



SWITCH THINKING

PREVENTING ELECTRICAL DEATHS IN AUSTRALIAN HOMES





ELECTRESAFE
RCCB-RCD SWITCH



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TABLE OF CONTENTS

Executive summary	ii	6.4 How do I know if I have a safety switch?	10	9.4 All other homes	25
1.0 Glossary of terms	1	6.5 I do have a safety switch. Am I protected?	10	10.0 Current take-up rates for safety switches	28
2.0 Foreword	2	6.6 Ensuring the quality of safety switches sold in Australia	10	Figure 10.1 – Estimated safety switch shortfall based on age of housing stock	29
3.0 Introduction from the CEO of Master Electricians	3	7.0 Preventable electrical deaths in Australian homes	12	10.1 The reasons for the shortfall	30
4.0 Context	5	7.1 Sourcing reliable data	14	Figure 10.2 – Safety switch shortfall based on State Government estimates	31
5.0 About Master Electricians Australia	6	7.2 Who is dying?	14	11.0 Urgent recommendations	33
Figure 5.1 – First preference for electrical work	7	7.3 Injuries	14	12.0 Full table of recommendations	35
Figure 5.2 – Would you prefer a Master Electrician to an Electrician?	7	Figure 7.1 – State and territory data on electrical deaths	15	References	37
6.0 What is a safety switch?	8	8.0 Lessons from the Home Insulation Program	18		
6.1 How do Safety Switches work?	8	9.0 The current regulatory landscape	22		
6.2 Circuit breakers, surge protectors and safety switches	9	9.1 Investment properties	22		
Figure 1 – Circuit Breaker	9	Figure 9.1 – Existing regulatory requirements for safety switch (SS) fitting	23		
Figure 2 – Surge Protector	9	9.2 Sale of existing homes	24		
6.3 Types of home safety switches	9	9.3 New homes	25		
Figure 3 – Safety Switch	9				
Figure 4 – Combination Safety Switch	10				



EXECUTIVE SUMMARY

Every year, 15 people are killed in Australian homes in electrical accidents that could be prevented if a safety switch was fitted on the electrical circuit. As many as 20 times that number of people are hospitalised with serious electrical injuries and burns. The causes of these deaths may include a child inserting an implement into a toaster, a handyman drilling into a live cable inside a wall, or stormwater ingress into lights and appliances. Around 93 per cent of the people killed in electrical accidents are male, and the majority of them are aged between 25 and 64. Those aged 15 to 24 are the next most likely to be killed, followed by the over 65 group, then children.

Those people killed in the last year have included three young insulation installers who were working on the Federal Government's Home Insulation Program (HIP). As a result of those tragedies, the use of metal staples or fasteners to hold aluminium foil insulation in

place was banned for installations funded by the HIP, and outlawed altogether by electrical safety regulators in Queensland, where all three deaths occurred. The Queensland Government has also introduced rules requiring electrical safety switches to be in place on all circuits where ever practicable before a home has aluminium foil laid. The Federal Government is funding the installation of safety switches where they are requested by home owners who have had foil insulation installed as part of the HIP.

The Federal Government also ordered an audit of electrical safety in homes fitted with foil insulation. Feedback from accredited Master Electricians undertaking these home audits has consistently shown serious safety faults in 20 per cent of homes, unrelated to the insulation. These faults are often the result of do-it-yourself electrical work. They may remain undiscovered for years, but will present a life-threatening situation to any person who comes into

contact with them while working in the roof space of a home.

A safety switch is designed to cut the power to an electrical circuit in as little as 0.03 of a second in the event of an electric shock. The technology is widely available, relatively cheap in the context of a home, and would almost certainly have saved the lives of the three insulation installers killed in the HIP. Safety switches have been commonplace in Australian homes for around 20 years, and in that time they have contributed to a significant reduction in electrical fatalities. However, around 40 per cent of Australian homes remain completely unprotected by safety switches. Approximately 30 per cent of homes have coverage of their power outlet circuits only, and a further 30 per cent have the light circuits covered as well. However despite the fact that only 60 per cent of homes have safety switches fitted, independent research commissioned for this report indicates that more



than 80 per cent of home owners believe they are well protected or very well protected from electrical injury in their own homes. This statistic betrays a fundamental disconnect in the Australian community between perception and reality.

This disconnect may be caused by confusion among home owners as to what a safety switch does, and the difference between a safety switch (which protects people) and a circuit breaker (which only protects electrical cables and appliances). It may also be caused by the wide variations in the regulatory requirements relating to safety switches in the different states and territories. While all jurisdictions have mandated safety switches on power outlet circuits of new homes since around 1991, and on the lighting circuits of new homes since 2001, there has been no other uniform action in this area. Queensland and Western Australia require safety switches to be fitted to the power circuits of investment homes and at the point of sale of existing homes. Western Australia has extended this requirement to lighting circuits as well. The Queensland Government is currently considering a proposal from that state's Electrical Safety Office to mandate retro-fitting of safety switches on all homes. The other states and territories

have so far made no move towards extending the very basic level of safety switch protection that exists for homes built or renovated in the last 20 years.

Independent research commissioned by Master Electricians Australia indicates 82 per cent of people believe safety switches should be made compulsory in all homes. Around 76 per cent of people said they were more likely to support this view if there was a government subsidy for safety switches. The next preferred position in the general community was for safety switches to be compulsory in new homes, and to be retro-fitted when homes are sold.

Given the very serious consequences of electrical accidents in the home, and given the very high level of protection offered by safety switches for a relatively low cost, this report has made a series of recommendations to increase the number of safety switches in residential properties across Australia. Initially these recommendations are targeted at homes from which the owner derives a financial benefit – either through rental income or at the time of sale – and at new homes. Providing safety switch protection for every circuit in a new home would add only around \$200 to the cost of a new home. Ultimately, however, the highest level of

protection will be achieved only through the addition of a safety switch to every circuit in every Australian home.

Considering lighting, power outlets, hot water, oven and stove and the proliferation of air conditioning and other devices, it is likely that most homes would need at least four safety switches to ensure occupants are fully protected against electrocution or injury. Based on an existing housing stock of just over 8.5 million, and considering the proportion of homes with existing safety switches (outlined above), this points to a need for at least 26.5 million more safety switches to provide adequate protection for every circuit in every Australian home.

Providing this equal level of protection to all Australians will require a program of retro-fitting safety switches to existing homes. It will require a legislative response from government, coupled with support for low income earners and a strong promotional campaign to encourage homeowners to act in their own interests. Some of the recommendations in this report will take time to implement. Others, such as retro-fitting safety switches to existing homes, will require a phase-in period to allow owners to plan for the expense. A number of the recommended measures, however, are



already in place or under consideration in some states. Others could be enacted with minimal disruption to home owners.

In the end, any cost and inconvenience to home owners must be measured against the human cost of inaction – 15 deaths and up to 300 hospitalisations each year. Seatbelts and airbags have become commonplace in motor vehicles due to their ability to save lives, even though their life-saving capabilities may never be drawn upon. The consequences of a motor vehicle accident are far greater for drivers and passengers without these basic protections. Similarly, the consequences of an electrical accident are far greater when there is no safety switch fitted to the circuit. A relatively minor investment will provide long-term protection against injury or death, and the time has come for this technology to be far more widely embraced across Australia.



1.0 GLOSSARY OF TERMS

ECA – Electrical and Communications Association

Electric shock – non fatal contact with live electrical fittings, which causes electricity to flow through the body

Electrocution – fatal contact with live electrical fittings

ERAC – Electrical Regulatory Authorities Council

HIP – Home Insulation Program

MEA – Master Electricians Australia

NECA – National Electrical and Communications Association

OTR – Office of the Technical Regulator (South Australia)

RCCB – Residual Current Circuit Breaker (safety switch)

RCD – Residual Current Device (safety switch)



2.0 FOREWORD

It is difficult to believe that in 2010 – almost 20 years after safety switches became compulsory items in new homes – the protection they offer is still not available to all Australians. Experience over two decades has demonstrated beyond all argument that safety switches save lives. Indeed, they have saved hundreds of lives across Australia in that time.

This report outlines a regulatory landscape that varies widely from state to state, and one in which the same level of safety at home is still not available to all Australians. As a result, take-up rates vary from state to state. Residents in older properties and those who rent their homes are more exposed than owners of new homes. Around 40 per cent of Australian homes have no safety switches installed, and most other homes do not have complete safety switch protection against injury or electrocution.

As the Queensland electrical safety regulator for eight years, I was a strong advocate for safety switches and was proud to be part of a safety regime that has placed that state at the forefront of national action in this area. As is the case in other areas of safety it is now time for a uniform approach across all states and all housing types. It's time that the protections that are available to new home owners are extended to everyone. It's also time that homes had complete protection, rather than just having safety switches on the power or light circuits. In short, it's time that every electrical circuit on every home was protected by a safety switch.

In the wake of a number of high profile electrical deaths, this report is a timely reminder of just what is at stake when safety switches are not fitted. I congratulate Master Electricians Australia for the initiative it has shown and the significant investment

it has made in highlighting this issue for consumers, regulators and governments.

I endorse this report, and I urge the speedy and comprehensive implementation of its recommendations.

Peter Henneken
Former Electrical Safety Regulator, Queensland



3.0 INTRODUCTION FROM THE CEO OF MASTER ELECTRICIANS

My personal commitment to safety switches goes back more than 30 years to when my life was first saved by a safety switch. As a teenager investigating the impact of wires clashing together, I made contact with a bare wire only to find myself flat on the floor but still alive as the safety switch had operated.

This report outlines the available statistics relating to deaths and injuries in Australian homes that could be prevented with safety switches. What it does not – and cannot – outline are the thousands of examples of lives being saved through the functioning of safety switches. As the outcome of many electrical accidents is simply that the safety switch trips and the home owner suffers an injury only to his or her pride, it goes unreported and life goes on.

My commitment to Safety Switches grew even stronger as an electrical inspector personally investigating electrical accidents where lives could have been saved simply by a simple safety switch installation. The daunting job of communicating with grieving relatives is made all the more distressing when one is bound to explain that for \$200 their loved one could still be here. “Why didn’t anyone tell me?” is the most common response.

It is my first belief that most homeowners, if equipped with the full knowledge of the value and operation of safety switches, would upgrade their home as a matter of urgency. Unfortunately, the level of awareness is currently very low even though safety switches have been commonplace in Australian homes for around 20 years, and in that time have contributed

to a significant reduction in electrical fatalities. Around 40 per cent of Australian homes remain completely unprotected by safety switches. Even more alarmingly, this report reveals almost all of the remaining homes are under-protected. Some homes have safety switches on power circuits only. Some have coverage on power and light circuits. Very few have safety switches on all electrical circuits. This means that residents remain exposed to the kinds of accidents described above, and the kinds of tragedies outlined throughout this report.

And yet, independent research commissioned by Master Electricians Australia shows that more than 80 per cent of home owners believe they are well protected or very well protected from electrical injury in their own homes. This statistic betrays a fundamental disconnect in the Australian community between



perception and reality. This is a dangerous and deeply troubling state of affairs.

Master Electricians Australia has produced this report in order to increase public understanding of what safety switches are and why they are vital for every home. We urge all home owners to review their electrical safety, and ensure they have safety switches fitted to every possible circuit. However, we believe the responsibility rests with legislators and policy makers. Just as seat belts and bicycle helmets have become mandatory across Australia, so too must Governments move to mandate safety switches on every circuit in every home.

This report contains very conservative assumptions about electrical fatality and accident rates, and about safety switch take-up rates. Even with these conservative assumptions, however, it finds a deficit of more than 26 million safety switches across Australia. It also finds that unless this situation is addressed, 100 Australians will die and 2000 will be hospitalised as a result of electrical accidents in the next seven years. These are figures that cannot be ignored. For home owners,

government and safety authorities in every state and territory, it is time for some switch thinking.

Malcolm Richards
Chief Executive Officer
Master Electricians Australia



4.0 CONTEXT

Hundreds of news articles have been written and aired about the tragic electrocutions of three young insulation installers between October 2009 and February 2010. The governments of Queensland (where all three tragedies occurred) and the Commonwealth moved quickly to address the safety concerns of electrical experts such as Master Electricians Australia in relation to the Home Insulation Program (HIP). As a result, the use of metal staples or fasteners to hold aluminium foil insulation in place was banned for installations funded by the HIP, and outlawed altogether by Queensland's electrical safety regulators. The Queensland Government has also introduced rules requiring electrical safety switches, or residual current devices, to be in place on all circuits where ever practicable before a home has aluminium foil laid. The Federal Government is funding the installation of safety switches where they are requested by home owners who have had foil insulation installed as part of the HIP.

All these responses are worthy, and the installation of safety switches on all circuits will serve to save lives into the future in situations entirely unrelated to the aluminium foil. However, these three tragic incidents must prompt questions about why – almost two decades after safety switches became mandatory on some circuits in new homes – lives can still be lost to electrocutions in Australian homes. A safety switch is designed to cut the power to an electrical circuit within as little as 0.03 of a second in the event of an electric shock. The technology is widely available, relatively cheap in the context of a home, and would almost certainly have saved the lives of the three insulation installers killed in the HIP.

In the wake of the HIP tragedies, this report examines preventable electrical injuries and deaths in Australian homes. It also examines the current regulatory landscape in each state and territory in relation to safety switches, and the proliferation of

safety switches across Australian homes. It concludes that a large number of Australian homes are not currently protected by safety switches, and that almost all homes are under-protected. This safety switch deficit must be urgently addressed by all State and Territory Governments if further tragedies such as those that took place under the HIP are to be prevented in the future.



5.0 ABOUT MASTER ELECTRICIANS AUSTRALIA

Master Electricians Australia (MEA) is a training and accreditation organisation dedicated to lifting standards of electrical safety. The Master Electricians accreditation program is owned and operated by the Electrical and Communications Association (ECA). The ECA has been representing electrical contractors for more than 70 years, making it one of the longest-standing industry associations of its kind.

MEA accredits electrical contractors who satisfy a stringent set of criteria. To become an accredited Master Electrician, a contractor must:

- Develop and implement an active safety management program;
- Have at least three years' experience as an electrical contractor;

- Adopt a quality management system that ensures high-quality service for customers;
- Provide a 12-month guarantee on workmanship;
- Comply with the Master Electricians Australia code of ethics;
- Demonstrate a commitment to providing energy-efficient options for clients;
- Respond promptly to customer inquiries; and
- Undertake annual audits to demonstrate compliance with these criteria.

These stringent accreditation standards are designed to provide peace of mind for consumers, and to boost the overall image of the electrical contracting industry. Any consumer who has ever experienced the frustration of dealing with contractors who do not respond promptly or provide a high-quality service will understand the

need for the service now being promoted by Master Electricians. In boosting the standards consumers can expect from their electrical contractors, Master Electricians hopes to lift the service, quality and reliability of the entire industry. We also aim to create a new cohort of electrical contractors who are highly aware of, and committed to, electrical safety in every facet of their work.

This commitment to excellence has resulted in a strong public recognition of the value of using a Master Electrician for electrical work. Recent findings by independent research organisation *Internet Thinking* showed Master Electricians has now become Australia's most recognised electrical industry association. Around 63 per cent of home owners surveyed said they would choose a Master Electrician as their first preference for electrical work. The Master Builders Association

Figure 5.1 – First preference for electrical workⁱⁱ

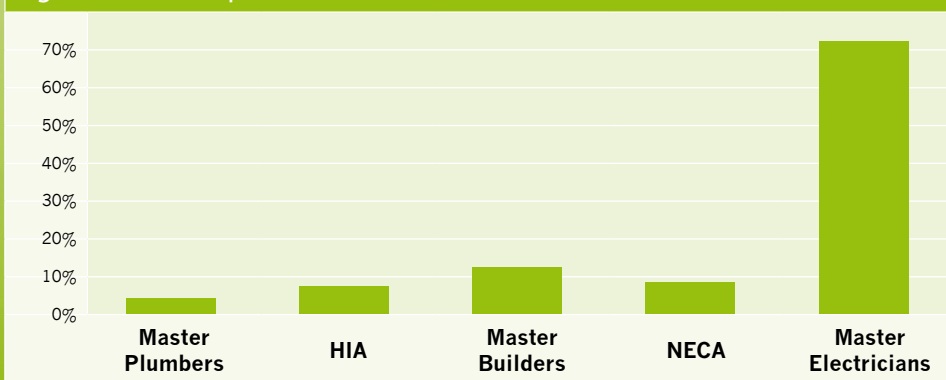


Figure 5.2 – Would you prefer a Master Electrician to an Electrician?^v



was second most popular, with 13 per cent, while the National Electrical and Communications Association (NECA) finished third with nine per cent.ⁱ (See figure 5.1, above)

The same research indicated the preference for Master Electricians over other electrical contractors was shared across those who owned their home outright, those who were paying off their home, those who were renting and others.ⁱⁱⁱ (See figure 5.2, above right.) In terms of favourable public recognition, Master Electricians Australia (32%) was second only to Master Builders (39%) in the construction sector. Home owners recognised Master Electricians for its commitment to quality and the requirement to guarantee workmanship.^{iv}

It was this commitment to safety that prompted Master Electricians to play the lead role in highlighting the dangers of metal products under the Federal Government's Home Insulation Program. MEA was the first to alert the Federal Environment Minister to the dangers posed by metal staples, and worked closely with the Minister and his Department to devise and enact safety measures to mitigate those dangers. When some sections of the insulation industry showed they were not willing or able to follow the agreed safety

measures, Master Electricians Australia led calls for the scheme to be scrapped. The organisation then worked closely with the Government to develop and roll out audits of those homes affected by dangerous installation of aluminium foil insulation.

While full data from the audit process was not available at the time of writing, anecdotal evidence from accredited Master Electricians undertaking home audits has consistently shown around one in five homes has a serious electrical fault unrelated to the insulation program. This alarming statistic – serious faults in 20 per cent of homes – prompted Master Electricians Australia to produce this report into Safety Switches. In homes without metal insulation installed under the HIP, these faults could remain undiscovered for years, and pose a very real risk of death or serious injury to any person who comes into contact with the affected electrical fittings.

Safety switches have a proven track record of saving the lives of people who inadvertently contact live electrical fittings. However, in investigating the use and prevalence of safety switches, Master Electricians found a dearth of comparative national data on this subject. For this reason, Master Electricians has funded

and conducted the research that forms the basis of this report. It is intended to be a snapshot of existing safety switch usage, electrical deaths and injuries, and state laws. It is also intended to serve as a guide to legislators and policy makers in determining the appropriate future levels of protection from safety switches. Master Electricians stands ready to work with any government or organisation committed to improving standards of electrical safety and saving lives across all states and territories.



6.0 WHAT IS A SAFETY SWITCH?

Safety switches – also known as residual current circuit breakers (RCCBs) or residual current devices (RCDs) – have been in common use in Australia for at least 20 years. However, feedback to Master Electricians through members and directly from the public indicates there is a high level of confusion among home owners about what safety switches do, how they work and indeed which homes have them fitted. As outlined in chapter nine of this report, safety switches have been mandatory on the power outlet circuits of new homes since the early 1990s, and on the light and power circuits of new homes in most states since 2000. They provide a higher level of protection against electrocution or electric shock, and have a proven track record of saving lives.

6.1 How do Safety Switches work?

On a healthy electrical power circuit supplying energy to a normal appliance, the current entering the circuit through

the active wire equals the current returning through the neutral wire. If a failure of insulation occurs, it can result in current leaking to earth through the appliance or any person in contact with it. In this case, not all the current being delivered through the active wire finds its way back through the neutral.^{vi} Instead, it flows to earth through the body of the person in contact with the circuit.

The impact of this electrical flow on the human body will be influenced by a range of factors, including the path of current flow, the area of contact with the source of current, body size, skin condition and the voltage applied across the body.^{vii} It can result in muscle spasms, including ventricular fibrillation or disruption of the heart muscles. Standards Australia provides the following explanation of how electricity impacts on the human body:

Ventricular fibrillation occurs if an electrical current of sufficient magnitude excites the heart fibres while they are in an inhomogeneous state of

excitability known as the vulnerable period. This period corresponds to the first part of the 'T-wave' of the electrocardiogram, which is approximately 10 per cent to 20 per cent of the cardiac cycle. When the heart is in the condition of ventricular fibrillation it is unable to pump the vital blood supply to various parts of the body. Loss of blood supply for more than a few minutes can cause irreversible brain damage and of course can ultimately lead to death.^{viii} It is important therefore that body currents of a magnitude that can cause ventricular fibrillation should be disconnected very quickly.^{ix}

Other effects of ventricular fibrillation may include paralysis of respiratory muscles, damage to the neural activation pathways for these muscles, and damage to the respiratory control mechanism within the brainstem. If not interrupted, these effects will cause death.



Figure 1 – Circuit Breaker



Figure 2 – Surge Protector



Figure 3 – Safety Switch

Prolonged contact (more than a few seconds) may lead to “deep-seated burns and other internal injuries”.^x

A safety switch will detect the leakage to earth of current from a circuit, described above, and will trip the circuit within as little as 30 milliseconds, and in no more than 300 milliseconds.^{xi} This stops the flow of electricity through the body of the person in contact with the electrical circuit, and prevents the muscle paralysis and associated symptoms. Importantly, this response time is faster than the critical section of the cardiac cycle, and therefore significantly reduces the risk of death or serious injury.^{xii}

A safety switch should always be considered a secondary safety response; it is not a substitute for rigorous electrical safety procedures – both in the home and the workplace – and old-fashioned common sense around electricity. A person who receives an electric shock from a circuit protected by a safety switch may still feel the current for an instant. This may be associated with a degree of pain as a result of the shock. It is, however, very unlikely to kill them and in this sense represents an infinitely superior option to an unprotected circuit.

6.2 Circuit breakers, surge protectors and safety switches

A number of State Governments have raised concerns in recent years over confusion among home owners about the difference between safety switches and other electrical devices such as circuit breakers and surge protectors. Both the Victorian^{xiii} and Queensland^{xiv} Governments have identified high levels of confusion among consumers, leading to a false impression that occupants of a home are protected from electrocution or shock.

While modern circuit breakers (figure 1) and safety switches can look similar, particularly when installed next to one another in a domestic switch board, their function is significantly different. Circuit breakers and fuses are designed to protect the electrical cables and fittings of the home from being overloaded and damaged. They cut the power when electrical wiring in the home has too much current flowing through it.^{xv} They are designed to prevent electrical fires. Circuit breakers rarely protect humans from electrocution or electric shock.

Some switchboards also have surge protectors (figure 2) fitted to safeguard appliances against a spike in electrical current caused by a lightning strike or other

external event. Some power boards or extension leads also have portable surge protectors fitted. However, these devices do not offer any protection against electrical death or injury.^{xvii} Only safety switches will cut the power to a circuit in the event of earth leakage. Only safety switches can save lives and prevent injuries.

6.3 Types of home safety switches

Switchboard-mounted safety switches

This type of safety switch (figure 3) is the device required by law to be fitted to the power and lighting circuits of new homes. They are located alongside circuit-breakers in the home’s switchboard, and can be distinguished from circuit breakers by the presence of a button marked “test”, which is located on the front face of the device.

Combination safety switch and circuit breakers in switchboards

Some homes have a combined circuit breaker (figure 4) and safety switch installed on their power and lighting circuits. These devices protect the electrical circuits and appliances attached to them, but also offer the



Figure 4 – Combination Safety Switch



safeguards against electrical injury and death that can only be achieved with a safety switch. These devices cost around \$100 more than a standard circuit breaker, and if installed at the time of construction do not require any additional labour than a standard circuit breaker.

Other types of safety switches

In older homes or in specific environments such as workshops or bathrooms, safety switches may be fitted to a power point. Again, this type of switch can be distinguished by the test button on its front face. In order to protect a circuit, the safety switch must be fitted to the first power point on a circuit.^{xvii}

Portable safety switches, attached to a power board or extension lead, are also available. These devices are designed specifically for people working with electrical tools, and only protect the circuits of appliances connected to them. They are often required under Workplace Health and Safety laws, in addition to or instead of testing and tagging of electrical equipment on workplaces. However, they are not adequate protection for the home environment.

6.4 How do I know if I have a safety switch?

As outlined above, safety switches have a “test” button on the front face. If the devices on a domestic switch board do not have a “test” function, they are likely to be circuit breakers rather than safety switches. The test button should be used several times each year to test that the safety switch is still functioning. To minimise inconvenience, this can be done at the time clocks are adjusted at the start and finish of daylight savings time. Home owners can also take advantage of any power outage to test their safety switches – after the power is reconnected but before resetting their appliances.

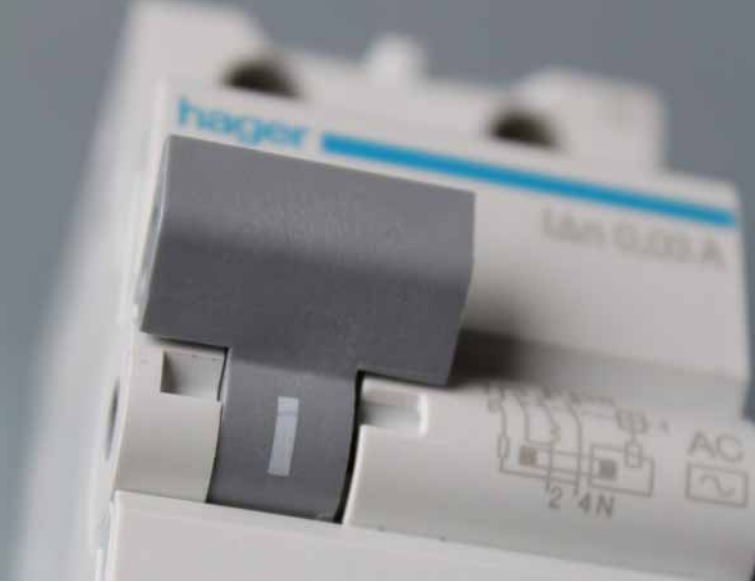
6.5 I do have a safety switch. Am I protected?

As a result of regulation and public awareness campaigns over the last two decades, around 60 per cent of Australian homes have at least one safety switch. Around half this number of homes has safety switches on the lighting circuits as well as on the power circuits. However while this is a good start, it does not represent total protection for the home’s occupants or tradespeople who may need to access the roof space. The circuits that support appliances such as

ovens, stoves, hot water systems and air-conditioners remain unprotected in most Australian homes. A range of factors such as water ingress, screwing or nailing through live cables inside walls, and contact with damaged equipment can cause injury or death on circuits other than power and lighting. To achieve the highest level of protection for home occupants and tradespeople, every circuit in the home would need to be protected by a safety switch.

6.6 Ensuring the quality of safety switches sold in Australia

Like all electrical equipment, safety switches are required to undergo safety testing prior to being made available for sale in Australia. The existing safety regime has largely remained unchanged in more than 60 years.^{xviii} However, sections of the electrical industry have voiced concerns that once products are approved and on the market, they may not always continue to meet the high standards set at the beginning. This may particularly be the case with products that are imported imitations of Australian-made products. The Electrical Regulatory Authorities Council made the following observation in a Regulation Impact Statement in 2009:



While there is a reasonable level of consistency in the pre-market approvals regimes across the jurisdictions, there is no comparable level of uniformity and activity at a post-market level. Some local level post-market activity does occur – however coordinated compliance and enforcement interventions, such as targeted auditing campaigns, are irregular. Overall, post-market enforcement (ie market surveillance and recalls) has little common strategic direction among jurisdictions. In general terms, surveillance activities are limited to investigation and follow up of complaints from suppliers, retailers and consumers with some targeted market surveillance in several jurisdictions. Enforcement is generally at a low level with some use of infringement notices (ie on the spot fines). Serious safety breaches are subject to prosecution but prosecution is relatively rare and, although generally successful, normally results in less than the maximum penalties. While some limited check testing is carried out, the operation of a co-ordinated national check testing program has lapsed due to lack of allocated funding,

although most jurisdictions do recognise the value of such a program.^{xix}

ERAC has recommended a national risk-based assessment system for all electrical equipment, mandatory registration on a national database for all suppliers of electrical equipment, uniform state legislation covering recalls and safety obligations, and a national program of post-market surveillance and testing.^{xx} Given the vital role that safety switches play in saving lives, it is essential that they meet the strictest standards of performance and safety – not only the prototypes and products tested at the time of market entry, but all products manufactured or imported for sale in Australia. The new national system of registration, post-market testing and ongoing surveillance proposed by ERAC provides the best avenue for achieving that vital outcome.

Recommendation 1

All States and Territories should adopt and implement the new Electrical Equipment Safety System as proposed by the Electrical Regulatory Authorities Council.



7.0 PREVENTABLE ELECTRICAL DEATHS IN AUSTRALIAN HOMES

Master Electricians has analysed the available data relating to electrical deaths in each state and territory. This analysis, detailed below, shows around 15 Australians are killed each year in domestic situations where a safety switch, if fitted, would have saved lives. Around 20 times this number are hospitalised with serious injuries resulting from electric shocks. This means 15 Australian families each year – more than 100 families over the next seven years – will have their lives shattered in less time than it takes a heart to beat.

7.1 Sourcing reliable data

As with the regulation of safety switches, the availability of reliable data on electrical deaths and injuries varies widely from state to state. Some states

provide detailed information on the circumstances of each death and whether a safety switch was present on the circuit. Others provide only basic, aggregated figures. Generally, those states with dedicated, stand-alone electrical safety regulators provide this information through their annual reports. In states and territories where the safety regulator function resides within a larger statutory organisation, such as the workplace safety regulator, this data is not usually as freely available. Even where data is available, the number of electrical deaths can also fluctuate wildly from year to year making it difficult to establish an average number of deaths. This report has examined a number of data sources which all support the view that safety switches in homes could prevent 15 to 17 deaths per year. We have chosen to rely on the more

conservative figure of 15. The various data sources are described below.

Suicides by electrocution are not included in the data provided by the states, but they are relatively common. They are not included because the act is wilful and so it is not viewed as a failing of the electrical safety regime. However, there have been a number of serious electric shocks recorded where the suicide was prevented by the operation of a safety switch. Eliminating electrocution from the options available to a person contemplating this course of action may lead them to another, more positive outcome.

Australian Institute of Health and Welfare
A 2007 report published by the Australian Institute of Health and Welfare (AIHW) Injury Surveillance Unit

CASE STUDY

Port Kembla, NSW – March 2010

A man was electrocuted after contacting a lighting circuit while helping a friend install a skylight. Ambulance officers were unable to revive the man. No safety switch was fitted to the circuit.

Source: ABC News^{xxxvi}

CASE STUDY

Townsville, Queensland – February 2010

A man died in hospital after coming into contact with live electrical parts in a disassembled vacuum cleaner several days earlier. A safety switch would have cut the power to the appliance, and prevented the injuries that ultimately claimed the man's life.

Source: Queensland Electrical Safety Office^{xxxvii}

CASE STUDY

Millaa Millaa, Queensland – February 2010

A ceiling insulation installer was killed on 4 February, 2010, at Millaa Millaa in far north Queensland. Initial findings of an investigation by the Queensland Electrical Safety Office found a metal staple used to fix foil insulation in place had pierced a live electrical cable, causing the entire installation to become live. There was no safety switch on the circuit.

Source: Queensland Electrical Safety Office^{xxxviii}

recorded 162 electrocutions over a four-year period. It found that the family home was the most likely location for electrical deaths, accounting for 43 per cent of those recorded. These numbers break down to an average of 40.5 electrocutions nationwide each year, with an average of 17.4 deaths taking place in the family home.^{xxi} The AIHW data is not specific as to which circuits caused the electrocutions. However, the measures recommended elsewhere in this report – for safety switches to be fitted to all circuits on all homes within five years – will almost certainly prevent the vast majority, if not all, of those deaths.

Electrical Regulatory Authorities Council Information gathered by the Electrical Regulatory Authorities Council details an average of 30.3 electrical deaths per year in Australia in the 10 years to 2006-07.^{xxii} The ERAC does not specifically break down its data by the location of each death, so it is not possible to record how many deaths took place in the home. However, applying the finding of the AIHW report that 50 per cent of electrocutions occurred while the victim was not working,^{xxiii} this supports the figure of around 15 deaths per year in homes. In

some of the cases where electrocution victims were at work, the work would almost certainly have been taking place in a private home and the deaths would therefore have been prevented had domestic safety switches been in place. These cases would boost this report's assumption of 15 preventable domestic deaths per year, were they included in these figures. However, it is impossible to quantify how many cases would fall into this category, and for this reason they have been omitted.

The ERAC data shows a general decline in electrical deaths from a high of 49 in both 1993 and 1994. However, the ERAC also noted "an increase of 25 per cent in the number of deaths associated with customers' electrical installations, appliances or equipment in 2006-07".^{xxiv}

State electrical safety regulators

The most reliable long-term data on preventable electrical deaths in the home comes from safety regulators in Queensland and Western Australia. An analysis conducted by Queensland's Electrical Safety Office (ESO) of fatalities between 2002-03 and 2007-08 found safety switches could have prevented 12

of the total 25 fatalities – or 48 per cent. If fatalities involving power lines are removed from the figures – as they cannot be protected by safety switches – 12 of the remaining 18 deaths involving electrical installations or appliances could have been prevented had safety switches been installed. This represents 66 per cent of deaths.^{xxv}

In the 10 years to 2008, the Queensland Electrical Safety Office estimates, safety switches would have prevented 33 fatalities – an average of 3.3 lives per year.^{xxvi} In Western Australia, the State Government has stated that 33 out of 38 deaths in 16 years to 2009 could have been prevented had safety switches been fitted to home circuits. This equates to an average of 2.1 preventable deaths per year.^{xxvii} The total for the two states points to an annual average of 5.4 deaths per year, averaged over more than a decade. Given that Queensland and Western Australia make up just over 30 per cent of the Australian population^{xxviii}, this average of 5.4 would equate to a national preventable death rate of more than 17 deaths per year. Considering that Queensland and Western Australia are leading the nation in terms of mandatory fitting of safety switches, it could in fact be argued that preventable death

CASE STUDY

Hamlyn Heights, Victoria – February 2010

An elderly man was found in the ceiling space of his property with electrical burns to his hand. Energy Safe Victoria investigators called to the scene said that the electrical wiring in the ceiling space was best described as “a fatality waiting to happen”. The victim contacted a metal conduit that had been energised by a cable with damaged insulation. There was no safety switch or RCD installed at this installation. A life could have been saved if one had been installed.

Source – Energy Safe Victoria^{xxxix}

rates would actually be higher in other states. Again, however, this report has chosen to rely on the more conservative estimate.

In other states, long-term and consistent data is more difficult to source. The figures used in figure 7.1 have been gathered from the most recently public information published by state safety authorities or available in the public domain. As a result, some states have long-term averages while others are simply snap shot data. Only preventable deaths have been included in this table. Those where the circumstances of the electrocution (and therefore the efficacy of a safety switch) cannot be determined from the statistics have not been included in this table. A nominal figure of one or less has been assigned to states which do not publish reliable data on the number and causes of electrical fatalities. Taken together, these figures indicate an average of 15 preventable deaths each year.

The South Australian Government has stated that the majority of electrical deaths in that state “could have been prevented by the use of a properly installed Residual Current Device (RCD) commonly referred to as a ‘safety switch’”.^{xxxiii} Similarly, the Victorian

CASE STUDY

November 2009 – East Gippsland, Victoria

A 15-year-old boy died in a shed at a property in East Gippsland on November 26, 2009. He was found by his father clutching a damaged extension lead socket. It is understood the victim was operating a power tool in the shed when he was electrocuted. The shed had an earthen floor which was extremely wet in parts. The victim was not wearing shoes or socks. His life would have been saved if a safety switch had been installed.

Source – Energy Safe Victoria^{xi}

Government’s regulatory agency, Energy Safe Victoria, has backed the installation of safety switches in homes: “There is strong statistical evidence that 90 per cent of electrical fatalities and serious accidents in domestic premises could have been prevented if safety switches had been installed.”^{xxxiv}

Recommendation 2

All states and territories should publish annual data on electrical deaths and hospitalisations. Fatalities statistics should be broken down into domestic and workplace categories, and should give a general indication of the circumstances of each death, the age and gender of the deceased, and whether a safety switch was fitted to the circuit.

7.2 Who is dying?

The AIHW report found 93 per cent of the people killed in electrical accidents were male, and just 7 per cent female. “The majority of deaths occurred in the 25–64 year age group (64 per cent), the next highest proportion of deaths occurred in the 15–24 year age group (16 per cent) and the older persons 65+ group (15 per cent). Children 0–14 years had

CASE STUDY

South Australia – 2008/09

A home owner was electrocuted whilst changing a very large Edison screw lamp associated with the cultivation of cannabis. The person had grasped the earthed metal light fitting with his left hand and the metal threaded section of the lamp with his right hand, to replace a “blown” lamp. The OTR investigation found that the electronic timer, plugged into a socket outlet, and used to operate the light, only switched the neutral conductor, thus creating a 240 volt potential difference between the threaded section of the lamp and earth.

Source: South Australian Technical Regulator^{xlii}

the fewest deaths with 4 per cent.”^{xxxv} Based on this breakdown, every 100 electrical deaths in Australian homes would, on average, include the demographic mix opposite.

7.3 Injuries

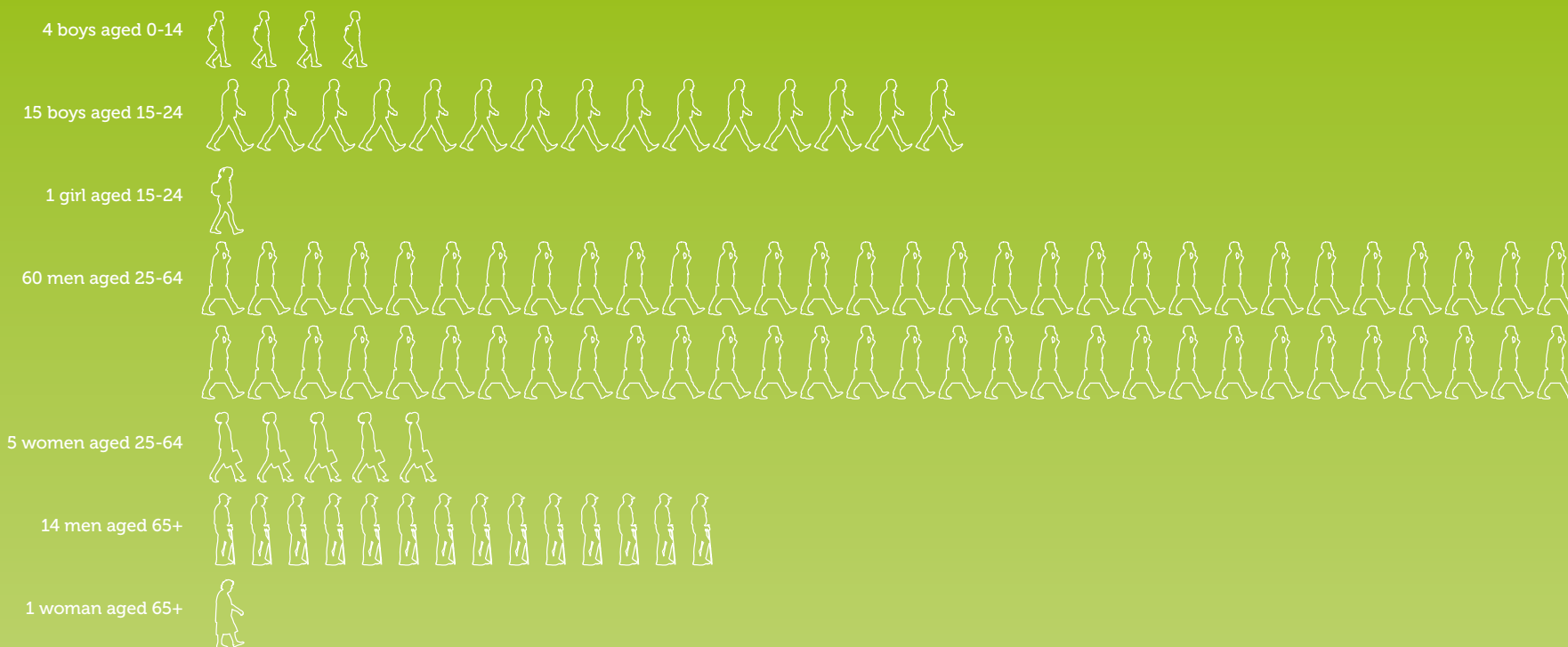
If consistent data on electrical deaths in Australian states and territories is scant, information about electrical injuries is close to non-existent. Despite providing arguably the most comprehensive data on electrical fatalities, even Queensland acknowledges a blind spot in relation to injury statistics. As part of its *Electrical Safety Plan for 2009 to 2014*, the Queensland Government has identified as a priority action area: “improved data on hospitalisations resulting from electrical incidents as a possible baseline data for future comparison”.

The AIHW National Injury Surveillance Unit study found 1416 people were hospitalised in a two year period as a result of electric shock. This equates to 708 serious injuries per year. The same study found an average of 40.5 deaths per year. Together these figures point to a ratio of 17.5 serious injuries for each electrical death. A separate AIHW report into

Figure 7.1 – State and territory data on electrical deaths

	NSW	Vic	Qld	Tas	SA	WA	NT	ACT
Most recent state government data	Four preventable deaths in 2008-09 ^{xxix}	Two preventable deaths in 2009/10 year ^{xxx}	33 preventable deaths in 10 years ^{xxxi}	Reliable recent data not publicly available	Five home deaths in seven years to 2009	33 out of 38 deaths in 16 years to 2009 preventable with safety switches ^{xxxii}	Reliable recent data not publicly available	Reliable recent data not publicly available
Lives saved each year with Safety Switches	4	2	3.3	≤ 1	0.7	2.1	≤ 1	≤ 1

Breakdown of every 100 deaths by age and gender



CASE STUDY

Western Australia – January 2009

A 73-year-old man died after accidentally touching an exposed live wire while using an electric drill at a home near Mandurah, Western Australia. The state's Director of Energy Safety Albert Koenig said the drill was plugged into a socket which was not protected by a safety switch.

Source: *ABC News*^{xlv}

CASE STUDY

Rutherford, New South Wales – October 2008

A plumber received an electric shock when a pipe he was moving pierced the insulation of electrical cabling. An apprentice who tried to intervene to save the plumber received a fatal shock. No safety switch was fitted to the circuit.

Source: *NSW Fair Trading*^{xlvi}

CASE STUDY

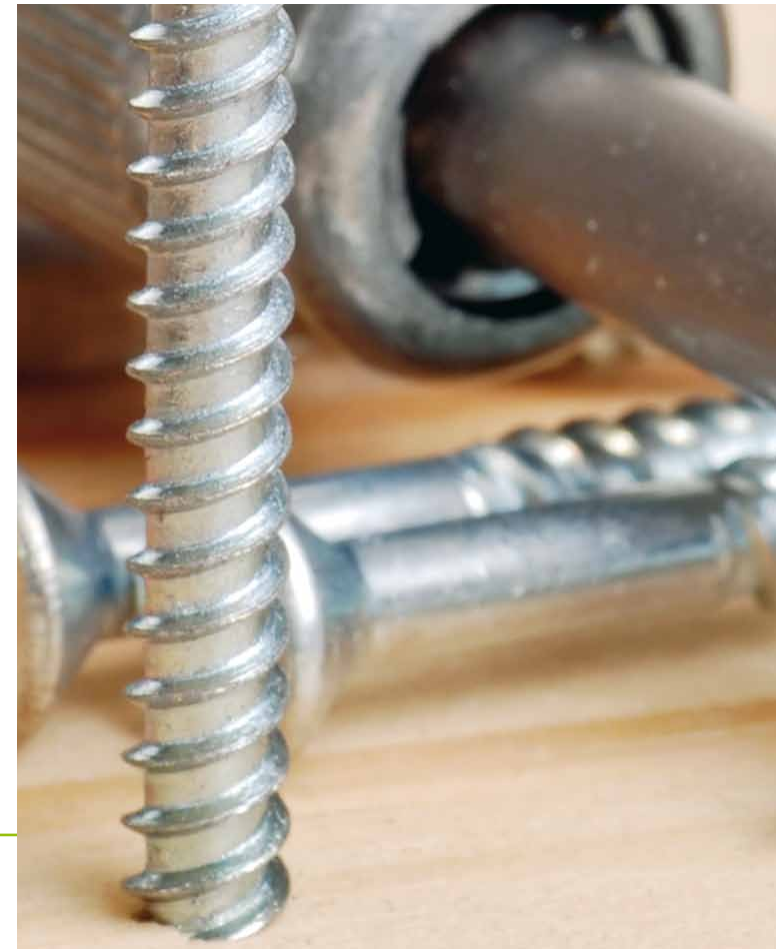
Stanwell, Queensland – November 2009

An insulation installer was electrocuted as a result of a fault in the electrical installation in the roof cavity of a home near Rockhampton on November 18, 2009. A cable supplying the stove circuit had been damaged by a ceiling fixing screw causing the supporting metal ceiling batten to become energised at approximately 240 volts. There was no safety switch on the circuit.

Source: *Queensland Electrical Safety Office*^{xlii}

hospital separations indicated 999 people had been hospitalised in Australia as a result of “exposure to electric current, radiation & extreme ambient air temperature & pressure” in 2004-06. Using the previous figure of 40.5 deaths per year, this represents close to 25 hospitalisations for each death. However, assuming a conservative middle figure of 20 hospitalisations per year, this means that for the 15 preventable deaths in Australian homes each year there are around 300 serious electrical accidents that require hospital treatment.

Further, there is no data on the number of times successful tripping of safety switches has prevented serious electric shocks. In these cases, the worst result is relatively minor injuries and some personal embarrassment to the individual involved. However, anecdotal evidence collected over a long period of time by accredited Master Electricians indicates that for every death or injury that could have been prevented by a safety switch, many more are prevented in homes that have the devices in place.



CASE STUDY

Brisbane, Queensland – October 2009

A ceiling insulation installer was killed and another received electric shock and burns during an installation in a home in Brisbane's south on 14 October 2009. The initial findings of an investigation by the Queensland Electrical Safety Office indicated that a staple being used to hold foil insulation in place had pierced an electrical cable. There was no safety switch on the circuit.

Source: Queensland Electrical Safety Office^{xiii}

CASE STUDY

Roebourne, Western Australia – September 2009

A two-year-old-boy was electrocuted while playing during a family party. Reports at the time indicated the boy had been crawling through a hole in a wall when he came into contact with live electrical fittings. Family members were unable to resuscitate him. No safety switch was fitted to the home.

Source: ABC News^{xiii}





8.0 LESSONS FROM THE HOME INSULATION PROGRAM

The tragic deaths of four insulation installers – three as a result of electric shock – from the Federal Government’s Home Insulation Program (HIP) in late 2009 and early 2010 have been well documented. Media reporting has also highlighted injuries caused to other installers from non-fatal electric shocks, and the fact that the ceiling spaces in hundreds of homes were potentially energised because of faulty installation. Nothing can restore those young lives; the safety procedures enacted by State and Federal Governments in the wake of the deaths, and all the recommendations of this report are simply too late for them. However, the issues associated with the HIP have arguably created a heightened level of awareness of electrical safety among Australian home owners at the current time. As

a direct result of the HIP, significant print space and broadcast air time has been devoted to discussion of safety switches, electrical safety and how to ensure the use of electricity in the home does not pose any threat to human life.

The challenges facing politicians, regulators and the electrical industry is to see the heightened awareness translated into action, and to ensure that these lessons do not fade from mind as the controversy surrounding the HIP slips off the media radar. To achieve these goals, it is useful to revisit briefly the events of late 2009 and early 2010.

On **October 14, 2009**, a young insulation installer was electrocuted while working in the roof of a home on Brisbane’s south. A second person also working on the project received an electric shock and serious burns. An

investigation by the Queensland Electrical Safety Office (ESO) found that a staple the installer had used to fix foil insulation had pierced an electrical cable, which energised the foil.^{xlvi}

On **November 18, 2009**, an insulation installer was electrocuted while preparing to lay fibreglass batts in a home at Stanwell, near Rockhampton. A second person assisting with the installation received an electric shock. The ESO investigation pointed to a fault in the electrical installation, where a metal screw had pierced a cable supplying the home’s stove circuit. As a result, a metal ceiling batten had become energised with 240 volts. The installer had contacted this live ceiling batten.^{xlviii}

On **February 4, 2010**, another installer was electrocuted, this time at Millaa Millaa in Far North Queensland. The ESO’s initial finding was that a metal



staple had pierced a live electrical cable, causing the aluminium foil insulation to become energised.

These three tragic deaths had two common elements. The first was that in each case the integrity of the insulation around the electrical circuit had been compromised by a metal fastener completely unrelated to electrical work. It was not as a result of working with electricity, but as a result of other general activities that the three men died. The second common element was that the flow of electricity through the victims' bodies continued long enough for them to suffer fatal harm. There was no mechanism in place to cut the power supply and save the lives.

Master Electricians Australia advised the Government of a large volume of reports from its members who were discovering energised ceiling insulation in the course of their normal activities. In most cases, this was as a result of metal fasteners for insulation piercing existing electrical cables. The result was that circuits with safety switches fitted were tripping repeatedly, and circuits without safety switches were channelling electricity into metal parts of the home, including plumbing and awnings. These warnings were delivered over several meetings with the Minister and bureaucrats.^{xlix} As a

result of this feedback, the then Minister ordered an audit of 10 per cent of homes that had been fitted with foil insulation under the HIP.ⁱ

The initial results of this inspection program, released in February 2010, indicated around eight per cent of installations had created electrical danger^{li}. More alarmingly, however, the audits also found pre-existing electrical faults in 142 of the first 700 homes tested^{lii}. This equates to a fault rate of more than 20 per cent – entirely unconnected with the HIP.

This figure suggesting faults in 20 per cent of homes is also reflected in anecdotal feedback to Master Electricians Australia from accredited contractors conducting the government audits. Master Electricians are reporting a fault rate of around one in every five homes – once again, entirely unconnected with the HIP. The vast majority of these faults are associated with unlicensed, do-it-yourself electrical work, although a small number are due to the deterioration of cables and electrical fittings, particularly in older homes.

On February 19, 2010, the Federal Government announced the suspension of the Home Insulation Program, following the three electrical deaths and a fourth death resulting from heat stroke^{liii}. The following

month – on March 10 – the government announced it would fund either the removal of metal-based insulation or the installation of safety switches for homes that had had foil installed as part of the HIP^{liv}.

On the same day, the Electrical Safety Office in Queensland – where foil insulation is most widely used for climatic reasons – issued a directive requiring safety switches to be installed before most metal foil insulation was installed. Specifically, the Queensland directive required:

- before the installation of electrically conductive ceiling insulation, a safety switch is installed on each final sub-circuit and sub-mains located in the ceiling space where such installation is possible; and
- the consumer's mains and/or cables of the electrical installation not able to be protected by a safety switch are clearly identified and marked permanently at the most accessible point and at intervals not exceeding one metre in the ceiling space to the extent that is reasonably practicable; and
- the electrically conductive ceiling insulation is installed so as to ensure that the consumer's mains, and any circuit not able to be protected by a safety



- switch, are not covered at any point by the ceiling insulation; and
- during the installation, a minimum of 25mm separation is maintained between the ceiling insulation material and the consumer's mains and/or any cables of the electrical installation not able to be protected by a safety switch.^{lv}

Master Electricians Australia supported the Queensland move, and called for it to be replicated across the country.

The solution proposed by the Queensland Government will ensure safety, without the cost and futility of ripping out all the foil products that have been installed over the last year. Other states should also act urgently to ensure the safety of their citizens. Although foil insulation is most widespread in Queensland, it is also relatively common in New South Wales, Victoria, Western Australia and the Northern Territory.^{lvi}

Our members are already very concerned about the number of metal fasteners being left behind

in homes where the foil has been removed. In most cases, these have been inserted using a high-powered tool, and are simply not pulling out with the foil. There are hundreds of staples inserted into dark, hard-to-reach nooks in the roof space. If just one of those staples remains inserted in or touching a cable, this will present a potentially life-threatening situation for the home owner or tradespeople accessing the roof in the future. Simply ripping out foil could leave behind a safety risk as high as when the foil was installed.^{lvii}

Although coronial and criminal investigations are continuing in relation to the HIP deaths, it is clear that safety switches would have saved the lives of the three installers had they been fitted on the circuits in the home which were pierced by the metal fasteners. The requirements announced by the Queensland Government on March 10 will go a long way toward ensuring the safety of insulation installers, and the protection of home owners and other tradespeople required to enter or work in the roof space after insulation is laid. It is for this reason that this report

recommends these measures be urgently adopted by all other states and territories.

Recommendation 3

[With the exception of Queensland, which has already done so, all states and territories should require the installation of safety switches on each final sub-circuit and sub-mains located in the ceiling space \(where such installation is possible\) before work begins on the installation of electrically conductive ceiling insulation.](#)

The consumer's mains electricity supply and any other cables not able to be protected by a safety switch should be clearly identified and marked permanently at the most accessible point and at intervals not exceeding one metre in the ceiling space (to the extent that is reasonably practicable).

Ceiling insulation should not be installed covering or within 25mm of the consumer's mains or any circuit not able to be protected by a safety switch.





9.0 THE CURRENT REGULATORY LANDSCAPE

The legal requirements on home owners to have safety switches fitted vary widely across Australia. Since the early 1990s, all states have required safety switches to be fitted to the power circuits of all new homes, and to new or extended power circuits when work is carried out in existing homes. This requirement was introduced into the Australian Standard in 1991, and was quickly adopted by all states and territories. Similarly, the standard was changed in 2000 to require safety switches to be fitted on the lighting circuits of new homes, and new lighting circuits in existing homes. This requirement has been introduced at different times by the states, and as a result the proportion of homes without safety switches on light circuits varies from state to state.

Despite two decades of mandatory fitting and government-sponsored awareness campaigns, around

40 per cent of homes – higher in some states – still have no safety switches at all. A much larger number of homes are protected only on the power circuits. As outlined elsewhere in this report, it will be necessary to have safety switches on every circuit of every home in order to prevent as many deaths as possible. However, as can be seen from the following table, figure 9.1, the regulatory landscape is currently patchy and inconsistent.

Queensland and Western Australia require safety switches to be fitted to the power circuits of investment homes and at the point of sale of existing homes. Western Australia has extended this requirement to lighting circuits as well. The Queensland Government is currently considering a proposal from that state's Energy Safety Office to mandate retro-fitting of safety switches on all homes.^{lviii} The other states and territories

have so far made no move towards extending the very basic level of safety switch protection that exists for homes built or renovated in the last 20 years.

Independent research commissioned by Master Electricians Australia indicates 82 per cent of people believe safety switches should be made compulsory in all homes. Around 76 per cent of people said they were more likely to support this view if there was a government subsidy for safety switches. The next preferred position in the general community was for safety switches to be compulsory in new homes, and to be retro-fitted when homes are sold.^{lix}

9.1 Investment properties

As outlined on the next page, Queensland and Western Australia already have legislation in place requiring the owners of investment homes to have safety switches



fitted to the power circuits, with light circuits also covered by the West Australian laws to come into force next year. The owners of investment homes would, in most cases, be deriving an income from their property, some of which could be used to absorb the one-off cost of fitting safety switches. These owners would also generally be able to claim their costs as a tax deduction.

Investment homes also attract the argument that the families who occupy them are entitled to the same levels of personal safety as they could have as owner-occupiers. Tenants, however, are not able to provide this level of safety for themselves (or at least should reasonably expect that the cost of basic electrical fittings would be borne by the landlord). So fitting safety switches to investment homes makes sense both from an electrical safety view point, and also from an equity perspective.

Recommendation 4:

With the exception of Queensland and Western Australia, which have already done so, all states and territories should move immediately to require the owners of investment properties to fit safety switches on the power circuits of those homes.

Recommendation 5:

With the exception of Western Australia, which has already done so, all jurisdictions should move immediately to require the owners of investment properties to fit safety switches on the lighting circuits of those homes.

Recommendation 6:

All State and Territory Governments should legislate within five years to require safety switches to be fitted to all circuits, where practicable, of all investment homes by the end of 2015. Circuits that cannot be protected with a safety switch due to the older nature of appliances such as stoves or hot water systems should be exempted from this legislation. However, such circuits should be required to have safety switches fitted when the appliance is replaced.

9.2 Sale of existing homes

As with investment properties, Western Australia and Queensland are leading the way in terms of requiring retro-fitting of safety switches when existing homes change hands. Western Australia again requires both power and light circuits to be protected, while

Queensland is considering extending its protection from just power circuits to also include lights. In Queensland, homes that are sold without a safety switch on the power circuit must be retro-fitted within three months of settlement, and this requirement must be stated on the purchase contract. When introducing its requirement for light and power circuits in 2009, the West Australian Government estimated that the twin protections could be achieved in 90 per cent of the state's housing stock within 15 years.^{civ} There is no reason to suggest that this estimate would not also apply in other states.

Mandating safety switches at the point of sale – or within three months of settlement – would significantly increase the proportion of the national housing stock in which residents were protected against electrocution. As is the case with new homes, this would be a relatively minor cost in the context of the sale of a home. Whether safety switches were fitted by the vendor or the purchaser, the cost would ultimately be reflected in the sale price of the home and these considerations could be included in the purchaser's financial planning.



Recommendation 7:

With the exception of Queensland and Western Australia, which have already done so, all states and territories should move immediately to require home owners to fit safety switches on the power circuits of homes at the time of sale.

Recommendation 8:

With the exception of Western Australia, which has already done so, all states and territories should move immediately to require home owners to fit safety switches on the lighting circuits of homes at the time of sale.

Recommendation 9:

All State and Territory Governments should legislate within five years to require safety switches to be fitted to all circuits, where practicable, of all homes at the time of sale by the end of 2015. Circuits that cannot be protected with a safety switch due to the older nature of appliances such as stoves or hot water systems should be exempted from this legislation. However, such circuits should be required to have safety switches fitted when the appliance is replaced.

9.3 New homes

As outlined previously, safety switches are now mandatory on all the lighting and power circuits of new homes. However, this still leaves a range of circuits unprotected, including hot water, stove/oven and other fixed appliances such as air-conditioning. The Australian Standard requires that these circuits have “mechanical” protection where they are installed in places likely to be subject to mechanical damage from a screw or nail. This protection would take the form of “an armour, screen covering or enclosure” designed to prevent damage to the wire.^{cv} However, the tragic 2009 death of an insulation installer as a result of damage to a circuit supplying the oven in a home near Rockhampton^{cvi} – detailed in section 8.0 – demonstrates that the risk of electrocution from circuits other than light and power. This example points very strongly to the need for earth leakage protection on these circuits as well.

In some older homes, appliances such as hot water systems or stoves are often unable to operate on protected circuits because they leak too much current to the earth system. Modern appliances, however, generally do not suffer from this problem. As a result, it is technically feasible to fit safety switches on every circuit of a new

home. Moreover, as part of the overall building project and if fitted at the time of construction, safety switches would represent a negligible cost impost – in the area of 0.1 per cent of the cost of a \$200,000 home. New home construction is already closely regulated by State and Territory Governments, and this change would be a minor imposition for governments, builders and home owners.

Recommendation 10:

Australian Standard (and New Zealand Standard) AS/NZS 3000 should be upgraded to require safety switches to be fitted to all circuits on new homes.

Recommendation 11:

All State and Territory Governments should legislate to adopt the upgraded AS/NZS 3000 in their own jurisdictions. This legislation should be enacted within two years, with a 12-month phase-in period.

9.4 All other homes

Across Australia, it has been mandatory for new homes to have at least one safety switch – on the power circuit – since the early 1990s. In most states homes built since 2000 have been fitted with safety switches on



both the power and light circuits. However, hundreds of thousands of Australians continue to live without even this basic level of protection. While it would be a significant step for State and Territory Governments to impose on home owners the expense of retro-fitting safety switches, the fact is that lives will continue to be lost unnecessarily without increased use of safety switches in the community. The Queensland Government is currently considering a proposal to mandate the retro-fitting of safety switches on the light and power circuits of all homes so far untouched by the reforms of the last two decades. All other states should move quickly in the same direction.

Moreover, in order to achieve the highest level of electrical safety for families, it will be necessary eventually to mandate safety switches on all circuits of all Australian homes. While this is a longer-term objective, governments should outline a legislative timetable in order to allow home owners to make informed decisions when retro-fitting safety switches on power and light circuits, or when commissioning other electrical work around their homes. Having advanced knowledge of a legal requirement for safety switches on all circuits – even if that requirement is some five years

down the track – will allow home owners to achieve economies of scale by having all circuits fitted at once.

State and Territory Governments, as the major provider of public housing, are often the largest landlords in their own jurisdictions. As such, they have an opportunity to lead their communities by example in this area. As well as increasing the prevalence of safety switches, a commitment from State and Territory Governments to fit safety switches to every circuit in public housing would increase awareness of the need for the devices, and demonstrate a commitment to the safety of their tenants.

State and Territory Governments will need to invest a significant amount of time and resources into educating home owners about the benefits of safety switches, and the legislative requirement to have them retro-fitted. Governments will also need to consider the cost impact on pensioners and other lower-income earners for whom the cost of one or more safety switches could represent a significant portion of monthly income. There are a range of options available to support lower income earners. These range from direct government subsidies – such as those provided in many jurisdictions for environmental measures such as solar

panels – through to financing arrangements. In some areas governments or government-owned corporations continue to be the dominant electricity retailers. In these areas, governments could offer a payment plan through electricity accounts that would help home owners to manage the cost of installing safety switches. In other areas, governments could negotiate with retailers to provide the same funding mechanism as a community service.

Recommendation 12:

All State and Territory Governments should legislate for the retro-fitting of safety switches to the **light and power circuits of all homes**. This legislation should be enacted within 12 months, with a two-year phase in period.

Recommendation 13:

All State and Territory Governments should legislate for the retro-fitting of safety switches to all remaining circuits in all homes, where ever practicable. Circuits that cannot be protected with a safety switch due to the older nature of appliances such as stoves or hot water systems should be exempted from this legislation.



However, such circuits should be required to have safety switches fitted when the appliance is replaced. This legislation should be enacted within three years, with a two year phase-in period.

Recommendation 14:

All State and Territory Governments should support an education campaign around the benefits of safety switches and the need to protect every circuit in order to save lives.

Recommendation 15:

All State and Territory Governments should commit themselves to fitting safety switches to every circuit in public housing.

Recommendation 16:

State and Territory Governments should consider providing avenues of financial assistance to help home owners retro-fit safety switches. This may include product subsidies, direct financial assistance for lower income earners, and encouraging electricity retailers to finance the installation of safety switches through their electricity accounts.

It is recognised that the recommendations made in this chapter would carry with them significant challenges for any government prepared to implement them. However, governments could expect strong support – not only from bodies concerned with electrical safety, such as Master Electricians Australia, but also from other major community commentators. It could be expected that unions and tenants’ organisations would support moves to improve safety for home owners and for those people who work in roof spaces. While social welfare groups may have some concerns about the cost of retro-fitting older homes, they could also be expected to see the benefits for renters (predominantly lower-income earners) of having higher levels of safety and personal protection in the home. The concerns of these groups could be allayed through financial support options such as those outlined above.

Ultimately, however, this is not an argument about cost or even social equity. This is an argument about safety in our homes, and about ending unnecessary deaths. Safety switches have demonstrated over 20 years that they have the potential to save hundreds of lives, and prevent the hospitalisation of thousands of people every year.



10.0 CURRENT TAKE-UP RATES FOR SAFETY SWITCHES

The phased introduction of mandatory safety switches – for power circuits in 1992 and light circuits in 2001 – has created a rough correlation between the age of the Australian housing stock and the level of protection with safety switches. Renovations and extensions will have forced the addition of safety switches to some older houses, as will the requirement for switches to be added in rental houses and upon sale in Queensland and Western Australia. However, the highest proportion of homes without safety switches is still to be found among pre-1991 housing stock.

The Australian Bureau of Statistics reported 5,852,500 private homes existed in Australia in 1991.^{cvi} It was after this point that safety switches became mandatory on power circuits, so it is reasonable to assume that the overwhelming majority of these homes would not have

had the devices installed at the time of construction. By 2001, the number of private dwellings had grown to 7,072,200 – an increase of 20.84 per cent^{cvi}. This 20.84 per cent – 1,219,700 homes – are most likely to have had safety switches installed on the power circuits only. If the rate of growth is repeated in the 10 years from 2001, the number of occupied private dwellings in Australia will reach 8,546,046 by 2011. These additional 1,473,846 homes would have been built with safety switches on both the light and power circuits.

This report has recommended that homes have safety switches installed on all circuits to ensure maximum protection for occupants.

The average home has two power circuits, two light circuits, and individual circuits for appliances such as hot water, stove, air-conditioners or pool pumps. In selecting the number and configuration of safety

switches needed, the licensed electrical contractor will take into account the correct functioning of the equipment, the likelihood of accumulation of leakage current causing nuisance tripping, and the installation implications. Ideally Master Electricians believes all circuits should have individual safety switches. However, some homes could reach full coverage with as few as 2 or 3 safety switches and others will require many more.

Considering lighting, power outlets, hot water, oven and stove and the proliferation of air conditioning and other devices, it is likely that most homes would need at least four safety switches to ensure occupants are fully protected against electrocution or injury. This is the figure used as the basis for this report's assumptions. Based on the housing numbers outlined above, Australia's existing housing stock requires an additional



Figure 10.1 – Estimated safety switch shortfall based on age of housing stock

Housing era	Number of houses	Safety switches needed per home for full protection	Total safety switches needed
Pre 1991 homes (Safety switches not included in construction)	5,852,500 ^{cix}	Four extra switches per home	23,410,000
1992-2001 homes (Safety switches on power circuits included in construction)	1,219,700 ^{cx}	Three extra switches per home	3,659,100
2001-2011 homes (Safety switches on power and light circuits included in construction)	1,473,846 ^{cx}	Two extra switches per home	2,947,692
All homes	8,546,046	N/A	30,016,792



30 million safety switches in order to provide protection on every circuit. (See figure 10.1)

Some older homes will have received safety switches through renovations or money-making activities such as sale or rental. However, even if all existing homes had safety switches on power and light circuits, the national housing stock of 8.5 million would require an additional 17 million safety switches to achieve a full level of protection. This indicates a deficit of safety switches in the national housing stock of somewhere between 17 and 30 million. An examination of data from state governments provides further insight into the penetration of safety switches across the Australian housing stock and allows us to refine this range.

The Queensland Government has laid claim to “the highest penetration of safety switches in domestic premises of any Australian jurisdiction at more than 63 per cent of homes”.^{cxii} The Victorian Government’s energy safety authority, Energy Safe Victoria, estimates that around 60 per cent of homes in that state have safety switches fitted.^{cxiii} (The organisation has also described the 40 per cent non-coverage rate as “unacceptable”.^{cxiv}) Other State Governments have not published recent figures on their estimates

of safety switch penetration. Given that Queensland has been, until recently, the legislative high water mark, it is safe to assume that the Victorian figure of 60 per cent would be closer to the national average. After a decade of mandatory safety switches on power circuits, and a further decade of mandatory safety switches on both light and power circuits, it is reasonable to assume a 50:50 split among houses with safety switches. That is to say, half of those homes that have safety switches would have them on light and power circuits, and half could be assumed to have them only on power circuits. This would lead to the following breakup of the national housing stock:

- 30 per cent of homes with safety switches on power circuits only (half of the 60 per cent figure derived from the Victorian data);
- 30 per cent of homes with safety switches on both light and power circuits; and
- 40 per cent of homes with no coverage.

Applying these percentages to the national housing stock identified in figure 10.1 would produce the results

outlined in figure 10.2. This shows a deficit of 26.5 million safety switches in the national housing stock. This is a very conservative estimate of the number of safety switches needed to provide adequate protection for every circuit in every Australian home.

10.1 The reasons for the shortfall

Independent research commissioned by Master Electricians Australia shows a troubling disparity between the levels of protection as outlined in the previous section, and perceived levels of protection in the community. For example, more than 80 per cent of people questioned indicated they felt “very well protected” or “well protected” by safety switches in their home. However, as indicated in the figures above, only 60 per cent of homes actually have safety switches. When surveyed, around 54 per cent of people believed they had one safety switch, 13 per cent believed they had two and 20 per cent believed they had more than two. This compared with genuine figures of around 30 per cent who actually have one safety switch, thirty per cent who have two and a very small proportion that would have more than two under current legislative arrangements.^{cxv}



Figure 10.2 – Safety switch shortfall based on State Government estimates

Housing type	Number of houses	Safety switches needed per home for full protection	Total safety switches needed
Homes with no safety switch (40 per cent of national housing stock)	3,418,418	Four extra switches per home	13,673,672
Homes with safety switch on power circuit (30 per cent of national housing stock)	2,563,814	Three extra switches per home	7,691,442
Homes with safety switch on power and light circuits (30 per cent of national housing stock)	2,563,814	Two extra switches per home	5,127,628
All homes	8,546,046	N/A	26,492,742



Ignorance of the need for safety switches or lack of urgency concerning electrical safety are the primary reasons given by home owners for not installing safety switches to provide even the most basic level of protection on power circuits. The most common answer among all respondents, however, for not having safety switches is that they are renting. This indicates that those in rented accommodation are not receiving the same level of protection as those in owner-occupied housing. This lends weight to recommendations four to six in section 9.1 that State Governments that do not currently require safety switches to be fitted to rental homes legislate for this outcome as soon as possible.

In a household safety survey in New South Wales in 1998, 75 per cent of respondents in rental housing said they did not have safety switches because installing the devices was the landlord's responsibility. Owner occupiers most commonly said they "haven't got around to buying one" (34 per cent), or had "never thought about it" (31 per cent).^{cxvi} In an ABS survey of West Australian residents, 23.8 per cent of respondents cited the landlord's failure to install safety switches, compared with 26.7 per cent who said they "have not got around to it" and 23.6 per cent who had never

thought about it. Only 7.8 per cent of respondents believed safety switches were too expensive.^{cxvii} These results indicate that a legislative response will be required to bridge the gap of 3.4 million homes without any safety switches, and to achieve the 26.5 million new switches needed to bring all Australian homes up to the maximum level of protection for residents. The responses to the ABS survey demonstrate that awareness campaigns by state governments and electrical safety authorities have failed to generate a sense of priority or urgency in relation to electrical safety in the community.

The Queensland Electrical Safety Board currently has a proposal before the relevant Minister in that state calling for the staged introduction of mandatory safety switches on power and light circuits on all homes by 2014. It says allowing a five-year uptake period would allow home owners to plan for and manage the cost of installation, and reduce the need to call out an electrician specifically to fit a safety switch as most home owners would require the services of an electrician in that time.^{cxviii} This response, if mirrored across other jurisdictions, (refer to recommendation 12 in section 9.4) would help to close the gap between

Australia's new homes and existing housing stock. If extended to all circuits (refer to recommendation 13 in section 9.4), it would provide the maximum protection for all home owners and erase the 26.5 million safety switch deficit.



11.0 URGENT RECOMMENDATIONS

Electrical safety is not a matter to be taken lightly. As this report has detailed, hundreds of lives will be lost and thousands more people will be injured in coming years if no action is taken to expand the use of safety switches in Australian homes. Some of the recommendations in this report will take time to implement. Others, such as retro-fitting safety switches to existing homes, will require a phase-in period to allow owners to plan for the expense. A number of the recommended measures, however, are already in place or under consideration in some states. Others could be enacted with minimal disruption to home owners. The following recommendations represent a logical next step in expanding Australia's safety switch regime, and should be implemented immediately by the relevant authorities.

Recommendation 3:

With the exception of Queensland, which has already done so, all states and territories should require the installation of safety switches on each final sub-circuit and sub-mains located in the ceiling space (where such installation is possible) before work begins on the installation of electrically conductive ceiling insulation.

The consumer's mains electricity supply and any other cables not able to be protected by a safety switch should be clearly identified and marked permanently at the most accessible point and at intervals not exceeding one metre in the ceiling space (to the extent that is reasonably practicable).

Ceiling insulation should not be installed covering or within 25mm of the consumer's mains or any circuit not able to be protected by a safety switch.

Recommendation 4:

With the exception of Queensland and Western Australia, which have already done so, all states and territories should move immediately to require the owners of investment properties to fit safety switches on the power circuits of those homes.

Recommendation 5:

With the exception of Western Australia, which has already done so, all jurisdictions should move immediately to require the owners of investment properties to fit safety switches on the lighting circuits of those homes.



Recommendation 7:

With the exception of Queensland and Western Australia, which have already done so, all states and territories should move immediately to require home owners to fit safety switches on the power circuits of homes at the time of sale.

Recommendation 8:

With the exception of Western Australia, which has already done so, all states and territories should move immediately to require home owners to fit safety switches on the lighting circuits of homes at the time of sale.

Recommendation 10:

Australian Standard (and New Zealand Standard) AS/NZS 3000 should be upgraded to require safety switches to be fitted to all circuits on new homes.

Recommendation 12:

All State and Territory Governments should legislate for the retro-fitting of safety switches to the **light and power circuits of all homes**. This legislation should be enacted within 12 months, with a two-year phase in period.

12.0 FULL TABLE OF RECOMMENDATIONS

Recommendation 1:

All States and Territories should adopt and implement the new Electrical Equipment Safety System as proposed by the Electrical Regulatory Authorities Council.

Recommendation 2:

All states and territories should publish annual data on electrical deaths and hospitalisations. Fatalities statistics should be broken down into domestic and workplace categories, and should give a general indication of the circumstances of each death, the age and gender of the deceased, and whether a safety switch was fitted to the circuit.

Recommendation 3:

With the exception of Queensland, which has already done so, all states and territories should require the installation of safety switches on each final sub-circuit and sub-mains located in the ceiling space

(where such installation is possible) before work begins on the installation of electrically conductive ceiling insulation.

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Recommendation 4:

With the exception of Queensland and Western Australia, which have already done so, all states and territories should move immediately to require the owners of investment properties to fit safety switches on the power circuits of those homes.

Recommendation 5:

With the exception of Western Australia, which has already done so, all jurisdictions should move immediately to require the owners of investment properties to fit safety switches on the lighting circuits of those homes.

Recommendation 6:

All State and Territory Governments should legislate within five years to require safety switches to be fitted to all circuits, where practicable, of all investment homes by the end of 2015. Circuits that cannot be protected with a safety switch due to the older nature of appliances such as stoves or hot water systems should be exempted from this legislation. However, such circuits should be required to have safety switches fitted when the appliance is replaced.

Recommendation 7:

With the exception of Queensland and Western Australia, which have already done so, all states and



territories should move immediately to require home owners to fit safety switches on the power circuits of homes at the time of sale.

Recommendation 8:

With the exception of Western Australia, which has already done so, all states and territories should move immediately to require home owners to fit safety switches on the lighting circuits of homes at the time of sale.

Recommendation 9:

All State and Territory Governments should legislate within five years to require safety switches to be fitted to all circuits, where practicable, of all homes at the time of sale by the end of 2015. Circuits that cannot be protected with a safety switch due to the older nature of appliances such as stoves or hot water systems should be exempted from this legislation. However, such circuits should be required to have safety switches fitted when the appliance is replaced.

Recommendation 10:

Australian Standard (and New Zealand Standard) AS/NZS 3000 should be upgraded to require safety switches to be fitted to all circuits on new homes.

Recommendation 11:

All State and Territory Governments should legislate to adopt the upgraded AS/NZS 3000 in their own jurisdictions. This legislation should be enacted within two years, with a 12-month phase-in period.

Recommendation 12:

All State and Territory Governments should legislate for the retro-fitting of safety switches to the **light and power circuits of all homes**. This legislation should be enacted within 12 months, with a two-year phase in period.

Recommendation 13:

All State and Territory Governments should legislate for the retro-fitting of safety switches to all remaining circuits in all homes, where ever practicable. Circuits that cannot be protected with a safety switch due to the older nature of appliances such as stoves or hot water systems should be exempted from this legislation. However, such circuits should be required to have safety switches fitted when the appliance is replaced. This legislation should be enacted within three years, with a two year phase-in period.

Recommendation 14:

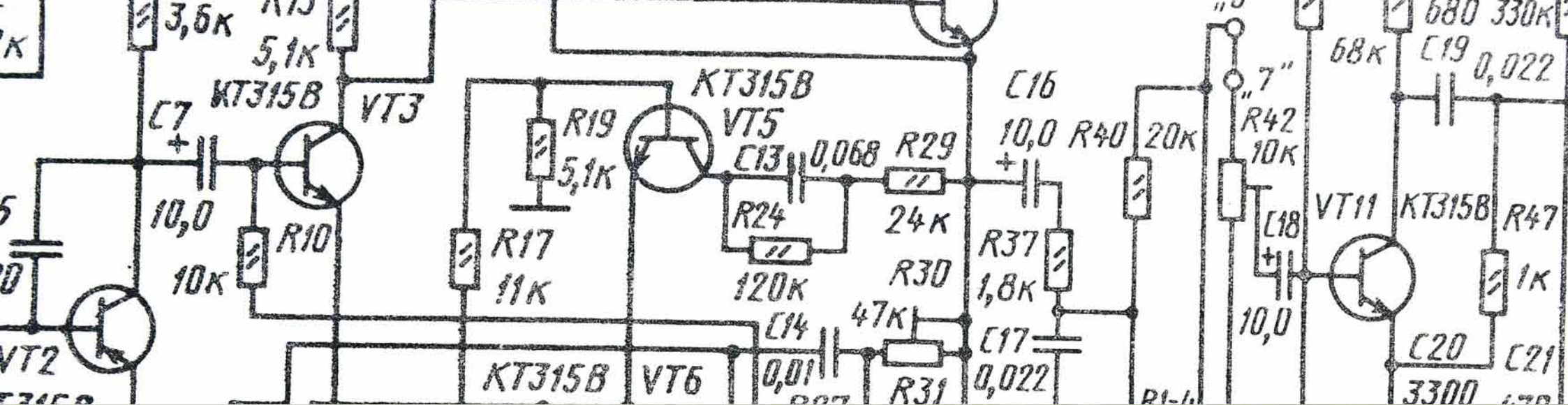
All State and Territory Governments should support an education campaign around the benefits of safety switches and the need to protect every circuit in order to save lives.

Recommendation 15:

All State and Territory Governments should commit themselves to fitting safety switches to every circuit in public housing.

Recommendation 16:

State and Territory Governments should consider providing avenues of financial assistance to help home owners retro-fit safety switches. This may include product subsidies, direct financial assistance for lower income earners, and encouraging electricity retailers to finance the installation of safety switches through their electricity accounts.



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