THE WATER MANAGEMENT SOCIETY

The Control of Legionella Bacteria in Dry/Wet Cooling Systems

(Sometimes referred to as "Hybrid" and "Adiabatic" coolers)

Guidance produced by
Water Management Society Working Party

First published November 2010
Amended January 2020

Original Working Party members:
John Alvey • David Bebbington
Bob Macleod-Smith • Giles Green • Colin Brown

Amended March 2021 by:
Giles Green • Colin Brown • Garry Kerin

The Water Management Society wishes to acknowledge the support of the Health and Safety Executive in producing this guidance.

The Control of Legionella in Dry/Wet Cooling Systems

1. In recent years there has been increasing use of dry/wet systems which are described in HSG274 Part 1 paragraphs 1.18-1.21. These are designed to operate both in dry air cooled mode and wet evaporative cooling mode. There are different types of dry/wet systems and these can have a wide range of risk profiles. In this document they are referred to as dry/wet coolers, however they are sometimes referred to as "hybrid" or "adiabatic" coolers. This WMSoc document is designed to supplement HSG274 Part 1 with more detailed information to help evaluate between different designs and risk profiles of dry/wet cooling equipment.

2. This guidance is to help dutyholders, which includes employers, those in control of premises and those with health and safety responsibilities for others, to comply with their legal duties. It gives practical guidance on how to assess and control the risks from legionella bacteria in dry/wet cooling systems.

3. Any water system that has the right environmental conditions could potentially be a source for legionella bacteria growth. There is a reasonably foreseeable risk in your water system if:

   - Water is stored or re-circulated as part of your system,
   - The water temperature in all or parts of your system may be between 20-45°C,
   - There are deposits that can support bacterial growth, such as rust, sludge, scale and organic matter,
   - It is possible for water droplets to be produced and, if so, for them to be dispersed,
   - It is likely that any of your employees, contractors, visitors etc could be exposed to any contaminated water droplets.

4. The control of legionella in dry/wet systems is included in the Health and Safety Executive's (HSE) Legionella Technical Guidance HSG274 Part 1 that accompanies the HSE Approved Code of Practice L8 (4th edition).

5. The Water Management Society (WMSoc) has undertaken to draw together people with expertise in the subject and those with knowledge in the control of legionella, as a working group to supplement HSG274 Part 1 and provide more detailed guidance in the control of legionella in these systems. The guidance offered here is the considered opinion of the WMSoc.

6. This is one of a series of guidance documents being produced by the WMSoc for the control of legionella in less common and 'Other Risk' systems.

Types of dry/wet systems

7. Conventional open and closed circuit cooling towers and evaporative condensers use the evaporative cooling principle for their operation and are known as 'wet' cooling systems. Further information can be found in HSG274 Part 1 paragraphs 1.14 – 1.17.

8. It is important to understand how the dry/wet system is being operated as the legionella risk can vary greatly depending on the design and operation. Some systems that operate in wet mode rely on the evaporative cooling principle in the same way as cooling towers and evaporative condensers, whilst some dry/wet systems use pre-cooling of the incoming air with water, usually by spraying water into the air stream or by trickling it over a medium through which air passes, to increase the cooling performance.

9. Certain dry/wet systems must be notified to the local authority in accordance with the Notification of Cooling Towers and Evaporative Condenser Regulations 1992 (Notification Regulations) and paragraph 38 of this document provides further guidance on assessing such systems against the notification requirements of the Regulations to determine if they need to be registered.

10. When assessing the range of risks associated with dry/wet systems it should be noted that this applies to both new and retro-fitted units. Designs range from a crude add-on spray system in front of the heat exchange coils, to units that are specifically designed to prevent or control the risk of legionella. Those systems that create aerosols, or where the water is sprayed into the air stream from a stored or recirculated water source, might pose a considerable legionella risk, especially where cooling in wet mode is infrequent or does not take place for prolonged periods. The risk is reduced in dry/wet systems that avoid the generation of aerosols or where there is no storage or recirculation of water.

11. There are also different levels of control for determining when to use the water system for cooling the air. In its simplest form, the water is turned on manually or automatically when additional cooling is required. Others have sophisticated controls that only activate the water system when the load or ambient temperature indicates that dry operation alone cannot achieve the desired cooling. Likewise, these controls turn off the water to allow the system to operate in dry mode when the load or ambient temperature drops. It is especially important to assess the risk presented by retro-fitted water spray systems as these will often not have an integrated design to assure minimum generation of aerosols, control of the wet operation, avoidance of water stagnation, etc.

Risk Assessment

12. The starting point with dry/wet systems is the same as for a conventional evaporative cooling system. A risk assessment must be carried out to determine if the system, including any storage tanks or other make up water components, could act as a multiplication and dissemination device for legionella bacteria. The assessment determines the level of the risk and which control measures are necessary. It should also identify the person responsible for monitoring these control measures to ensure they are carried out at the correct frequency and remain effective.

13. The recommendations made in this guidance document should be taken into account, but dutyholders must ensure that each system has its own specific risk assessment. For each system, local factors such as design, duration and frequency of operation and environment, as well as the previous history of the system need to be considered. Dry/wet cooling systems can vary widely in design and the implications of the variations should be understood. It is important that the person chosen to risk assess such systems has a suitable degree of competence, including training and experience, in order to complete the task of producing a suitable and sufficient risk assessment.

14. Working on a dry wet cooling system will require a task risk assessment which may indicate the need for control measures such as minimisation of splash and spray, and/or the use of PPE including respiratory protective equipment (RPE).

Guidance on Factors and Controls Affecting Legionella Risks

15. As with all water systems, dry/wet systems require a risk assessment to identify and assess the risk of exposure to legionella bacteria. This applies in all cases even when the design of the cooler minimises the risk.

16. The following factors need to be considered when assessing the risk of dry/wet coolers or condensers causing cases of legionnaires' disease.

Exposure to aerosols

17. Some dry/wet systems generate aerosols as part of their normal operation, whereas other types of systems do not. If aerosols are not generated then the possibility of disseminating legionella bacteria should be minimal; however, aerosols may be released at times e.g. during changeover from dry to wet operation, times of abnormal operation or during maintenance. The amount of spray generated may also be influenced by the number and orientation of nozzles, the system pressure, the nozzle orifice size, the prevailing wind directions, etc. Special precautions must be stated within the written scheme of control to take any release of aerosol into account.

18. It is best to select a design of dry/wet system that minimises aerosols. If a design that creates aerosols is being used then special care must be taken to ensure that the aerosols do not contain legionella. For spray-type coolers where the water is stored or recirculated, the risk of bacteria in the aerosols must be prevented by proven chemical or physical controls, see paragraph 20 of this document, and a scheme must be put in place that will ensure the controls remain effective.

19. Extra precautions will be necessary if susceptible people, e.g. the immunosuppressed, could inhale aerosols from the system.

Water quality

20. Water used in dry/wet systems needs to be of suitable quality and may need to be treated further to avoid scaling, corrosion, fouling and biological growth. Water treatment regimes vary according to the water quality and requirements of the system, including materials of construction and taking into account the effect of concentration of any dissolved material as water evaporates from the cooling batteries; however, the following elements will usually need to be considered.

    Pre-treatment - softening, reverse osmosis etc.

    Water conditioning - Scale and Corrosion control by the addition of chemicals - scale and corrosion control can be achieved by measured automatic dosing of a proprietary scale and corrosion inhibitor. Dosing inhibitor must take into consideration the materials of construction.

    Fouling - wetted surfaces in the air stream frequently collect contaminants, whilst hard water can form scale deposits, so a regime of inspection and cleaning is required.

    Bleed - recirculating systems accumulate impurities, so a means of controlling the level is usually necessary. This often takes the form of an automatic bleed of part or all of the water.

Microbiological control - biocidal control of the make-up water should not be necessary; however, where water is stored or does not drain when switching back to dry mode, microbiological controls will normally be necessary. The microbiocidal control regime may include the use of chemical biocides and ultraviolet light. The pattern of dry and wet operation and the potential for stagnation when operating in dry mode need to be taken into account. Care should be taken in using biocides to ensure biocide residuals carried in the aerosol are not hazardous to health. Biocides must also be controlled in order to minimise potential corrosion risks.

Disinfection - in addition to treatment of the make-up water, all wetted parts of the system will require disinfection from time to time, such as prior to start up after a prolonged period of operation in dry mode or following modification or repair etc.

Temperature

21. Legionella bacteria are said to be dormant at temperatures below 20ºC and if the water stays below this temperature, growth will be minimal. However, if there are warm stagnant places within a normally cold system, legionella might grow in these areas and inoculate the rest of the system. Town mains supply water is normally below 20ºC, but if the supply pipes run through a factory or office they may be exposed to much higher temperatures allowing legionella bacteria to proliferate (temperatures of 20 to 45ºC will allow this). Storage tanks can be heated either from the direct sunlight or from their general environment. Similarly, in systems that recirculate water, heat transferred from cooling fins may result in water temperatures that are conducive to legionella growth. The system that supplies the water needs to be considered fully when assessing the risks of dry/wet systems.

Stagnation

22. Dry/wet coolers usually operate with water during the warmer parts of the year, but there may be times (such as spring and autumn) when the systems operate intermittently and might operate only in dry mode for considerable periods during which stagnation is likely to occur. This will require appropriate control measures e.g. draining and flushing of all parts (including, and where applicable, spray bars and ponds) or water treatment. Deadlegs, blind ends, and duty/standby loops and/or equipment in the feed-water line can all result in stagnation so must be managed to prevent growth of bacteria, or preferably be removed.

23. If the water supply is via a break tank, then the tank needs to be considered as part of the system, inspected, cleaned and disinfected in accordance with the risk assessment which needs to consider water consumption and turnover patterns.

Contamination

24. Contamination of dry/wet systems is normally either from the air or from the water. The air will contain contaminants such as insects, traffic or combustion fumes, dust, pollens etc. which can adhere to surfaces and contaminate the water directly providing nutrients which can promote the growth of microorganisms and reduce heat transfer. This can contribute to the legionellosis risk and also impair the performance of the plant if they accumulate on heat exchange surfaces.

25. Where wetted cooling pads are used ahead of the fins, these will not only reduce the risk of aerosol generation but also collect the precipitated salts and the airborne contaminants. The pads therefore act as air filters, which helps to prevent the contamination of the heat exchange surfaces, helping to maintain good heat transfer; however, all parts of the system need to be regularly inspected, cleaned, disinfected or replaced as required.

26. In systems that recirculate water, problems due to contaminants are likely to be greater and should be taken into account in the maintenance, cleaning and disinfection programme for the system.

27. The main control measure is to keep the equipment in a clean condition. This includes heat exchanger fins. Dirty fins result in corrosion and higher energy use, and where the dirt accumulates is where any residual water will reach its hottest temperature. This water on the fins could be as a result of the dry/wet cooling process but may also result from rainfall. If there is any moisture present on the fins then bacteria can grow within the pollutants trapped within the fins.

28. A regular regime of inspection and fin cleaning is recommended, the frequency depending upon the nature of local airborne contaminants and their rate of accumulation. It is normally recommended that a frequent inspection regime is introduced initially and subsequent inspection and cleaning adjusted according to the risk assessments and results obtained.

29. Corrosion, fouling or excessive dirt found anywhere in the system during inspection should be dealt with as soon as possible e.g. by cleaning and coating, or refurbishment.

30. Materials of construction that do not support microbial growth also need to be employed. Where possible, all components coming into contact with water should be WRAS approved. In addition, the coil matrix can have enhanced protection from contamination by the addition of approved coatings. Air screens will help improve cleanliness and thermal efficiency. Suitable and safe access points will aid operations.

31. In systems that operate by recirculating water, environmental contamination of the system will be greater. Particular attention should be given to the cleanliness of the system to ensure that the levels of contamination do not become excessive.

Maintenance, Cleaning and Disinfection

32. The risk assessment should consider the comprehensiveness of the maintenance schedule, the frequency of cleaning and disinfection, the ease of access to those components that require cleaning and the risks to the operatives who are carrying out the maintenance and cleaning as well as others in the vicinity during the work.

Management and Procedures

33. The management structure and procedures, definition of responsibilities, appointment of the responsible person, training and competence of personnel together with a current system line diagram are all essential elements for consideration when assessing the risk.

34. It is essential that the legionella risk assessment and written scheme are regularly reviewed to ensure they remain relevant and up to date in assessing and controlling the risk.

35. The written scheme will vary according to the characteristics of the system and the risk factors identified in the risk assessment. For example, circulating water is likely to accumulate contaminants more rapidly than water which flows continuously to drain. Similarly, a system which incorporates sprays is likely to disseminate more droplets than one which wets absorbent pads by a splash free trickle mechanism. Where there are components such as water softeners and storage tanks, the written scheme should follow HSE guidance in the relevant part of HSG 274.

36. Whilst some dry/wet systems fall within the legal definition of an evaporative condenser (see below, *Notification of cooling towers and evaporative condensers regulations*), the scheme of control will typically be quite different from that required by a cooling tower system or evaporative condenser. Rather than applying a set of controls which maintain strict limits to the scaling and corrosion tendencies of the water and inhibiting microbiological activity in an environment highly conducive to growth, the strategy in dry/wet systems might be to:

- Completely empty the parts of the system which deliver the water in dry mode, for example by installing some components at a slight angle to create a "fall" to suitably placed drain points.

- Prevent conditions conducive to growth in wet mode by operating in wet mode with the water passing through from supply to air cooling zone to drain with minimal residence time and either little or no temperature increase, or even a temperature reduction.

- Control growth by the application of one or more biocides or disinfect the water with UV. Appendix 2 offers some examples of model schedules which could be used to develop written schemes of control.

Record keeping

37. All control works must be completed at the frequency as determined by the risk assessment. Records of work carried out, i.e. control measure checks, maintenance, updating of the risk assessment, safe systems of working, system diagrams, management structure and training, should be kept for a minimum of five years.

Notification of Cooling Towers and Evaporative Condenser Regulations

38. Based on their design and operating design characteristics, some dry/wet systems may require notification. For example, for a dry/wet system where water is applied directly to the heat exchange surface, either by spray or by trickle, then the device requires notification. Whereas in systems where water is sprayed away from the heat exchanger into the approaching air or trickled onto a medium in front of the heat exchanger, then the device does not require notification. Appendix 1 provides more detail on the design and operation of dry/wet systems, with an indication as to whether they require notification under the Notification Regulations or not.

A 'notifiable device' means a cooling tower (a device whose main purpose is to cool water by direct contact between that water and a stream of air) or an evaporative condenser (a device whose main purpose is to cool a fluid by passing that fluid through a heat exchanger which is itself cooled by contact with water passing through a stream of air) except where it contains no water that is exposed to air; where its water supply is not connected; and where its electrical supply is not connected.

39. Due to their different principles of operation, it is important the risk profile of each system is taken into account as the legionella risk can vary greatly depending on the design and operation of the system. Both the HSE and Local Authorities are aware of dry/wet systems and that they can create a risk to public health depending on their design, operation and level of maintenance. There must be: -

- A legionella risk assessment,

- A written scheme to control the risk where it is assessed that there is a risk of exposure to legionella bacteria,

- Effective implementation of the scheme of control, management and regular documented reviews,

- Records of the operation, maintenance and monitoring of the system, and notification where required.

Appendix 1

Types of Dry/wet Systems

40. Dry/wet systems are an option for increasing the cooling capacity of a dry cooler/condenser (also known as air-cooled radiators or air blast coolers/condensers) where for much of the time it will operate in dry mode and then switch to wet mode operation for increased ambient and load conditions. There are many dry air-cooled systems which are retro-fitted with wet mode modifications.

41. To increase cooling capacity in wet mode, the incoming air is cooled by evaporation of water. Several configurations are used, the commonest being as follows:

- Water sprays directed away from the cooling coil into the incoming air
- Water sprays or trickles over the coil (deluge)
- Water sprays directed away from the cooling coil onto a medium such as a mesh
- Water trickling onto a porous medium or pad

In practice, those systems with sprays will frequently wet the cooling coil when the fan operates at high speed.

42. There are several different types of these, which are distinguished by the mechanism whereby the air is cooled. Some examples of these mechanisms are illustrated below in Figure 1:

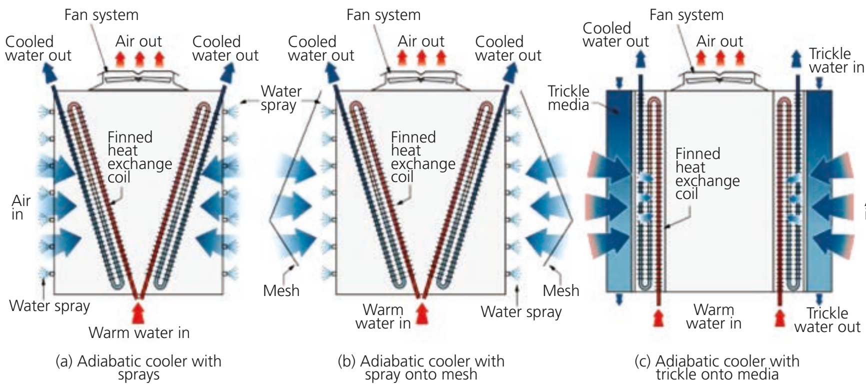

Fig. 1 Contains public sector information published by the Health and Safety Executive and licensed under the Open Government Licence

43. Where the device is designed such that the cooling coil is wetted in operation the dry/wet cooler is notifiable as an evaporative condenser, which is defined in the Notification Regulations as; "evaporative condenser" *means a device whose main purpose is to cool a fluid by passing that fluid through a heat exchanger which is itself cooled by contact with water passing through a stream of air.*

44. In some systems, excess water (i.e. that which is not evaporated in the evaporative cooling step) is collected and recirculated through the system. This will result in an accumulation of impurities in the water in the same way as in a cooling tower or evaporative condenser and is likely to lead to an increase in the microbiological load. This does not directly equate to an increase in a risk of legionellosis as the water temperature will frequently be below 20°C and aerosol generation and dissemination might be anything from nil to very substantial. These units will require the risk assessment and scheme of control to take account of this.

Typical system configurations

i. Spraying water away from the face of a finned coil

45. This type of equipment tends to be used as a conventional dry air cooler for long periods. Only when ambient temperatures or the cooling load rise, is water sprayed outwards in front of the coils to improve cooling effectiveness (see Figure 2). This spraying can produce significant amounts of aerosol in the vicinity of the unit which will be dispersed especially in windy conditions and, if the water has been standing in the supply system or a deadleg for some time, it may contain significant levels of bacteria including legionella. The aerosol will be disseminated into the surrounding area and if inhaled could constitute a high risk. Some of these systems are intended to evaporate all the water sprayed into the air but in practice this is difficult to achieve.

There is also a high risk of scale or other deposits precipitating onto the face of the coil/ fins as the water evaporates. This reduces the heat transfer effectiveness and so reduces any advantage of cooling the incoming air. This type of system does not require notification under the Notification Regulations.

Fig. 2 View of a dry/wet cooler with water spray outwards

Fig. 3 View of dry/wet cooler with water spray inwards

ii. Spraying water towards the face of the finned coil

46. As for i above, aerosols are produced and if the water contains significant levels of legionella, may similarly constitute a high risk. This method carries a high risk of scaling and corroding of the fins and would therefore require water treatment (see Figure 3). This type of system requires notification under the Notification Regulations.

iii. Spraying water onto a mesh-like structure from which it evaporates

47. As with items i and ii above, there remains substantial aerosol generation and dissemination. This type of system does not require notification under the Notification Regulations.

iv. Distributing water over cooling pads through which the air flows

48. This type of unit is specifically designed to avoid the generation of aerosols. When the unit is in wet mode, a regulated volume of water is distributed over pre-cooling media (usually cellulose pads) mounted in front of the heat exchange coils. Figure 4 illustrates this type of unit and Figure 5 shows the principle of operation where water is passed over / onto pre-cooling media, through which the air flows horizontally. A portion of the water is evaporated and there is normally an overfeed to help wash the pads. The intention of the design is to avoid creating aerosols, however, this is dependent on matching the air speed to the pads and coils as increasing the air speed might result in stripping water droplets, generating an aerosol and wetting the coil. This type of system does not require notification under the Notification Regulations.

Fig. 4 Dry/wet cooler with cooling pads

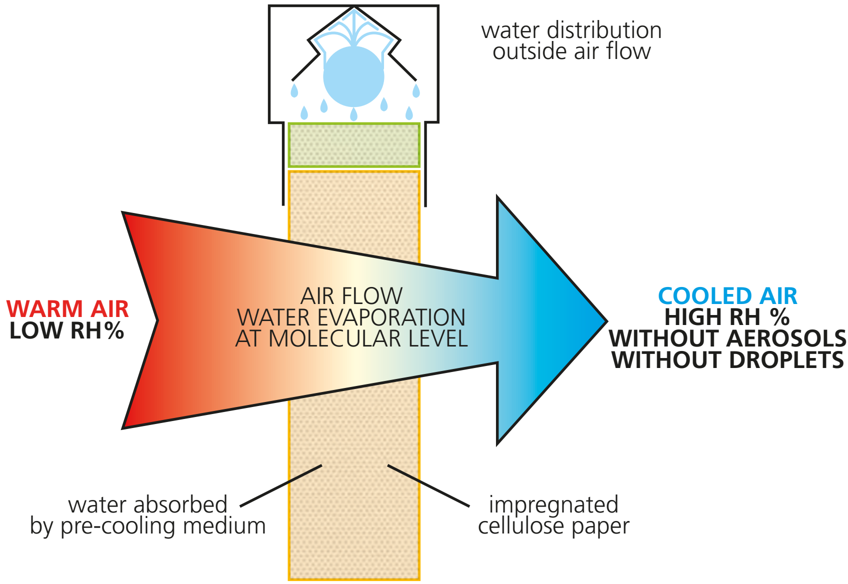

Fig. 5 Schematic showing how air is cooled within cooling pads without the generation of aerosols

Appendix 2

Some examples of model schedules which could be used to develop written schemes of control.

Dry/wet systems with once-through water sprays supplied with wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Monthly
	Inspect wetted parts including spray nozzles for scale and descale if required	Quarterly
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with once-through water sprays supplied with non-wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Weekly to monthly as indicated by risk assessment and inspection
	Inspect wetted parts including spray nozzles for scale and descale if required	Monthly to quarterly as indicated by risk assessment and inspection
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with circulating water sprays supplied with wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Empty and refill or flush the pond to replace the water	Daily (or nightly), or more frequently as indicated by risk assessment and scaling tendency (saturation index or result of inspection)
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Monthly
	Inspect wetted parts including spray nozzles for scale and descale if required	Quarterly
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with circulating water sprays supplied with non-wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Empty and refill or flush the pond to replace the water	Daily (or nightly), or more frequently as indicated by risk assessment and scaling tendency (saturation index or result of inspection)
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Weekly to monthly as indicated by risk assessment and inspection
	Inspect wetted parts including spray nozzles for scale and descale if required	Monthly to quarterly as indicated by risk assessment and inspection
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with once-through spray-free wetted pads supplied with wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Monthly
	Inspect wetted parts for scale and descale if required	Quarterly
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with once-through spray-free wetted pads supplied with non-wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Weekly to monthly as indicated by risk assessment and inspection
	Inspect wetted parts including spray nozzles for scale and descale if required	Monthly to quarterly as indicated by risk assessment and inspection
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with circulating spray-free wetted pads supplied with wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Empty and refill or flush the pond to replace the water	Daily (or nightly), or more frequently as indicated by risk assessment and scaling tendency (saturation index or result of inspection)
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly as indicated by risk assessment and inspection
	Inspect wetted parts for fouling and clean if required	Monthly
	Inspect wetted parts including spray nozzles for scale and descale if required	Quarterly
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Dry/wet systems with circulating spray-free wetted pads supplied with non-wholesome water		
	Task	**Frequency**
Dry mode operation	Drain all wetted parts and water storage completely and store dry	When switching to dry mode
	If not drained, flush to prevent stagnation	Weekly
Wet mode operation	Inspect, clean, flush and (if required) disinfect all wetted parts	Before switching to wet mode
	Empty and refill or flush the pond to replace the water	Daily (or nightly), or more frequently as indicated by risk assessment and scaling tendency (saturation index or result of inspection)
	Inspect to check for correct operation	Weekly
	Check any water treatment has been applied, e.g. chemical dosing has taken place	Weekly
	Carry out general microbiological testing, e.g. dipslide	Weekly to monthly, or as indicated by risk assessment
	Inspect wetted parts for fouling and clean if required	Weekly to monthly as indicated by risk assessment and inspection
	Inspect wetted parts including spray nozzles for scale and descale if required	Monthly to quarterly as indicated by risk assessment and inspection
Intermittent dry and wet mode operation	All wet mode checks	As for wet mode operation

Reference Sources and Further Information

HSE Approved Code of Practice L8 (4th edition) published 2013 HSE Technical Guidance

HSG274 Part 1 published 2014

Notification of Cooling Tower and Evaporative Condenser Regulations 1992

WMSoc: Guide to Legionella Risk Assessment

BS8580-1: 2019 Water quality – Risk assessments for legionella control – Code of practice

CIBSE TM13:2013 Minimising the risk of Legionnaires' disease

THE WATER MANAGEMENT SOCIETY

Disclaimer: The Water Management Society has published this document as part of a series of guidance papers designed to give support in the control of legionella. Guidance in this document does not replace any legislative requirements and should be used in conjunction with any manufacturers' recommendations.

The Water Management Society accepts no responsibility for misuse or misapplication of the guidance.

For further copies of this document, and more information about Water Management Society publications, training courses and future events

visit www.wmsoc.org.uk or telephone: 01827 289558

The Water Management Society
6 Sir Robert Peel Mill, Hoye Walk, Fazeley, Tamworth, Staffs B78 3QD
Telephone: 01827 289 558 Email: admin@wmsoc.org.uk
www.wmsoc.org.uk

W046-9
06/21