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ANALYSIS REPORT

REPORT DETAILS

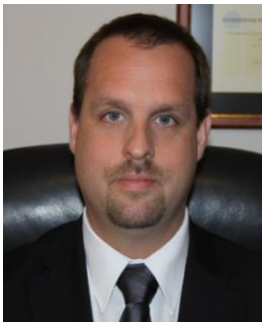
INVESTIGATOR	David Bazen	**FILE REF.**	9/31119
CLIENT REF.	16/9364/STP	**REPORT DATE**	14/03/16
COMMISSIONED BY	Insurance Commission of WA		
INTEREST	Insurer		
THIRD PARTIES	Nil		
ATTACHMENTS	Nil		

INCIDENT DETAILS

INCIDENT DATE	Multiple	**INCIDENT TIME**	
TYPE OF INCIDENT	Fire		
LOCATION	Multiple		
OWNER	Department of Education		
OCCUPIER	As Above		
DAMAGE	Fire damage to air conditioning unit and building structures		
USE OR APPLICATION	Mechanical Services		

FINDINGS

BRIEF CAUSE	Maintenance Practices Deterioration Age
RECOVERY POTENTIAL	Unlikely
FURTHER ACTIONS	As per Recommendations



AUTHORS CREDENTIALS

David Bazen is the Managing Director of Jarm Adjusting, as a specialist Loss Adjusting and Technical Consulting firm, and has been working as a Loss Adjuster and Consultant in the engineering, business interruption and major property loss sector since 2002.

Technical background is based on 17 years as an industrial diagnostic and repair technician in the electrical and refrigeration/air conditioning fields, including 11 years as the service manager of a specialised mechanical and electrical services contracting firm.

During this period David was primarily involved in electrical/electronic/PLC control system design for mechanical services systems, as well as refrigeration, air conditioning and process machinery fault diagnostics, root cause analysis and design engineering.

Between 1993 and 2004 the author also worked concurrently as a Local Authority fire officer, including 8 years as a gazetted Fire Control Officer (FCO). Roles included management of bush and structural fire fighting operations including ground and aerial fire suppression, with specific experience in fire cause investigation.

Since 2011 David has been actively involved in the investigation and preparation of technical expert witness submissions, as engaged by Legal Firms, Insurers and Brokers, as well as providing independent technical review for cases under consideration in the Internal Dispute Resolution phase and cases before the Financial Ombudsman Service.

Current Qualifications:

1. Chartered Loss Adjuster - ACLA, FIFAA ANZIFF (Snr Assoc.) CIP
2. Bachelor of Science
3. Diploma Financial Services (Loss Adjusting)
4. Trade Certificate (Electrical Mechanics) – ‘A’ Class Electrical Licence EW129278
5. Trade Certificate (Heating, Ventilation, Air Conditioning & Refrigeration) – ARC Licence L016272
6. Certificate IV (Electronics and Instrumentation)
7. Certificate II (Automotive Air Conditioning)
7. Austel (Telecommunications) Base Cabling Certificate
8. AIIMS ICS 4.04 (Fire Management), AFAC Structural Fire Fighting & Investigation
9. Certificate IV Workplace Training & Assessment
10. Private Pilot (Aeroplane) Licence

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1 SCOPE OF APPOINTMENT

1.1. We have been engaged by the Insurance Commission of Western Australia to conduct investigations into multiple fires occurring with evaporative air conditioners at Department of Education sites over the previous 18 months

1.2. The purpose of the investigation is to identify possible triggers for fire in this type of air conditioning unit and to provide recommendations of potential prevention measures.

1.3. In order to compile this report and derive recommendations we have relied on the following:

1.3.1. Jarm Adjusting Analysis Report (dated 2/9/15) covering confirmed fire incidents:

1.3.1.1. Maida Vale Primary School
1.3.1.2. Lesmurdie Senior High School
1.3.1.3. Mirrabooka Senior High School

1.3.2. Jarm Adjusting Analysis Report (dated 25/11/15) covering a confirmed fire incident at Osborne Park Primary School

1.3.3. Jarm Adjusting Analysis Report (dated 23/2/16) covering a confirmed fire incident at John Forrest High School Trade Training Centre

1.3.4. Jarm Adjusting Analysis Report (dated 28/2/16) covering a confirmed fire incident at Rossmoyne Senior High School

1.3.5. Bonaire OEM data and technical drawings

1.3.6. Electro-Cool WA Evaporative Media Fire Ratings Study (July 2007)

2 NOMENCLATURE

2.1.	Maida Vale Primary School	MVPS
2.2.	Lesmurdie Senior High School	LSHS
2.3.	Mirrabooka Senior High School	MSHS
2.4.	Osborne Park Primary School	OPPS
2.5.	John Forrest High School	JFHS
2.6.	Rossmoyne Senior High School	RSHS
2.7.	Department of Education	DOE
2.8.	Building Management and Works	BMW

3 BACKGROUND

3.1. Over the last 18 months there have been multiple incidents of fires originating from evaporative air conditioners installed in State School premises, as listed in Fig.1.

Location	Date of Loss	Damage	A/C Type	Estimate Value
MSHS	7th Jan 2015	Complete unit destruction	Bonaire (side discharge)	$20,000.00
MVPS	30th Jan 2015	Complete unit destruction, smoke damage to classroom	Bonaire (bottom discharge)	$30,000.00
LSHS	3rd Feb 2015	Complete unit destruction	Bonaire (bottom discharge)	$20,000.00
OPPS	13th Nov 2015	Complete unit destruction	Brivis (bottom discharge)	$100,000.00
JFHS	17th Jan 2016	Complete unit destruction, roof structural damage	Bonaire (bottom discharge)	$50,000.00
RSHS	11th Feb 2016	Complete destruction of [4] units, roof structural damage, extensive water damage to building	4 x Bonaire (bottom discharge)	$750,000.00

Fig.1 – Incident Synopsis Table

3.2. Whilst it is clear that the timing and location verifies these events are not directly interrelated the high number of incidents in a short period has raised concern over a potential systemic issue with these installations that may represent a higher risk of property damage and safety risk to occupants.

3.3. At this stage we understand that the majority of Government schools in the Perth Metropolitan area have evaporative air conditioning installed in at least some of the buildings, most of which are similar brand and age to these systems.

4 ROOT CAUSE ANALYSIS

Overview

4.1. Although each of the six reported fires have unique characteristics there are two distinct categories of failure evident:

4.1.1. Operating Failure (MSHS, MVPS, LSHS, OPPS) – as defined as the unit switched "on" at the control panel with both fan and pump motor engaged and operating in this condition on the load area for a period greater than 15 minutes.

4.1.2. Standby Failure (JFHS, RSHS) – as defined as the unit switched off at the control panel, water tank drained and pump/fan motor not operating, but live supply at the isolator and within the control box in readiness for a start signal.

4.2. In addition, there are a number of factors that are common to all of the reported incidents that require further analysis in relation to relevant and contribution, as being:

4.2.1. Suitability of application
4.2.2. Brand
4.2.3. Age
4.2.4. Maintenance and repair practices
4.2.5. Timing

Common Factors

Suitability of Application

4.3. During the various inspections conducted in the analysis of each fire incident it was noted that both commercial and domestic style evaporative units have been used on DOE sites.

4.4. The selection of unit type appears to have been made based on both the air volume required and considerations to noise, such as lower levels required in classroom areas.

4.5. Aside from using larger components for increased air output, the primary difference between domestic and commercial units generally relates to the use of metal chassis and frames in commercial units (solely for structural strength required for larger components) as compared to all-plastic construction in domestic units.

4.6. Whilst the higher plastic content in a domestic unit has the potential to contribute to the duration and extent of a fire once established, the presence the plastic is not considered a risk factor for the inception of a fire in these units.

4.7. Both commercial and domestic units are constructed in identical configuration and comparable production standards, thus a domestic unit has a similar robustness of construction and is not inherently a greater risk of failure or fire compared to a commercial equivalent.

4.8. The use of a domestic unit in a classroom environment is considered appropriate to reduce overall operating noise and have an airflow more closely reflective of the required load.

4.9. The use of a commercial unit in a gymnasium or assembly area is considered appropriate due to removal of noise restrictions and the larger air volume required to be effective.

4.10. Based on the above we consider that the evaporative air conditioning units selected by DOE are generally suitable and appropriate for the various applications in DOE infrastructure.

Brand

4.11. It is noted that the Bonaire brand of unit is represented in 5 out of 6 failures (one incident was a Brivis unit) and therefore we have examined if there is any evidence of an inherent fault with this brand.

4.12. The failures have involved several classes and models of Bonaire products of differing ages and therefore we can rule out a possible manufacturing defect contained within a specific production run.

4.13. In addition, noting that all units have operated successfully for at least 5 years, and that there is no one specific fault over-represented in the fire causes, that a manufacturing or design defect can also be discounted as a primary cause of these fires.

4.14. We have researched these products and can confirm that there is no data specifically linking the Bonaire brand to repeated incidents nor is there historical evidence of a product recall for known manufacturing faults.

4.15. In relation to the single incident involving a Brivis unit it was noted that a product recall was issued for the AD model series (same as the affected unit) installed between 2000 and 2003 for faulty pump units that had the potential to overheat.

4.16. As the damaged unit was installed in 2005 or later, and we understand has since had a replacement water pump fitted through normal maintenance, it is clear that this product issue is not relevant to the fire cause.

4.17. There are a limited number of brands of evaporative air conditioners available in Australia that are suitable for installation in a school building and although we do not have full data it appears that the majority of units selected by DOE between 5 -10 years ago are Bonaire brand units.

4.18. As there is no apparent defect inherent in this brand we can conclude that the ratio of fires involving a Bonaire branded unit is due to the higher proportionate the number Bonaire units installed, as opposed to a specific brand issue.

Age

4.19. Based on the model series and estimated installation dates it appears that all of the affected units were between 5 – 10 years old at the time of incident.

4.20. The average life expectancy of an evaporative air conditioning unit in a commercial application is generally considered in industry to be between 10 – 15 years, noting that the practical life expectancy can be significantly greater if the units are correctly serviced and maintained.

4.21. Given the estimated age of the units we consider that all of the damaged units were still within their reasonable operating lifespan and that that fires could not reasonably be attributed to systems operating beyond their working life.

4.22. However, age is considered a factor in the pre-loss of condition of the equipment leading up to failure for two primary reasons:

4.22.1. Deterioration of operating components
4.22.2. Alteration of the system from original manufacture due to repairs

4.23. During normal operation the unit sustains deterioration (wear and tear) and this generates increased failure potential such as (but not limited to):

4.23.1. Thermal and vibration loosening of electrical connections causing arcing
4.23.2. Worn mechanical components causing seizure and/or motor overloading
4.23.3. Deteriorating gaskets and seals allowing moisture ingress into live components
4.23.4. Moisture or dust build up in motors causing internal winding arcing (fusion)

4.24. In addition to direct failure triggers it is also noted that risk of fire propagation and the potential fire intensity increases with the age of the unit though the loss of fire retardant properties inherent within the filter pad media.

4.25. As per a study undertaken by Electro-Cool WA in 2007 the fire propagation risk of CelDek pads was tested using a comparison between identical products at ages 0, 5 and 10 years, with the result confirming that flammability and propagation increased by around 15% at 5 years and 20% at 10 years as compared to the 0 year (new) sample.

4.26. It is also noted that the average lifespan of some internal components (pump unit in particular) is around 2 - 5 years and therefore an evaporative unit that is over 5 years old is highly likely to have been repaired at least once.

4.27. Despite even the most careful repair it is accepted that loss of integrity of the control box seals and cable entries from the original manufactured specification is inevitable and therefore a unit has an increased likelihood of failure post repair.

4.28. There are further potential issues with poor quality repairs increasing risk of moisture and vermin ingress, however this issue is more fully discussed in Maintenance and Repair Practices.

4.29. Whilst it appears that the age of the units is a contributing factor it does not appear that the fires have been triggered by age as a primary or direct cause.

Maintenance and Repair Practices

4.30. We are advised by BMW that evaporative air conditioning units located on DOE sites are generally scheduled to be serviced twice per year, which we can confirm is in line with best practice for the maintenance of this type of equipment.

4.31. However, on inspection of several undamaged units in the various locations it is apparent that the level and quality of service and maintenance is variable and indeed some units did not appear to have been serviced for considerable time.

4.32. Evidence of poor servicing that has been found is (but not limited to):

4.32.1. Pad media in poor condition
4.32.2. Excess debris build up inside units (beyond expected levels after 6 months)
4.32.3. Water fittings loose or misaligned

4.33. These findings did not represent any particular pattern or site and are general observations in terms of the potential shortcomings in servicing being provided at some DOE sites.

4.34. However, we have found firm evidence of poor installation/repair practices as seen in RSHS and shown in Fig.1.

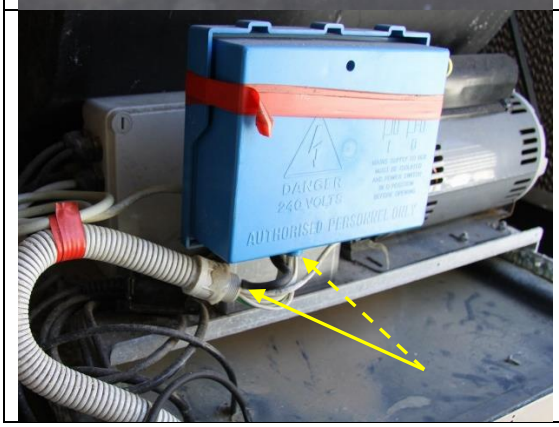
	AC 12 Motor capacitor missing plastic cover and live terminals insulated (poorly) with insulation tape
	AC 07 Insulation tape retaining control box lid due to broken clips and conduit gland not fitted to base of control box

Fig.1 – RSHS - Maintenance issues on units immediately adjacent to fire

4.35. As noted at 4.26 these issues generally arise after around 5 years in service, at which time the replacement of a main operating component is normally required.

4.36. It must be noted that the issue with the poorly fitted gland in AC 07 is likely to be related to the original installation of the unit, however it would be expected that the maintenance contractor would detect this issue and make arrangements to have it rectified at some point.

4.37. Without conducing a detailed audit on all DOE sites we are unable to determine what proportion of units contain poor workmanship, however based on our experience in private enterprise this sub-standard quality of work is relatively common with evaporative units.

4.38. Given these two issues were detected directly on either side of a fire involving the same type of unit we can conclude that the units involved in the fire were highly likely to have contained similar defects prior the incident.

4.39. This type of situation arises (for example) where the service technician breaks part of the control box (normally as they become brittle with age) whilst trying to access it for repairs, leading to a quick-fix repair to get the job completed rather than obtaining the correct parts and returning at a later date.

4.40. Another potential servicing issue that was queried as a result of the MVPS, LSHS and OPPS fires is the practice of after-market non-standard parts being substituted into the system to replace damaged genuine parts, particularly pump units.

4.41. This practice is wide-spread in the industry as cheaper components are available (thus increasing margins) with almost identical specifications, however they often lack comparable build quality and safety features that are used in genuine items.

4.42. During our assessments of these incidents we can confirm we did not find any evidence of part substitution, however noting that the components involved in the fires were destroyed to a point where it was not possible to determine if they were genuine spares.

4.43. It is considered prudent to ensure all contractors are suitably instructed to only use genuine parts to ensure ongoing safety and reliability.

Timing

4.44. On review it became apparent that the incidents have all occurred after the units have been inactive for an extended period, predominantly during or immediately following the summer school holidays.

4.45. This becomes relevant as the timing is implicated technically in both the Operating Failure and the Standby Failure incidents.

4.46. In relation to Operating Failure, the period of inactivity is linked to pump failures through mechanical seizure causing motor overloading.

4.47. In relation to Standby Failure, the period of inactivity is linked to the build-up and movement of moisture within the poorly sealed control boxes.

4.48. It appears likely that the negative effects of long period of inactivity may be mitigated by more timely inspection and servicing immediately prior to the school year to detect potential faults.

Operational Failure

4.49. Based on the individual fire investigation reports we can determine that the air conditioning units were operating at the time of incident for MSHS, MVPS, LSHS and OPPS.

4.50. In order for a fire to be sustained in these units to the point where the unit is destroyed the following conditions are required:

4.50.1. Unit being operated under normal conditions (fan and pump on)
4.50.2. Loss of pump motor operation – pump failure or control damage to pump feed
4.50.3. Water pads have dried out through continued fan operation
4.50.4. Fire trigger source has caused ignition to dry water pads
4.50.5. The continued operation of the fan has supplied sufficient oxygen to propagate the fire at high intensity resulting in the destruction of the unit

4.51. If the water pump remained operational at the time of fault then the quantum of water flowing over the pads and inside the unit would extinguish any fire before it reached sufficient intensity to destroy the unit, thus the above sequence must have occurred in each case.

4.52. Examination of operating conditions allows us to conclude that the loss of pump operation is invariably linked to the fire trigger source, either directly or indirectly.

4.53. In the case of MVPS it appears the loss of pump operation was indirectly linked to the trigger for the fire through arcing on the main control board causing loss of power supply to the pump and subsequent fire through the heat of arcing.

4.54. The cause of the arcing has been attributed to a loose or damaged terminal that may have been discoverable during prior inspection of the control box, evidenced by darkening of the PCB or discoloration of the spade connector

4.55. However, this type of arcing can also occur quite rapidly and therefore even with regular inspection this can still occur, thus processes such as thermal image scanning cannot be justified as an effective mitigation measure for this fault.

4.56. Arcing of this nature is not implicated in any other fire and therefore we can conclude this is a singular event and not indicative of the other issues surrounding these fires.

4.57. In the remaining fire there was no evidence to suggest control board failure, albeit significant evidence was disposed of from some sites before full analysis could be conducted.

4.58. It was therefore concluded that the likely loss of pump operation was related to the failure of the pump itself, providing the direct heat source to trigger the fires at MSHS, LSHS and OPPS.

4.59. Both the Bonaire and Brivis systems uses a vertical stack centrifugal pump (as per Fig.2) manufactured by JRM, as brand of Fasco (USA), who manufacture a large number of refrigeration and air conditioning products.

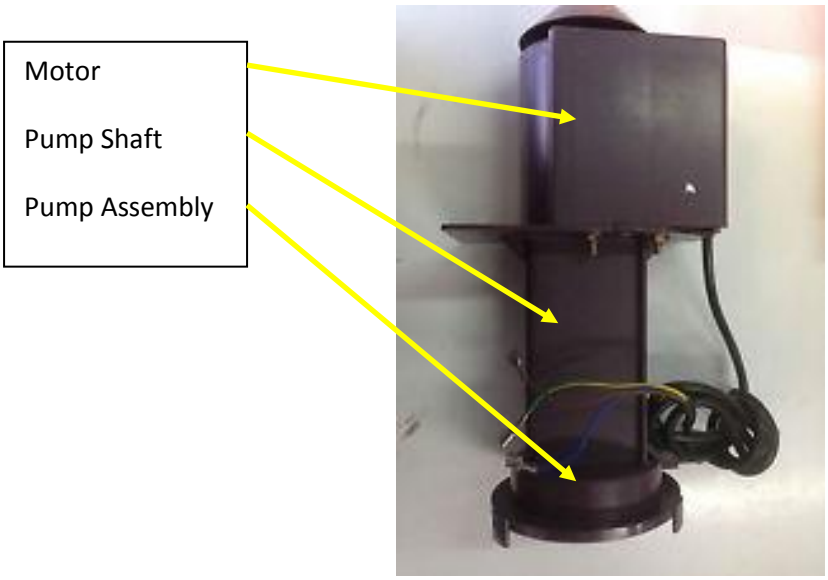


Fig.2 – Evaporative Air Conditioning Pump

4.60. These pumps have a limited life in service due to the harsh internal operating environment of the air conditioning unit, generally considered to be between 2 – 5 years.

4.61. The most common cause of breakdown is mechanical seizure of the pump and shaft assembly through wear to the bottom bearings causing eccentric operation or moisture ingress and/or corrosion to the top bearing assembly.

4.62. In addition, where the pump is left inactive for extended periods (during winter and during school holidays) the lack of movement causes stagnation of the bearing lubricants that can lead to hardening and seizure, further augmented by corrosion from trapped water.

4.63. Based on construction, the electric motor sits above the water line and around the same level as the base of the water pad media, with the assembly generally in close proximity to the water pads (normally between 50mm – 150mm clearance).

4.64. There is no cooling mechanism for the motor beyond the shaft fan located in the top housing that is driven by the motor operation, so if the pump is seized there is no cooling to remove heat created by the motor overloading.

4.65. It is therefore a common finding for the pump to be seized and the top casing melted due to the motor being energised in locked rotor conditions without any means to remove the excess heat.

4.66. The genuine JRM pumps are fitted with an auto-reset thermal overload that will isolate the power in the event of pump seizure and then will reset once cooled down and attempt to start the pump, however if the pump is seized then the motor will re-heat and trip the overload again.

4.67. The overload system on these pumps is capable of preventing fires under most circumstances, however if left in fault condition for an extended period of time cycling on overload (as described at 4.66) this could potentially cause motor winding fusion, which can cause sparks to be emitted from the pump and create a fire trigger.

4.68. There is no industry precedent of multiple fires being triggered by JRM pumps and this design has been in use for around 25 years, so it would appear unreasonable to conclude that these pumps are unsuitable for this type of air conditioner.

4.69. However, as discussed above, the constant cycling of the overload if left unattended does increase the likelihood of electrical breakdown, which can trigger a fire, and therefore this risk may be mitigated (subject to OEM approval) by replacing the JRM pump with either:

4.69.1. Submersible pump unit – sealed and below water line (no spark potential)
4.69.2. Pump fitted with thermal fuse – once overloaded with not reset

Standby Failure

4.70. Based on the individual fire investigation reports we can determine that the air conditioning units were in standby mode at the time of incident for JFHS and RSHS.

4.71. In this condition the water pads are dry and the water trough in empty thus any heat source sufficient to reach combustion point of the plastic or water media will propagate a fire unhindered by the pump operation.

4.72. As there was no evidence of heat from an external source (such as malicious damage) the only potential trigger is electrical arcing within the control box area, as the only part in standby mode containing the live terminals from the incoming feed.

4.73. Arcing under these circumstances is triggered by a breach in insulation between phases or phase and earth, and can occur through (but not limited to):

4.73.1. Moisture ingress into the live terminals
4.73.2. Vermin/insects ingress into the live terminals

4.74. The potential for ingress of moisture (in particular) and to a lesser extent vermin/insects is high based on the location of the electrical equipment within the operating area of the pump and water media.

4.75. This potential is further increased when viewed in context of the maintenance issues identified in Fig.1, which significantly reduces the IP rating of the control box below the OEM standard.

4.76. It was further noted that both fires in this condition occurred in the early hours of the morning, which is consistent with normal diurnal weather patterns that create the highest probability of moisture and condensation formation due to humidity and temperature changes.

4.77. Based on the above the only apparent factor capable of mitigation is ensuring effectiveness of the live conductor protection through correct installation, service and repair practices.

5 SUMMARY OF FINDINGS

5.1. Based on review of installation specifications we can confirm that the unit type (domestic or commercial) is considered suitable for the application in each case and therefore unit selection is not considered a relevant factor.

5.2. The brand of units installed in DOE sites are all well-known and reputable brands for this product and whilst Bonaire is over-represented in the number of fires, this is attributed solely to the greater proportion of these units installed.

5.3. The affected units are all between 5 – 10 years old however considered still to be within reasonable life-expectancy, particularly given they are maintained to a high standard, thus the fires cannot be attributed to operation of expired plant.

5.4. There is no evidence to indicate inherent design flaw or manufacturing defect given the units have been operating successfully for around 10 years, and there are significant numbers of these units still in service across the DOE sites.

5.5. Age related deterioration of operating components such as pumps, motors and controls can cause electrical breakdown and trigger a fire through arcing.

5.6. Fire intensity and propagation can be increased as a result of the reduction in fire retardant properties of the water media that occurs beyond 5 years of normal usage.

5.7. Repairs undertaken to rectify component breakdown can create loss of OEM standard water-proofing integrity through deterioration of seals, cover retaining devices and poor service practices, all of which generally occur once a unit exceeds 5 years in operation.

5.8. The Standby Failure incidents have both been attributed to poor service practices evident on these sites and has been implicated specifically in the incident due to failure to maintain appropriate water-proofing for electrical components.

5.9. The Operating Failure incidents have been attributed to maintenance related deterioration of the pump assemblies or electrical components, with the circumstances aligning with requirements for fire propagation.

5.10. The timing of the fires all being either during or immediately following a period of inactivity or low demand for the units, is consistent with the known triggering factors for both pump breakdown (Operating Failure) and condensation build-up (Standby Failure).

6 RECOMMENDATIONS

Mitigation

6.1. Routine inspection and servicing of these units needs to be closely timed with periods of inactivity to ensure any deleterious processes occurring during extended standby are detected and rectified before the units recommence normal operations

6.2. For DOE sites this timing would generally be start-up following winter (September) and start-up following summer school holidays (January/February)

6.3. This pre-start inspection should comprise of the following checks (in addition to standard tests and cleaning procedures):

6.3.1. Pump unit to be operated for a minimum of 15 minutes before inspecting for overheating, excessive noise, mechanical binding and correct output

6.3.2. Fan motor to be operated for a minimum of 15 minutes before inspecting for overheating, excessive noise and mechanical binding

6.3.3. Fan motor to be current tested to ensure incorrect belt tension is not causing motor to exceed full load amps (as per name-plate rating)

6.3.4. Control box assemblies to be opened and inspected for obvious overheating of terminals or PCB components, electrical connection integrity, ingress of moisture and presence of vermin/insects

6.3.5. Inspection of all electrical cabling and components and rectification of poor workmanship and/or broken covers and protective structures

6.4. Specific instructions are issued to ensure that all repairs to be undertaken must restore the unit to OEM standard condition and that all parts used must be genuine OEM components or OEM approved after-market alternatives.

6.5. Water pad media is replaced with new OEM specified material at intervals not exceeding 5 years to ensure fire retardant and anti-microbial properties are maintained at safe levels

6.6. Subject to OEM discussion and review, option to replace existing vertical stack pumps with either submersible or thermally fused pumps at the time of failure, noting the level of risk reduction does not justify retrofitting of existing working systems.

Compliance

6.7. Baseline auditing to be undertaken on the quality of repairs and maintenance based on random samples of evaporative air conditioners across a number of sites services by each contractor being subjected to audit

6.8. Dependent on results of baseline audits, a regular audit program to be developed and implemented to ensure compliance with service instructions and mitigation measures is being maintained by all contractors engaged by BMW

Future Equipment Considerations

6.9. The following items have been provided as recommendations for consideration in the selection of equipment for new installations and replacement of retired plant.

6.10. It must be noted that these recommendations are not in response to significant or primary risk factors in existing equipment and that there is no justification to consider retro-fitting equipment with these specifications at this time.

6.11. Based on construction and operation the use of submersible water pumps in evaporative coolers does provide an overall lower risk of fire trigger, as the electrical components are completely sealed and immersed under water.

6.12. We understand that these pumps are greater cost and therefore OEM's have ceased using these pumps, with all products available in Australia using the vertical stack pump system, however should an OEM return to this design this would be a valid consideration for selection.

6.13. An alternative to submersible pumps is the potential selection of pumps using a thermal fuse as opposed to an auto-reset overload, which will permanently isolate the pump from the supply in the event of overload thus minimising the potential for burn out with a continuous reset cycle.

6.14. It is also noted that some international manufacturers (not available in Australia) are producing a water pad media using fibreglass material (such as GLASdek) that significantly improves the fire resistance of the material and does not lose these properties over the lifespan of the material.

6.15. As the pad media is classed as collateral damage and not a specific fire trigger the cost of importing this product is prohibitive compared to the minimal benefit, however should this material become economically viable at a later stage this may be a valid consideration for new units and replacement media for existing systems.

This concludes our report based on the currently available information however we reserve the right to review our findings should further information become available at a later stage.

Yours faithfully

Dave Bazen ACLA FIFAA ANZIIF (Snr Assoc) CIP BSc
JARM ADJUSTING