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Maintenance of Air Conditioning and Hydraulic Systems in Unoccupied Buildings

Introduction

This paper addresses the scenario where a building is temporarily or partially shut down, for example for a period of 2 – 12 weeks, where complete decommissioning of the air conditioning systems may not be warranted.

Outside the topic of this article is the scenario where a building is to be shut down for an extended period of several months or more, for example during a major refurbishment, when complete decommissioning of the air conditioning systems is recommended. This is a structured process of putting plant into a safe mode, so that it does not pose a health and safety risk and the plant itself is properly protected during the shutdown period. Exceptions might include maintaining toilet ventilation or other critical / sanitary ventilation systems, but all other systems would normally be shut down. Proper recommissioning of the systems will be required to put the plant back into operation, similar to that required to commission a newly completed building.

General Commentary

Some components of the air conditioning systems will still require maintenance to be performed, even though the majority of the plant may not be operating. It is important that such components are maintained, as they can pose a health & safety risk once the air conditioning systems are re-started, or if they fail to start.

For air conditioning plant which does not pose a health and safety risk to building occupants and has been deactivated, this plant can have its regular maintenance deferred until the building is re-occupied.

Care needs to be taken when restarting some electric motors if they have been idle for extended periods in cold weather (especially if exposed to the elements) as moisture ingress can adversely affect both the electrical windings and the bearings. Pre-heating of the windings is recommended to avoid failure at start-up.

Cooling Towers

The requirements for inspections and maintenance of cooling towers which are in regular service is clearly set out under section SS 9 of the Compliance Schedule Handbook as part of the NZ Building Code, which in turn can be found under Schedule 1 of the NZ Building Regulations 1992.

Unless cooling towers have been drained and effectively decommissioned for the duration of the building shutdown, we recommend that regular testing and maintenance is continued.

Even if the chillers or any other plant served directly from the cooling towers is shut down, it is still important that normal prescribed cooling tower testing and maintenance is continued, as cooling towers provide a place for potentially harmful bacteria, including legionella, to grow if the tower is not maintained properly.

Cooling tower testing requirements are shown in the table below (taken from the NZ Building Code Compliance Schedule handbook).

Table 1: Cooling tower testing

Cooling tower with automatic chemical dosing	Time	Test method	Test result levels and control strategies²
Legionella:	Monthly	AS/NZS 3896 ¹	AS/NZS 3666.3 ² Table 3.1
Heterotrophic microorganisms	Monthly	AS 4276.3.1 ¹	AS/NZS 3666.3 Table 3.2
Cooling tower without automatic chemical dosing			
In addition to the testing above, cooling towers without automatic chemical dosing must also do the following test.			
Heterotrophic microorganisms	Weekly	Dipslide	AS/NZS 3666.3 Table 3.2

We recommend the following:

Continue with the testing requirements set out under the NZ Building Code, including dip slide testing where appropriate. These tests measure the microbial growth rate inside the cooling tower and indicate how effective the chemical dosing regime is.

Ensure a regular chemical dosing regime is continued as this is critical to prevent legionella and other microbial growth in the water within the tower, and to prevent corrosion within the condenser water system.

For systems with automated dosing, this can be achieved by regularly operating the condenser water pumps to allow chemicals to mix through the water and be distributed through the condenser water system and cooling tower. We recommend operating the condenser water pumps and cooling towers a minimum of twice per day, for at least 2 hours at a time.

Undertake normal checks for the condenser water pumps, cooling tower fan motors and strainers on the condenser water circuit to ensure normal water flowrates are being achieved through the condenser water system and cooling tower.

Critical and Life Safety Systems

A number of ventilation and air conditioning systems have duties other than providing personal comfort. Such systems may need to remain in operation even when the building is unoccupied. Examples of such systems include:

- Server room cooling systems will be required to operate if computer equipment is still functioning during the period that the building is unoccupied.
- Carpark ventilation systems may be shut down if the carpark is under very light usage. Systems with automatic demand control can be left in their normal state, so they operate if required.
- Rubbish area ventilation systems should be left in operation unless the rubbish areas have been properly cleaned prior to the building being vacated.
- Plant room, sprinkler pump room, lift motor room & electrical/transformer room ventilation systems should be left in automatic operation so the systems function when required to preserve the function of the equipment in the room being served.
- Sewage ejector ventilation systems should be retained under normal operation.
- Chemical store ventilation, including those in salons, cleaning stores and medical or process stores should be left in automatic operation as standard life safety measures.
- Smoke ventilation systems, including stairwell and lift shaft pressurisation systems as well as atrium smoke exhaust fans should be left in automatic operation as standard life safety measures.

- Systems that are required to operate under fire mode (which in addition to dedicated smoke control fans, may include carpark exhaust systems, and central air handling systems in some commercial buildings) should be left in automatic operation, so they are available to start when required, as part of the buildings standard life safety measures.

The maintenance for these systems should be conducted as per the regular preventative maintenance schedule if the buildings are likely to have any form of occupation over the shut-down period, as these systems are required to remain operational even though the building is substantially unoccupied.

Where no access is possible to the building during the shut-down period, maintenance can be deferred, but these systems should be checked and proven prior to reoccupation of the building.

Hydraulics

During relatively short periods of shutdown, central hot water systems can be left in their normal operating mode with minimal running costs resulting. Smaller instantaneous water heaters can be switched off.

If any hot water systems have been shut down, maintenance can be deferred, however strict restart procedures must be followed in order to reduce or eliminate the risk of exposure to legionella. This may include a full system flush with fresh potable water, and pre-heating (possibly superheating) the domestic hot water system for a 48-hour period prior to water usage.

Maintenance of hydraulics systems includes ensuring water seals in drainage traps are maintained and do not dry out. Dry traps allow odours and the potential for bacteria to be released into a building directly from a sanitary sewer connection. We recommend the following be carried out:

Operate taps on basins and sinks, flush toilets and pour water into floor waste gullies.

Inspect traps on the condensate drainage lines on fan coil units, indoor air conditioning units and air handling units prior to re-starting these systems. These traps can be re-filled by pouring clean water into the drain tray of each unit.

Building Management System Monitoring

Some buildings are equipped with a Building Management System (BMS) which will control the HVAC plant amongst other things. If the BMS has the facility to allow remote access, we recommend using this function to monitor any alarms and undertake remote checks of the operation of any essential air conditioning or ventilation systems that have been left operational. If any non-critical faults are found, items of plant may be remotely deactivated, the maintenance can be deferred and a service visit arranged ahead of the building being re-occupied, so plant downtime is minimised.

The following checks should be carried out:

Check plant run and alarm logs for any plant failures or warnings of plant operating outside of normal parameters.

If available, monitor trend logs or graphs to check the performance of the air conditioning plant serving critical areas, especially if the air conditioning plant is being exercised while a building is unoccupied.

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