected and operational.

Confirm occupancy schedules for HVAC systems and review timer set points and programmed operating schedules in the building automation system (BAS). Modify the occupancy schedule as needed to fit the current occupancy schedules for the building.

If HVAC system control setbacks were previously implemented as part of a building shutdown protocol, check to ensure that these setbacks were returned to normal.

After confirming timers are functional and BAS occupancy schedules are set right and overrides have been put back to normal, operate the HVAC systems in Occupied mode for at least 24 hours. During this period, trend temperature control and ventilation parameters in those areas serviced by central HVAC systems. If trending through the BAS is not possible, work with the ventilation contractor to install monitoring equipment or measure to verify proper temperature and ventilation control. These measurements should confirm that space temperature and relative humidity levels are being controlled to the acceptable setpoints.

One Week Before Opening

Check domestic hot water heaters for proper operation and setpoint. Confirm that the water heater is set to at least 120°F. For domestic hot water systems equipped with mixing valves, higher primary water temperatures (>130°F) can further reduce the risk of Legionella growth; however, mixing valves must be tested to prevent scalding temperatures.

Check all drain pans in air handling units and floor drains. Fill with water to ensure that drain traps are wet and do not allow for the passage of sewer gas.

For facilities with hot tubs and spas, confirm that the chemical treatment has been maintained during the shutdown to avoid conditions that could lead to an outbreak of Legionnaires’ disease.  

Day Before Opening

- In buildings with operable windows, if the outside air temperature and humidity are moderate, (temperature range between 65°F and 78°F and relative humidity between 20% and 75%), open all windows for four hours minimum. Utilize internal fans, i.e., ceiling-mounted fans or strategically (and safely to avoid tripping hazards) place floor fans to promote air circulation. Operate all exhaust fans during this preoccupancy period as well.
- Prior to re-occupying a building with an HVAC system such as the administrative building or Health Center, perform a “flush out” by opening outside air intake dampers to the maximum allowable position and operate in this manner for at least four hours before reoccupation. Note that the maximum allowable outdoor air damper position will depend on outdoor air temperature and humidity conditions. When operating in the flush out mode, acceptable indoor temperature and humidity conditions should be maintained. Upon completion of the flush out, damper positions can be adjusted back to achieve normal design outdoor air levels.
- Consider installing portable high efficiency particulate air (HEPA) filter air cleaners in administrative offices, the health center, and indoor spaces that are provided with mechanical ventilation. These air cleaners should be operated continuously (24/7 operation).
- Implement a flushing plan to flush hot and cold water systems through all points of use (e.g., showers, sink faucets). The purpose of building flushing is to replace all water inside building piping with fresh water.

Day of Opening

- In buildings with operable windows, if the outside air temperature and humidity are moderate, (temperature range between 65°F and 78°F and relative humidity between 20% and 75%), open all windows for three hours minimum before the reoccupation.
- Utilize internal fans, i.e., ceiling mounted fans or strategically (and safely to avoid tripping hazards) place supplementary floor fans to promote air circulation. Operate all exhaust fans during this reoccupancy period as well.

During Ongoing Camp Operations

- Keep HVAC systems, internal fans, and operable windows functioning and operational to maintain good air circulation within the camp buildings throughout the season.
- Try to maximize general ventilation by utilizing window and door openings. If windows must remain shut due to weather, insects, or safety conditions, maintain continuous operation of exhaust fans. Consider use of supplementary floor fans, if overall ventilation and thermal comfort must be improved, especially if there is limited window and door opening opportunities.
- Once HVAC systems are placed in normal operation, consider implementing an outdoor air ventilation flushing mode two hours before scheduled occupancy and again two hours after
occupancy. This includes operating the exhaust fans as well as opening the outside air dampers. Ideally, this flushing mode can be implemented through timers or the BAS.

- During occupied periods, optimize outdoor air ventilation by operating HVAC systems at increased outdoor air rates (i.e., increase the percentage of outdoor air). The percentage of outdoor air delivered will be limited to cooling capacity of the HVAC systems and its ability to provide an appropriate discharge air temperature while also controlling for humidity.
- During unoccupied mode (i.e., when it is expected that the occupants will not be present for at least four consecutive hours), the HVAC systems should continue to operate continuously and at minimum outside air mode.

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS – GENERAL GUIDANCE

- Inspect HVAC system components to verify proper function. Inspection should include the following elements:
  - Fan belt(s) are appropriately tensioned to ensure full airflow is provided to space(s).
  - Outdoor air and other damper linkages are fully connected and operational.
  - Heating and cooling coil valves and valve actuators are connected and operational.
- When servicing air handling equipment such as changing filters or accessing interior areas, consider workers’ use of personal protective equipment (PPE). This would typically involve use of safety glasses or face shields and gloves.
- It is not necessary to clean ductwork for COVID-19 control, however, if internal duct cleaning is being considered for other reasons, you should consult additional industry guidance before implementing.

HVAC SYSTEM MAINTENANCE AND FILTRATION FOR SPECIALIZED AREAS

- For HVAC filtration in the Health Center or other specialized area, consider increasing the level of filtration in the air handling systems to a MERV13 or greater. An assessment of the current filtration coupled with air handling unit performance information can be used to determine whether the existing fan systems can overcome the additional pressure drop of the new filters while still maintaining appropriate air flow.
- Inspect HVAC system air filters and replace with new filters if deemed necessary. Inspect air filter installation and ensure filters are properly fitted and have little to no bypass around filter banks.
- If the use of higher efficiency filtration is not possible in the healthcare clinic, portable HEPA units can be used to provide continuous recirculation.
HEATING AND COOLING SYSTEMS

- For facilities with cooling towers, confirm that the chemical treatment has been provided and maintained to avoid conditions that could lead to an outbreak of Legionnaires’ disease.
- Check controls of water chillers and cooling towers to ensure that setpoints are consistent with those required during normal operation.
- Check the status of chilled water systems and cooling towers to ensure they are operated at appropriate water levels and are provided sufficient make-up water. Check pump operation and that water is flowing.
- For HVAC systems with direct expansion cooling coils, check the refrigerant pressures to make sure the system is adequately charged.
- Check controls and operation of hot water boilers, steam generators, and heat exchangers to ensure that setpoints are consistent with those required during normal operation and in accord with local health department requirements. Ensure proper carbon monoxide detectors are functioning in areas where combustion appliances are located and in accord with local municipal requirements.
- Check the fuel source for boilers and hot water generators to make sure it is on and available. Confirm that the flues and make-up air paths are open prior to engaging these devices.