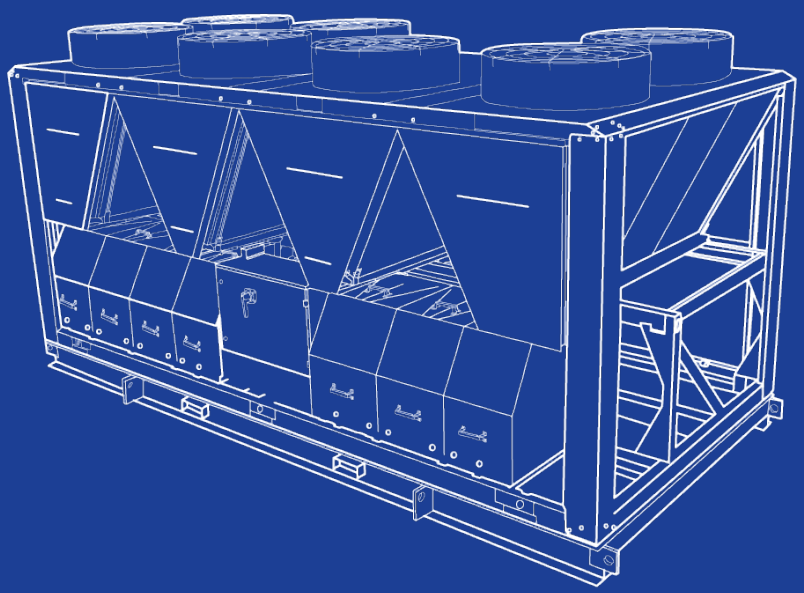
The Ultimate Chiller Survival Guide



ACTIVEAir

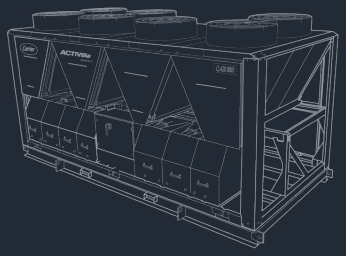
CONTENTS

Chillers fail. And they always fail at the worst possible time.

That's why it's so important to know the signs and have a backup plan in place.

In this guide you will find:

- A breakdown of the signs to look for that indicate your chiller may fail
- Maintenance tips to help improve your chiller's work rate
- A step by step guide to building a contingency plan so that if your chiller does fail, you have a backup plan ready to go
- Details on what to do when your chiller does fail, to minimise downtime



SECTION 1

Why Do Chillers Fail?

While you can’t always predict when your chiller is going to fail, there are some signs you can look out for to help you better prepare for potential downtime.

There are many causes of chiller failure; here are some of the most common.

The Chiller's Past Performance

The number one indicator of potential chiller failure is its history of reliability. If your chiller struggled last summer and you haven't made any major repairs, chances are it's going to struggle again.

The Chiller's Age

Although chillers can last 20-30 years (or even longer with proper maintenance), their reliability starts to waiver as they get older. If your chiller is 15 years or older, it's time to start planning for backup.

Lack Of Maintenance

Improper or infrequent maintenance is arguably the biggest contributor to chiller failure. Scheduled checks are required to ensure the chiller is kept in optimal working condition.

Poor Operating Procedures

Poor practices usually start off as quick fixes. But over time, they become part of the standard operating procedure which can lead to long term damage and cause chiller failure.

Idle Time

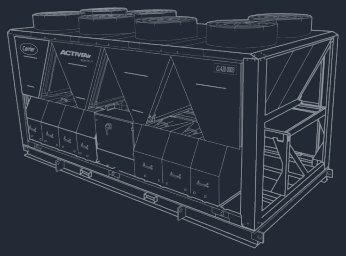
Chillers left idle for a long period of time are also at risk of becoming unreliable if they aren't properly maintained.

Oversizing / Undersizing

Improper sizing has a huge impact on the efficiency and lifespan of a chiller. Under-sizing can result in insufficient air flow meaning the chiller won't be able to achieve its full capacity, while over-sizing might restrict the low-load operations which can result in higher operating costs due to excessive cycling.

Ignoring Cooling Towers

Cooling towers are often forgotten because they're usually located on a building's roof. And as they can be exposed to harsh elements, over time they end up collecting a lot of dirt and debris which can clog the air and water passages.



SECTION 2

How To Help Your Chiller Survive The Summer

While there’s no full-proof way of stopping chiller failure, there are a number of steps you can take to ensure smooth operation and prolong its lifespan.

Take these steps to help prolong your chiller's lifespan.

1) Keep A Log

Maintaining a daily log forms the basis of any good chiller maintenance program. Keeping an ongoing record of specific operating conditions will help you identify inefficiencies long before they become a problem.

You should log details including:

- Flow rates
- Pressures
- Fluid levels
- Temperatures

> *NOTE: Make sure to record these stats at regular intervals throughout a 24-hour operating period.*

You also need to make time to review the logs. As most chiller problems tend to develop slowly over time, it can be easy to overlook slight discrepancies in the chiller's operating parameters. By regularly reviewing your maintenance log, you will be able to spot trends in the stats and address them right away.

2) Regular Maintenance

As part of the daily monitoring process, you should also be performing regular maintenance checks. These checks should only take a couple of minutes to perform each day and could save you a lot of downtime in the long run.

Use a daily log sheet to keep track of whether checks have been conducted as well as any maintenance that has been carried out.

Technicians should note any maintenance was performed and who it was performed by. The key is to ensure every detail is recorded, no matter how small the maintenance was (even if it's just topping up the oil).

You should also perform more in-depth checks on a weekly or monthly basis. For these checks, you will need to look inside the chiller.

If your chiller is used on a seasonal basis, you should also perform extensive checks twice a year - at the start of the season, and before shutting down at the end of the season.

WHAT YOU SHOULD BE CHECKING

Controls
On a daily basis, you should be checking the chiller's control centre for any fault codes. You should also test and calibrate your controls quarterly to ensure the sensors are accurate and not sending incorrect signals to the control centre.

Air Handling Unit
Check your air handling unit at least quarterly for buildup of dust, dirt, and mold.

Leaks
Check to make sure there are no refrigerant or air leaks daily.

Heat Exchangers
An eddy current test should be conducted every year to check the integrity of your heat exchanger's tubes and determine whether they need to be replaced.

Every couple of years, you should also check and clean the heat exchanger tubes to ensure there is no scale. This should be done before conducting any audit to ensure your data is accurate.

Condenser Coils
Inspect and clean the condenser coils daily to remove clogging and ensure free air passage.

Refrigerant
During your daily checks, you should ensure the refrigerant is properly charged.

You should also check the refrigerant charge levels on a yearly basis. Conduct an analysis of the refrigerant to identify any presence of contaminants in the chiller system, including, rust, sludge, or harmful acids.

Water
Check the condenser water loops daily and clear out any debris, fouling, or scaling.

The water in your system should be treated annually to help safeguard against scale, corrosion, and biological growth.

Oils
You should conduct an oil analysis on a quarterly basis, checking for contaminants including metallic content and acidity. On a yearly basis, you should have the oil filters changed by a professional.

WHAT YOU SHOULD BE CHECKING (CONT.)

Pumps
Check the pump shaft for any minor damage or discolouration on a weekly or monthly basis. You should also lubricate the pump seal to prevent dryness and flush the pump to prevent deposits from forming.

At the end of each season, you should check your pumps for any leakages in the seals, damage to the shafts, as well as any rust or corrosion.

Vents
Every week you should check and clean your chiller's air intake vents to remove any build up of dust and other blockages and ensure proper air flow around your chiller.

Pipework
On a weekly basis, check that there are no fluids leaking or seeping from the chiller. If you come across any leaks, it's best to call an expert.

Cooling Towers
Check your cooling towers at least once a month. Remove any debris, including leaves, dirt and anything else that may clog the air and water passages. Also check the spray nozzles for any biological growth.

You should implement a water-treatment program every year to minimise the amount of solids in the tower's water system.

Tubes
On a daily basis, check the tubes for fouling. Your chiller's tubes should also be tested for leaks on a quarterly basis.

Clean your chiller's tubes once a year to remove any buildup including scale, mud, sludge, or algae. Ideally you should do this prior to starting up the chiller for the new season.

Thermostat
Reprogram your thermostat at the start of each season. You may need to bring in a professional to recalibrate, repair, or replace broken thermostats.

Condensation
Check for any excessive condensation as part of your daily process.

Debris
Every week you should check that there is no debris inside or around the chiller.

Noises
During the daily rounds, listen for any usual noises and vibrations and investigate to find the source.

Fixings & Fastenings
On a monthly basis, check all the fixings and fastenings, including hinges, locks, and screws, to ensure everything is tightly secured.

Vibration Analysis
Once a year you should perform a vibration analysis to identify issues with the bearings and determine if any have failed or are failing.

Check The Chiller When Restarting Your Chiller After The Off-Season
If you're starting your chiller back up after the winter period, you should record key data and compare them to the previous period to ensure it's running efficiently and catch any potential problems early on.

You should look at temperature readings, fluid levels, pressure readings, and flow rates.

3) Conduct An Audit

Every three months, you should conduct an audit to identify your chiller's operating efficiencies. Your audit should run over a minimum of three weeks up to a couple of months to get a reliable picture. You should review whether the data falls within the standard/normal operating range. And if it doesn't, you will need to look into what may be impacting the chiller's ability to operate inside of its ideal range.

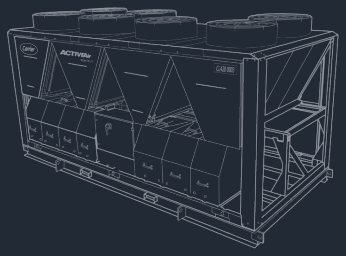
4) Follow Recommendations

To ensure your chiller is operating at optimal efficiency, you should always follow the recommendations outlined in the chiller's manual.

You should also consult a qualified technician when maintenance is required.

5) Check The Standard Operating Procedures

Take some time to review the standard operating procedures and whether they're being properly followed by your technicians. Make note of any poor practices that may have become part of the regular process and move to eliminate them by providing staff with training. Follow up regularly with your technicians to ensure the proper procedures continue being met.



SECTION 3

Creating A Contingency Plan

Contingency planning is important in ensuring minimal downtime and losses in the instance your chiller fails. This section will help you create a contingency plan.

Why Do You Need A Contingency Plan?

Contingency planning is important whether your chiller is brand new or over 20 years old. You never know when a chiller may fail you, and often times it happens when you least expect and at the worst possible moment.

Bringing in a replacement chiller isn't always a straightforward process. Many factors need to be considered, including the size of the chiller, the space available, the access points, and the power available. By creating a contingency plan, you ensure that you can act as quickly as possible to get your system back up and running, and minimise downtime as well as any financial loss.

This is especially important if your chiller is used for a critical environment, such as a hospital or operating theatre, laboratories, warehouse for perishable items, certain production environments, etc.

Having a backup plan will also help reduce stress in an emergency situation. When disaster strikes, a contingency plan will give you a step-by-step action plan of what needs to happen. So instead of panicking, you can get straight to work sorting out the problem.

It will also give everyone involved a clear idea of their role in the process and the actions they need to take to restore the system. Contingency planning allows for the entire process to run much more smoothly and reduce potential hiccups that can occur when a plan hasn't been properly laid out.

In the event a replacement chiller is required, the wait time can be several months. And the cost of a new chiller can be quite draining on budgets, meaning a longer term (e.g., up to 12 months) solution may need to be implemented. Planning for this scenario will help keep your costs as low as possible.

Contingency planning can take a fair amount of time, but it will be effort well spent if you ever need to enact the plan.

Who Needs A Contingency Plan?

Anyone who manages a chiller requires some form a contingency plan.

The type of plan and level of detail depends on whether your chiller usage is considered critical. For example, if your chiller is used for basic air conditioning / cooling, then your dependency on your chiller is not as critical as say a hospital which requires cooling to operate on patients.

We've split the types of chiller usage into three main areas:

1) COMFORT

This is the least critical environment from a chiller failure perspective. As the chiller is providing cooling for basic comfort there are fallback options available which don't require a replacement chiller being installed. While your chiller is being fixed, portable air conditioners can provide temporary relief.

While the dependency on a chiller may not be crucial, it is still worthwhile having a contingency plan in place; it will allow you to implement a solution as quickly and stress-free as possible. Your plan may just be a little more flexible in terms of the type of solution to be implemented and the expectations for turnaround time.

2) PRODUCTION

The second type of chiller usage is for production purposes. This is when a chiller is used to provide cooling for production which is temperature-sensitive. For example print processes and plastic production require temperatures to be maintained at a certain level to ensure proper production.

Contingency planning is important in this instance as it helps reduce potential financial loss through lost production. The longer production stops, the greater the financial loss, which means you need a contingency plan that can be implemented relatively quickly.

3) ESSENTIAL

These are the most critical environments which a chiller can operate within. Essentially, this includes any environment which lives may depend on or which may cause irreparable loss (financial or otherwise).

Hospitals and operating theatres are the main examples of critical environments, as patients' lives are potentially at risk and specific temperatures are required for operations to take place.

Laboratories and morgues are an example where major loss can occur if the chiller fails; specific temperatures must be maintained in order to preserve things such as DNA.

Certain warehouse facilities, such as those holding pharmaceuticals or highly perishable items, are also considered critical environments as a chiller failure may see huge financial losses via the spoiled stock. If your chiller preserves items which are sensitive to heat and/or may expire due to changes in temperature, a contingency plan is extremely important.

In these situations, you must have a contingency plan which clearly outlines what is to happen in an emergency situation and the timeframe required.

How To Create A Contingency Plan

Your contingency plan should be a fairly technical document and requires a detailed understanding of your entire chiller system. It's best to bring in someone who can work with you to create the plan if you do not have the technical understanding required.

RISK ASSESSMENT

The first step to creating a contingency plan is to determine the critical equipment which is at risk. In this instance we're specifically focused on chillers, so you'll need to list the number of chillers you're creating the plan for.

You will then need to determine the actual risks. List all the potential problems that could occur; anything from a power outage through to a natural disaster.

Next, map out the worst case scenario; imagine your chiller breaks down during the hottest time of year. What would happen? Detail the impact of the chiller being unavailable for different amounts of time; one minute, one hour, one day, one week, one month. Is there an existing fall back in place for the chiller failing? Can the system or building continue functioning without it? And if so, for how long?

IDENTIFY EQUIPMENT & SERVICES REQUIRED

Once you've completed your risk assessment, the next step is to list the equipment required.

For this part, it's best to bring in the supplier who will be providing the equipment as they will be able to determine the exact equipment you will need.

When creating the list of equipment, don't forget to include accessories and ancillary equipment, including pumps, hoses, valves, fittings, ducts, and cables.

You will also need to determine what additional services you require to get the equipment installed and commissioned. This may include services such as rigging, forklifts or cranes, electricians, pipe fitters, etc.

To determine the equipment required, you will need to review a number of things:

The Existing Chiller
What is the size of your existing chiller? Is it air cooled or water cooled? Will the temporary replacement chiller be able to use the existing pumps? What are the water connection size requirements?

The Power Available
Is there enough power available to run a temporary chiller? If not, you will need to consider hiring a generator. If power is available, how can it be accessed? Are access valves available? Have the tale offs already been fitted? What is the available voltage? What is the total amperage?

Accessing The Location
How accessible is the site? How difficult will it be to get a temporary chiller onto the site? Is the building located on a busy street? How secure is the location? How wide is the driveway? How close can the temporary chiller be positioned to the system? Will there be any potential issues around noise?

These are just some of the considerations you will need to be aware of when determining the type of equipment you will need and the process for getting it installed. The best way to know for sure is to have your preferred supplier conduct a site visit and draw up a plan for you.

You should also use this time to determine whether any changes need to be made to the building, in preparation for an emergency, in order to streamline the installation of a temporary system. Changes such as adding access valves in large pipes may end up saving you both time and money in the event of an emergency.

CREATE THE PLAN

The next step is to formalise the plan.

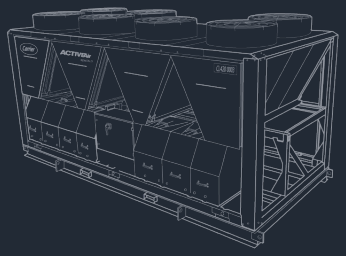
You will need to detail the steps to be taken to install the equipment. You should draw up the layout of the equipment and also take photos of the areas in which the equipment will be installed along with photos of the access points. This will help the suppliers get the equipment installed as smoothly as possible.

You should also outline detailed directions for the suppliers delivering the equipment.

Your plan should also include a contact list with all the relevant personnels' details, both internal and external. Include the key contacts for the vendors you have selected, along with the building's owners and managers, maintenance personnel and technicians, and anyone else who may be affected by the system breakdown.

Your contingency plan should also include a budget, outlining all of the expected costs associated with getting the temporary system in place. Having these costs planned for and preapproved will save you time and reduce stress in the event it needs to be activated, as everyone involved will have an understanding of both the expense required and the potential cost of not going ahead with it.

Finally, once you've formalised your contingency plan, don't forget to share the document with all of the building's occupants.



SECTION 4

What To Do If Your Chiller Fails

If your chiller has failed, chances are you will need a temporary solution until your chiller is fixed or replaced.

If you've taken the time to create a contingency plan, that's great! You will know exactly what to do; just follow your detailed action plan.

If, however, you don't have a plan in place, the best thing to do is call a chiller rental supplier and get them to come out and inspect your site. Depending on the critical nature of your chiller system (refer to section 3), you may need them to come out as quickly as possible to determine the best solution.

Work with your supplier to determine the additional services required to get the temporary solution installed.

To speed up the process, you should try and have as many of these answers as possible:

- What does the chiller service? Is the replacement chiller needed right away or can it wait a few days?
- What capacity is required (in kW)?
- Is it air cooled or water cooled?
- How will the temporary chiller be connected into the system?
- Will you be able to use the existing pumps?
- Is sufficient power available or will a generator be required?
- Where will the chiller be placed? Is there enough space close enough to the system?
- Is access to the site clear and can trucks get in, or is it more complicated?
- How will the temporary chiller be integrated into the existing building management system (BMS)?

The answers to these questions will help your rental supplier determine the best solution and method of getting your system back up and running.

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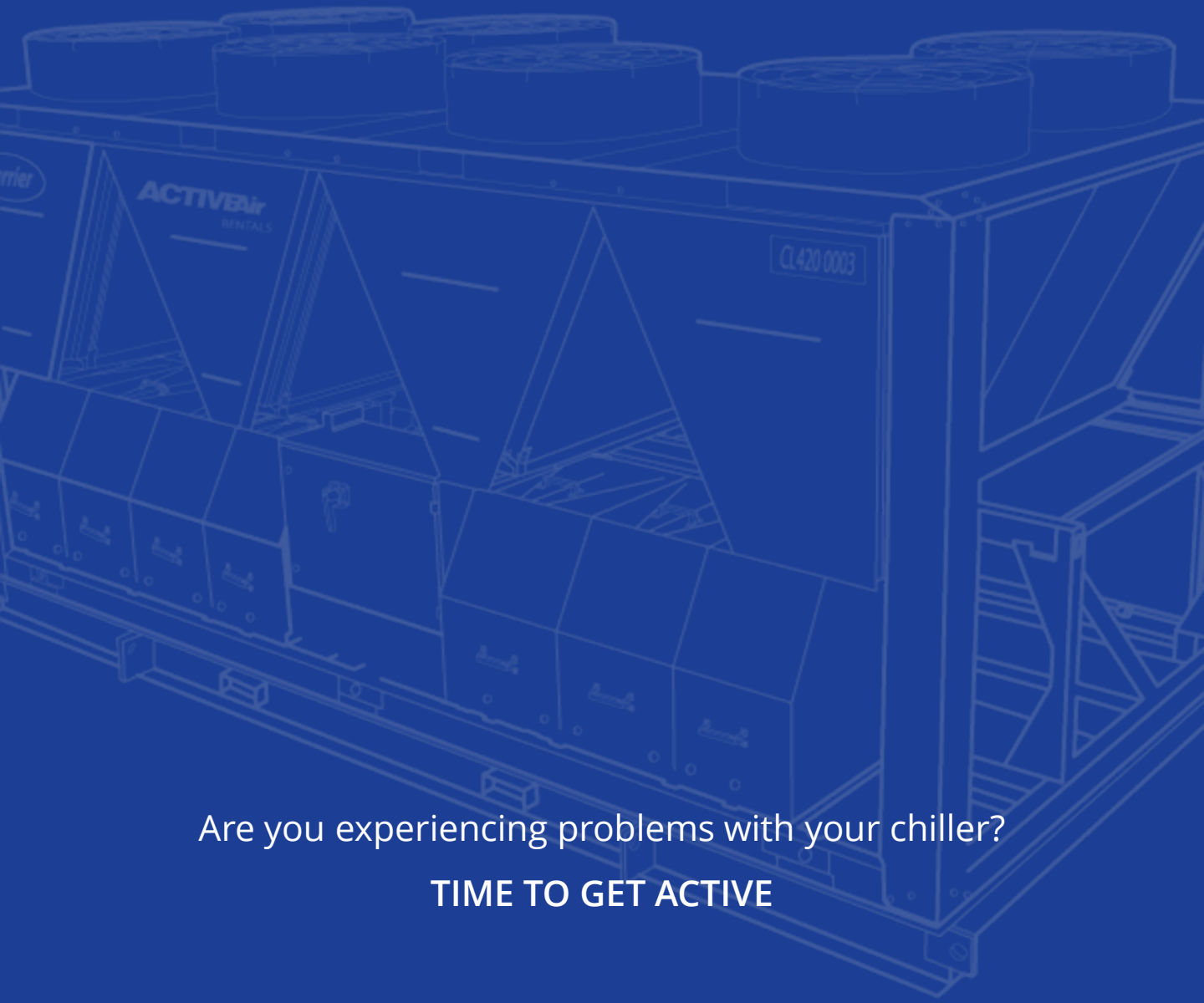

Are you experiencing problems with your chiller?

TIME TO GET ACTIVE

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