

Technical bulletin

Equipment start-up following an extended shut down period



**Guidance for machinery, electrical
installations and mechanical systems**

A car left unused for an extended period of time may experience operational problems because the battery has gone dead, the tires have gone flat, or maybe the handbrake seized in place.
Machinery, electrical installations and mechanical systems in commercial properties are no different.

Following an extended shut down period, parts and components can corrode and become seized and/or strained; potentially leading to breakdown, damage or even catastrophic failure upon start-up. It is, therefore, good practice for commercial property owners/building managers to perform basic checks prior to machinery/ electrical installation/mechanical system start-up following an extended shut down period.

In this document, we provide some basic guidance and specific system considerations for machinery, electrical installations and mechanical systems in commercial properties following extended shut down periods.

Our guidance for commercial property owners/building managers should not replace the defined maintenance start up processes and prescribed procedures of equipment/ installation operation manuals or any applicable codes and local regulations.

An inspection should be carried out and documented before start up commences, and only qualified and authorized persons should be engaged in starting up machinery or electrical installations.

Basic start-up guidance

Machinery

A cold start-up of machinery and equipment following a period of inactivity could lead to catastrophic failure of mechanical parts. Vibration, seizure and problems caused by corrosion, moisture or contaminants may lead to the failure of components and protective devices. Before starting up machinery:

- Refer to the user manual for specific start up procedures.
- Ensure all critical spare parts and tools are present.
- Safely isolate the machine and lock off energy sources to make it safe.
- Clean all accessible parts of the machine.
- Examine the machine for leaks and check that lubrication levels are sufficient.
- Check plugged-in electrical parts are securely connected and there is no loose or damaged wiring.
- With the power still isolated, check control panel switches and buttons are working properly.

- Ensure that the machine settings and parameters are correct or in 'neutral' so that no part of the machine can move unless initiated by the operator.
- Where possible, move rotating, pivoting and sliding parts manually and lubricate where required according to the machine's maintenance manual.
- Replace all guarding after the necessary checks have been completed and safely start the machine slowly in steps. If possible, verify each part is operating correctly before engaging the next step

Electrical installations

Switching high-power electrical devices (such as machinery, air conditioners and refrigerators) creates sudden, brief demands for power that can upset the steady voltage in the electrical systems. These are known as 'switching surges', and can be severe enough to damage components.. Some equipment may fail to start after being idle for a long period but a surge could cause significant damage to electrical installations..

Undervoltages, overvoltages and overcurrents caused by switching surges can also damage insulation or cause insulation flashover (an unintended electric discharge over or around the surface of an insulator). Damage and flashovers can often lead to power system outages, eroded components and increased risk of fire.

Refer to operation and maintenance manuals for buildings relating to the correct isolation and start up procedures, and to individual manufacturers' literature for single items of equipment.

If areas of a commercial property have been electrically isolated, there is a sequence to follow to help avoid surges.

- Ventilate the building and turn the central heating on, if available, to reduce condensation within accessories and appliances.
- Work backwards through the distribution system before reinstating the power:
 1. Switch off and unplug equipment.
 2. Isolate the fixed final circuits (e.g. lights, machinery, equipment, etc).
 3. Safely isolate as many circuits as possible at each distribution board by switching off the individual circuit breakers (MCBs).
- To avoid power surges:
 1. Switch on the power at main switch.
 2. Turn on the distribution board switches.
 3. Turn on individual switches.
 4. Energize or plug in required equipment.
- Allow sufficient time for battery back-up systems to charge (e.g. emergency lighting)

Overvoltage

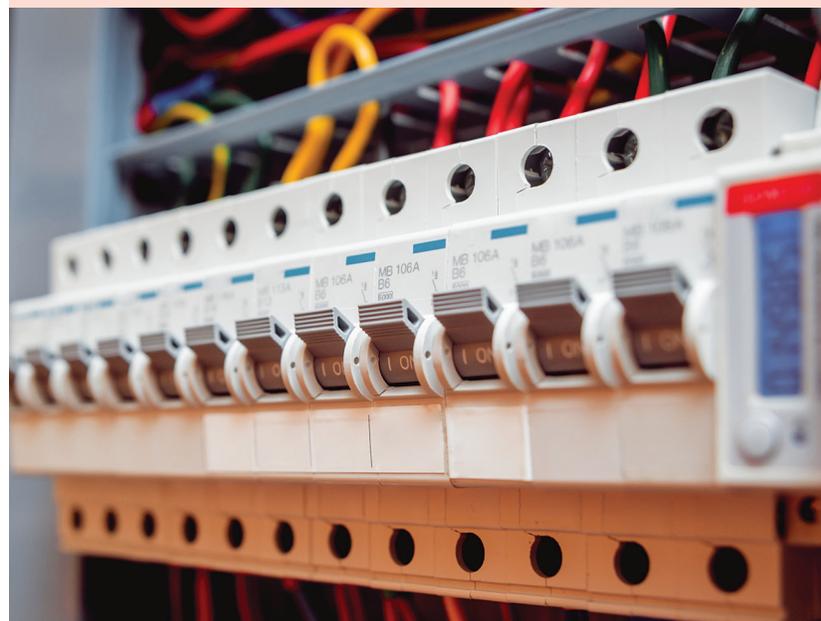
Occurs when the voltage in an electrical circuit is raised above its upper design limit. Overvoltage events can be transient (i.e. a temporary spike in the voltage) or permanent, leading to a power surge. Typical causes of overvoltage are insulation failure and poor regulation of power sources.

Undervoltage

Occurs when the voltage in an electrical circuit drops below the lower design limit, and is often referred to as a 'brown out'. A common cause of undervoltage is the starting up of large loads. Electro-mechanical components, such as single and three-phase motors, are designed to operate at very specific voltages. Devices allowed to operate at a reduced voltage will result in them drawing a higher current and inducing an overcurrent event.

Overcurrent

Occurs when a larger-than-intended electrical current is drawn through an electrical circuit, leading to an excessive build-up of heat. The rise in temperature of the winding coils can cause damage to the critical insulation that protects them. Prolonged operation can lead to life cycle reduction, and premature and/or catastrophic failure.



Air conditioning systems

Dirt, debris, insects and animals may find their way into air conditioning systems during a period of shutdown, so it is worth completing a few basic visual checks before restarting:

- Inspect the cooling unit for signs of damage, cracks or new signs of corrosion. If any irregularities are noted, HVAC service company should be notified.
- Remove any temporary covers and clean the condenser unit, removing any leaves or debris that may have accumulated.
- Verify refrigerant lines and gas pressure. If the pressure in the system is low, seek advice from your HVAC service company.
- Inspect the air filter and clean or replace as necessary.
- Ensure grills are free from debris.
- Remove any stagnant water that may have accumulated.
- Ensure all drains are clear of obstructions.
- Ventilate internal areas. Open windows and doors to allow fresh air to circulate prior to turning the system back on, and close before starting up the system (running the system with windows and doors open will put it under increased stress).
- Compressor power should be started 8 hours before allowing controls to be activated to provide crankcase heaters to operate and reduce the refrigerant migration which occurs with extended shutdowns.
- Turn on the system, gradually bringing it online. Allow the system to run for 20 minutes at a low load until you can feel the air being cooled/heated.
- Slowly increase/decrease the setpoint by a couple of degrees every hour until the desired conditions are achieved.
- Verify the thermostat is set to the correct temperature. This will depend on seasonal conditions (cooling in summer, heating in winter).
- Check the condenser is running. During summer, the air coming out of the top should feel warm as the warm air is being removed from the building.

Local exhaust and ventilation systems

When these systems have been out of use for some time, there is the possibility of occurrences that could lead to damage and/or reduction in operational efficiency. Before the system is restarted, a visual check of the system should be undertaken to include:

- Fans and filters
- Water ingress
- Dampness in the system (which could lead to heavy residue 'caking' in the filters)
- Vermin ingress and nesting

Hot and cold water systems

Ideally, for extended shutdown periods, hot and cold water systems should be decommissioned and emptied of contents as far as practicable. If they have been isolated and not drained in the correct manner in preparation for a shutdown period, there is the potential for the presence of Legionella bacteria. This is the cause of Legionnaires' disease. Still or stagnant systems offer Legionella bacteria favorable conditions to thrive.

Commonly found in hot and cold water systems, Legionella bacteria (the cause of Legionnaires' disease; a type of pneumonia) can be contracted by the inhalation of water droplets. These water droplets are present at most system outlets such as shower heads, baths, taps, wet air conditioning systems, whirlpool baths and hydrotherapy pools.

Commercial property owners/building managers should carry out a full Legionella risk assessment of their hot and cold water systems following an extended shut down period, and ensure satisfactory measures are in place to control the risk.

The advice of a water treatment professional should be sought when reinstating these systems.

Pressure systems

Steam boilers/systems

If shut down for extended periods, steam boilers/systems can experience an introduction of condensate in the pipework. This can lead to potential water hammer hazards (caused by the introduction of steam into cold pipework that has not been sufficiently drained) which can cause injury to operating personnel and others working within the vicinity of the plant. Therefore, the following steps should be considered to minimize the hazard:

- Introduce steam into the cold pipework gradually to avoid the risk of thermal shock and to reduce the chance of water hammer.
- Ensure the pipework system is completely drained when cold, and pay attention to areas where condensate can collect, which might include sagging lengths of pipework, vertical legs, changes of slope, dead ends, etc.
- Inspect steam traps in accordance with manufacturers' instructions.
- Use isolating valves to permit the gradual warming of the system.

Compressed air systems

- Check compressor oil levels are correct.
- Ensure all compressors are well ventilated.
- Drain all dryers, traps, pipework and receivers of condensate.
- Ensure all filters are clean.

Hot water boilers/heaters

- Ensure air is completely vented from the system.

All machinery/mechanical systems/installations being brought back online should have all protective devices tested under normal operating parameters to ensure they are suitable for further service. Any defects found should be rectified before machinery/mechanical systems/installations are brought back online.



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This article is intended for information purposes only. All recommendations are general guidelines and are not intended to be exhaustive or complete, nor are they designed to replace information or instructions from the manufacturer of your equipment. Contact your equipment service representative or manufacturer with specific questions.

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