

Advisory Note

A Service to A.G. Coombs Group Clients.

Returning to Operation from COVID-19

During the COVID-19 situation buildings experienced significantly reduced occupancy with some being completely vacated. Building services systems have seen reduced operation and some have been turned off. Ramping up or starting systems after a protracted shut down, especially those that are large, complex and interdependent, requires care. Additionally, in planning for the return of people to buildings there will be a period of changed occupancy with the requirement for social distancing, influencing how the building and its services operate.

What are the important building services issues to consider, how can these be best managed and what should be done to prepare buildings for a safe and trouble-free return to occupancy?

- This Advisory Note Covers**
- + Returning mechanical, HVAC, fire protection, electrical and plumbing systems to operation.
 - + System cleanliness and cleaning.
 - + Improvement opportunities for healthy internal environments.

Mechanical and HVAC Systems

Return to operation

A plan should be developed with a HVAC system maintenance service provider. Returning systems to full operation should be managed by qualified and experienced personnel to avoid damaging the plant and the buildings systems.

Consideration should also be given in the plan to new operating circumstances:

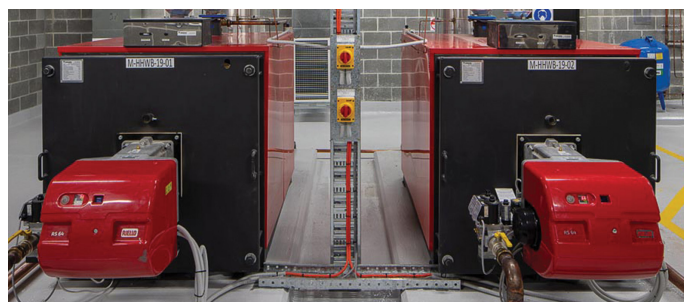
- + Because of the need to social distance, will there be significant changes in building occupancy rates? Substantial changes to internal thermal loads due to reduced occupancy may negatively affect the correct operation of some HVAC system types.
- + Will there be changes to operational times? Extended operational hours will increase energy usage; smart control strategies can reduce this.
- + Building occupants may benefit from communication assuring them that the HVAC system is operating correctly and supporting a clean indoor environment. Well worded messages will help address occupant's concerns.

Start-up focus should be on equipment pre-start checks and progressively returning plant to full system operation. If 3, 6 or 12 monthly scheduled maintenance services have been missed, these activities should be reviewed and undertaken as appropriate. The following provides general return to operation guidance and should be reviewed with the system's maintenance schedules:

Packaged Air-Conditioning Plant:

Starting units after reduced operation or a protracted shutdown period requires a structured approach to avoid damage.

- + Undertake a visual system inspection in accessible areas for signs of vermin, mould, ingress of litter or other contaminants.
- + Inspect filter media and pressure drop on starting.
- + Ensure unit has power, and sump heaters have been on for adequate time.
- + Check drain trains to ensure all traps have water in them to ensure there is an air lock.
- + Operate the HVAC system the day before occupation.
- + Ensure the required internal conditions are in place before occupancy.
- + Continue with previous maintenance regime.



Central Systems – Mechanical Plant:

A good understanding of the plant and systems, and their integrated operation is required when starting plant after reduced operation or a protracted shutdown period. On restarting, common issues can include water and refrigerant leaks, control issues and excessive energy and water use.

- + Carry out condition inspection and pre-start checks on major plant, restart using manufacturers recommended processes and cycle through operational modes (refer later section for cooling tower system requirements).

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- + Consider the sequencing of bringing systems on-line.
- + Refrigerant leak test chillers, confirm pressures, and check safety systems.
- + Leak test boilers, undertake flue gas analysis, test safety systems.
- + Water systems; check for correct operation, water leaks and air locks.
- + Check if any key plant requires recalibration to ensure that plant operates efficiently.
- + Confirmation that any tenant plant returns to normal operation.
- + Review and address any alarms or isolations.



Central Systems – Air Handling:

On restarting, common issues can include odours and poor indoor air quality, air balancing issues and difficulty in maintaining internal conditions and excessive energy use.

- + Undertake a visual system inspection in accessible areas for signs of vermin, mould, ingress of litter or other contaminants.
- + Inspect the filter media and pressure drop on starting.
- + Inspect and clean cooling and heating coils as required.
- + Check drain trains to ensure all traps have water in them to ensure there is an air lock.
- + Check fans and drives including Variable Speed Drives.
- + Operate the HVAC system with maximum outside air rates the day before occupation.
- + Ensure the required internal conditions are in place before occupancy.
- + Check the operation of modulating outside air systems (economy cycles). Incorrect operation can result in significant energy wastage.
- + Continue with previous maintenance regime.

Ventilation Systems:

- + Check all exhaust systems including toilet, kitchen and tearoom are operational.
- + Carpark ventilation systems should be fully operational before building occupancy.

Stair Pressurisation and Pressurised Exit Systems:

- + Initiate an alarm via the Fire Panel and ensure correct system start.
- + Confirm correct airflow and door pressures.

Mechanical Fire Mode System Integration Test:

- + Conduct a system readiness test by initiating an alarm via the Fire Panel. Ensure that zones activate as per the Fire Matrix.

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Building Management and Control Systems:

- + System controls should be checked and reset to the previous normal operation as required.
- + On start-up check to see that required airflows are being achieved and space temperature and relative humidity levels are being controlled to the required setpoints.
- + Check and address any system alarms.
- + Check BMCS computer, software, communications and backup power supply infrastructure.

For further information refer to A.G. Coombs Advisory Note; **Are you in control of your BMCS?**

A partial recommission of HVAC systems and retuning may be required for return to the required performance levels and energy efficiency.

System Cleanliness and Cleaning:

To help assure building occupants that HVAC systems are clean, the following actions could be considered:

- + Replacement of all air filter media.
- + Cleaning and disinfection of heating and cooling coils and associated drip trays using approved methods and chemicals.
- + Cleaning of internal surfaces of air handling units using approved methods and chemicals.
- + Cleaning and disinfection of wall mounted or console type induction type units or chilled beam induction coils using approved methods and chemicals.
- + Inspection and cleaning of ductwork if required. Standard HVAC ductwork systems are often difficult to clean and disinfect effectively because of the lack of access to many of the system components and ductwork.
- + Cleaning of air grilles.

When replacing air filter media and cleaning and/or disinfecting system components, it is important service providers follow approved safe work methods including the appropriate use of Personal Protective Equipment (PPE) and appropriate disposal of used filter media.

Fogging or fumigating is not recommended for normal facilities and standard HVAC systems that are not specifically designed for this treatment. It is very likely to be ineffective and may be hazardous in these situations.



Cooling Tower Management:

If a cooling tower system has been de-commissioned or been out of use, the system should be reinstated in close consultation with a

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mechanical services maintenance provider and water treatment service provider. The following steps are a guide:

1. Notify local Cooling Tower System regulating authority of the intention to re-commission the system.
2. Cooling towers should be cleaned and inspected prior to refilling. Clean side-stream filtration units if installed.
3. Reinstate system components and fill system if it has been drained.
4. Upon refilling, the entire system must be thoroughly decontaminated using appropriate concentrations of biocide and corrosion inhibitor. Care must be taken to ensure that all elements of the system receive adequate flow.

It should be noted that most Cooling Tower systems cannot practically be fully drained. This results in stagnant water pockets and ensuing microbial growth and corrosion. This can cause significant ongoing issues with both microbial control and system degradation.

5. A re-commissioning testing regime should be applied to ensure appropriate microbial management is in place, also that major plant such as Chillers operate normally and that all air has been removed from the condenser water pipework.

For further information refer to A.G. Coombs Advisory Note; **Cooling Tower Systems during COVID-19**

Improvement opportunities – HVAC systems for Healthy Internal Environments

From COVID-19 there is an increased awareness of the importance of healthy indoor environments. There are practical HVAC operational measures that can be applied along with possible system changes to reduce the likelihood of an infectious disease virus spreading:

Maintenance:

The application of good HVAC system housekeeping and preventative maintenance regimes are imperative. HVAC maintenance should be carried out as prescribed by the recognised standards and maintenance procedures should be adhered to.

System Commissioning and Operation, and Outside Air Rates:

It is important to ensure that HVAC systems have been properly commissioned and are operating correctly to provide as designed ventilation rates, outdoor air rates and temperature and humidity control. Humidity level monitoring as part of the maintenance regime can be considered.

Minimum statutory outside air rates should be in place as a basic requirement. Increased ventilation (circulation) rates can assist in diluting contaminants in room air and potentially reduce the likelihood of infections. Special consideration should be applied to transient areas and other areas where the requirement for social distancing requirements may be difficult to maintain including lift lobbies and public areas, bathrooms and kitchens and lunchrooms.

In systems with modulating outside air systems, or where adjustment is possible, increasing outside air rates may be possible. This will also require increasing the system's exhaust air rate and will help dilute any contaminants in the circulating air.

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It should be noted that increasing outside air rates and or ventilation rates will generally result in increased energy usage and in some circumstances may result in difficulties in the system maintaining the desired internal temperature and humidity conditions.

Improvements in lift car and lift lobby ventilation may be considered.



Air Filtration and Air Cleaning:

Air filtration typically installed in standard HVAC systems will not be effective in filtering droplet nuclei or viruses, should these reach the filters. The addition of increased efficiency particle filtration is likely to reduce the airborne load of infectious particles.

Conventional air filters with an improved Minimum Efficiency Reporting Value (MERV) between 13 and 15 (F7 to F9) can reduce levels of droplet nuclei but are not likely to be effective at stopping any unattached virus particles. These filters could assist in reducing the likelihood of droplet nuclei from spreading and may be within the fan capabilities of existing systems.

HEPA filters are unlikely to be a practical option for most existing HVAC systems due to their high-pressure drop. Additionally, HEPA filters require specific housings and cannot be retrofitted as a direct replacement for traditional filter media.

As a general rule, more efficient filters have higher pressure drops which can increase energy consumption, though advancements in technology mean this is not always the case.

Another method of air cleaning is Ultraviolet Germicidal Irradiation (UVGI). UVGI technology involves the production of short wavelength light which is capable of disrupting the DNA of microorganisms including viruses. The effectiveness of ultraviolet radiation depends on the intensity of the light and the time period that a given pathogen is exposed to the light. Units are available as in-duct devices or for in-air handling units. Units are also available to maintain coil cleanliness.

Other air cleaning methods including ionisation technologies may be considered.

For more information on viral transmission, how HVAC systems work, and the practical HVAC operational measures that can be considered along with possible design changes to reduce the likelihood of the virus spreading refer to A.G. Coombs Advisory Note; **HVAC and COVID-19**.

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Humidity Control:

Commercial HVAC systems are typically designed to produce internal conditions with a relative humidity of 40 – 60% RH. Published research suggests that this humidity range may have a positive impact on virus deactivation, human susceptibility to virus's and cross infection rates.

For further information refer to A.G. Coombs Advisory Note;
Humidity Control – Using HVAC to Help Reduce Infection Spread

Fire Protection Systems

If the inspection and testing regimes required for essential fire safety systems regulatory compliance or fire services systems maintenance have been discontinued or interrupted the following is a guide for return to operation:

- + Lack of operation of the systems (e.g. alarm valves, fire pumps, hose reels, hydrants etc.) may result in expensive repairs or replacement upon reoperation if care is not taken. Systems should be inspected and tested by the essential services maintenance provider and any issues rectified.
- + Review condition of batteries in Fire Indicator Panels EWIS systems; Pumps and Exit and Emergency lights.
- + Ensure portable extinguishers are present and charged.
- + The required regulatory inspection and testing regime must be restarted.
- + Implications from any interruption to scheduled essential fire services maintenance on annual certification should be reviewed with your essential services maintenance provider and a registered building surveyor.
- + Any insurance implications if the essential fire services have been disabled or maintenance discontinued for a period of time should be reviewed with the building insurer.



Electrical Systems

When buildings return to normal service pre-testing of electrical systems is strongly recommended to provide an adequate level of assurance that the equipment is safe to operate. These tests are particularly important if a building has been shut down. The following tests should be carried out prior to returning a building to operation:

1. Emergency and exit lighting systems require six monthly testing in accordance with Australian Standard AS2293. Beyond any system computer generated / automatic tests undertaken at six monthly intervals, there is also the requirement to complete annual physical inspections as scheduled.
2. Residual Current Device (RCD) testing is defined by Australian Standard AS3760, dependent on the type of environment, is required to be undertaken between 3 to 24 month intervals.
3. Electrical distribution systems sitting idle may operate differently when energised. Thermography scans, inspections and maintenance rectifications on all electrical switchboards alleviate this risk. This testing is also important to confirm the integrity of the busbar assemblies and associated switchgear and internal components are not compromised or show signs of degradation.
4. It is also important for emergency backup generators and Uninterruptable Power Supplies (UPS) to undergo regular testing. Conducting no load testing confirms general operation whereas maintaining the control componentry and other equipment such as battery systems, oil, fuel and air filters are critical to enable the equipment to operate when required

For further information refer to A.G. Coombs Advisory Note;
Managing Electrical Systems in Buildings

Plumbing Systems

If domestic hot and cold-water systems have been used infrequently, flush them prior to returning the building to occupancy.

Warm water domestic systems can be a source of legionella and the risk is increased if water is stagnant. These systems should be carefully flushed, and the water tested.

Ensure P and U-traps on tundish water traps in plant rooms and plumbing drains have water in them to ensure there is an air lock.

For further information or advice on returning building services to operation during COVID-19 please contact your A.G. Coombs, Walker Fire Protection, or Integrated Technical Management Contract Manager, or A.G. Coombs Advisory:

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