ELECTRICAL CONNECTION

WWW.ELECTRICALCONNECTION.COM.AU

AUTUMN 2017

2017: an automation survey

INSIDE >>

Teaching a lesson
The eyes have it
Training diary and more


EXCEL life
SUPER JOB
SUPER FAST

USB charging solutions for every type of job

EXCEL LIFE DOUBLE POWERPOINT WITH DUAL USB CHARGER WITH EXTERNAL DRIVER

FAST CHARGING: 4.8A

Ideal for plaster board installations

ED777USB2PSA

NEW EXCEL LIFE DOUBLE POWERPOINT WITH DUAL USB CHARGER WITH **INTEGRATED** DRIVER

Ideal for brick wall installation

ED777USB2IWE

The traditional Excel Life double powerpoint with dual USB charger with external driver delivers 2.4A per port. With a total charging capacity of 4.8A, the end-user can simultaneously charge 2 tablets at their maximum charging speed. This solution is great for installations in new buildings with plasterboard or double brick wall where there is a cavity to accommodate the external driver.

Our brand NEW Excel Life double powerpoint with dual USB charger with integrated driver delivers a total charging capacity of 2.4A shared between the 2 ports. Featuring a compact size integrated driver, this solution is perfect for fit-off in brick wall buildings or in any installation requiring a wall box.

Now you can install a USB powerpoint whether it is a new or retrofit project.

Visit www.excellife.com.au today

legrand®

We've forged a solid reputation as a provider of innovative automation solutions. Renown for providing intelligent integrations across a wide range of markets, we are at the forefront of resource-efficient environments. It's why we've partnered with CP Electronics to provide world leading sensors and controls.

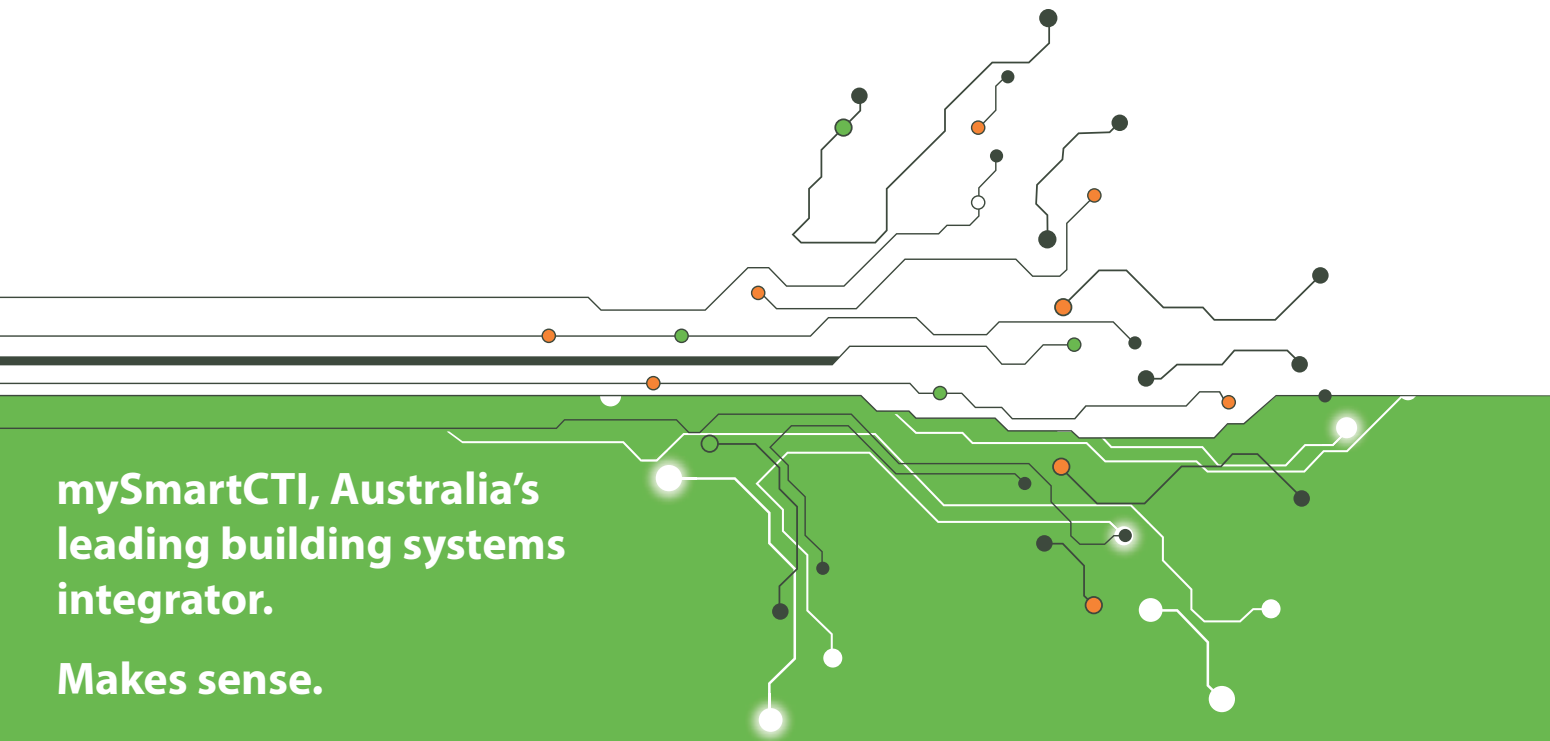
CP electronics

EXCLUSIVE PARTNER

mySmartCTI™

mySmartCTI™

SENSORS THAT MAKE SENSE



mySmartCTI, Australia's leading building systems integrator.

Makes sense.

1300 697 627 www.mySmartSensors.com.au

SYDNEY | MELBOURNE | BRISBANE | CANBERRA | PERTH

TAKING CONTROL

Home and building automation is a very real part of the electrical industry of tomorrow. What you may not realise is that it is also a big player today.

20

ELECTRICAL CONNECTION

CABLINGCONNECTION

Features

Regulars

ATT
ACROSS THE TRADES

MAKING YOUR LIFE EASIER...

Our new ecommerce website brings our branch to you. Access our extensive range of products, personalised pricing and promotions from anywhere, anytime.

THE POWER TO SAVE TIME IS IN YOUR HANDS:

- Manage your account on the go
- See live product availability
- Order fast using Bulk Order Pad
- Schedule Replenishment Orders

Open an online account today – it's quick and easy.

Visit *www.cnw.com.au* or call 1300 010 010

CNW Electrical Wholesale

THE FUTURE OF STANDARDS

SAI Global has accepted a take-over offer from Hong Kong-based private equity firm, Baring Asia Private Equity worth some $1.1 billion.

Now, you and many of your industry colleagues on Standards Committees have worked hard over the past decade or so to increase the value of this organisation (value creation is one of those great phrases these global bankers love to drop in conversation) – most likely at the expense of personal business time, effort and family... But, I'm not sure that your effort and value-add was ever really taken into consideration.

The world of Standards Australia and SAI Global is a complex one and I am constantly amazed at how few senior people across the building and construction sectors really know how it all works.

Standards Australia is controlled by 75 member organisations, such as NECA, Master Plumbers Australia, Australian Window Association, HIA, etc... and is responsible for the creation and development of all Standards documents across all industry sectors.

Hark back ~15 years and the Australian Government took advice (probably from a merchant banker) to split the roles of Standards development (the boring hack work) and the marketing of the Australian Standards that were produced or updated.

That all sounded great when the public float took place.

Standards Australia received funds from the equity-raising to invest, and then re-use the dividends to assist with funding the ongoing business of developing relevant Standards documents across Australia's societal and business needs.

SAI got a sweetheart deal and gained the exclusive marketing rights with the obligation of a small commission on sales paid back to Standards Australia.

SAI also set the retail price of the Standards for the market.

Everyone was pretty green at the time and Standards documents were still mainly published in print back then.

But, SAI started to grow an international base, which eventually outgrew the core business, somewhat aided by takeovers.

In more recent times, local industry has come to realise that the marketing 'clip' being passed back to Standards Australia is not within cooee of what similar arrangements are in other countries. In fact, it's probably 75% below what is accepted in similar schemes globally.

That means things may get a bit messy given the current marketing deal between Standards Australia and SAI reaches its sunset in 2018. (SAI has a five-year option to renew at 'market rates' but it may be a rocky conversation.)

No doubt the new SAI owner has taken this into account – and there is a suggestion that they may well hive-off the Standards publishing side of the business.

Fortunately, Standards Australia already anticipated the need for change.

In recent months it has announced a large investment in a digital platform that will ensure better use of members' time in developing/updating Standards and help put the organisation back in more control of the marketing of the Standards documents, whatever form that might take.

Standards exist for the common good. Hopefully that's not forgotten in all the hubbub of a handover.

Jeff Patchel

ELECTRICAL CONNECTION

MANAGING DIRECTOR
Jeff Patchell
jeffpatchell@build.com.au

GENERAL MANAGER
Jeremy Sweet
jeremysweet@build.com.au

EDITOR
Paul Skelton
03 9542 9016
paulskelton@build.com.au

EDITOR – ACROSS THE TRADES
Jacob Harris
jacobharris@build.com.au

STAFF WRITERS
Jacob Harris

GRAPHIC DESIGNER
Elizabeta Todorova

ADVERTISING TRAFFIC MANAGER
Gail Dwyer

CONTRIBUTORS
Matias Peluffo, Rebecca Mair, Phil Kreveld, Dr Bernie Crimmins, Wes McKnight, George Georgevits, Brian Seymour, Murray Teale, Paul Reilly, Joe Young

ADVERTISING **1800 063 371**
Angelo Sticca
0451 374 317

TO SUBSCRIBE
Australia Freecall 1800 623 214
New Zealand 613 9542 9000
Fax (with credit card details) 03 9542 9090
By mail, please write to the address below

PUBLISHED BY:
Connection Magazines Pty Ltd
Unit 2/18-22 Lexia Place,
Mulgrave, Victoria 3170
AUSTRALIA

ISSN 1839-2288

connection magazines

THE REAL COST

Hi Paul,

I read with great interest your story in the Spring 2016 edition of *Electrical Connection* titled *Having NAAN of it.* The story highlights the problems with purchasing from overseas and much more.

The real cost of purchasing the equipment from India with all the retrofitting and changes may have been dearer than buying locally. Strong specifications and penalties for failing to meet requirements need to be spelt out in contracts including making the final payment after the equipment has arrived and meets requirements.

I assume there was little ongoing support from India and the additional advice and instructions that is mostly available from local suppliers can't be understated or underestimated.

There is also the issue of changing legal responsibilities by altering a product. The installer goes from being an installer under Section 26 of the Australian harmonised Work Health and Safety Act to the designer and manufacturer under Section 22 and 23 of the Act. Additionally, the person bringing the equipment into Australia and perhaps selling it on becomes the importer and supplier under Sections 24 and 25 of the Act (though probably no change in roles here as they would have had these legal responsibilities anyway). The change in roles for the installer brings with it quite onerous legal responsibilities - check out these sections of the Act and you will see what I mean.

Also, what we don't know when we alter a piece of equipment is the hidden design issues that have been inbuilt into the product and we may detrimentally alter the equipment and not even know about it.

My advice is to buy locally and talk to the manufacturer if changes must be made to a piece of equipment to ensure you do not compromise the design. In doing so, you will be supporting Australian jobs but more importantly, ensuring safety. Yes, there may be an additional cost but what was the real cost of 'Having NAAN of it'?

Regards,
Chris Halliday

Hi Chris,

Thanks for your letter. We here at Electrical Connection completely agree that using product that is not designed to adhere to local specifications simply isn't worth the risk (either in terms of the law and/or safety). Further, all sparkies need to become aware of their legal requirements when it comes to the import and supply of product.

-Paul

A QUESTION ON COMPLIANCE

I recently saw at a well-known retailer a BC to ES lamp converter for sale. I also see these for sale on eBay quite often. I advise my customers that these converters likely do not comply with Australian Standards simply because the centre pin on an ES Lamp holder must be the active and in a BC adaptor you would have a 50% chance of this being wrong. This then means that the outside metal thread is potentially live and it is very possible that you could come into contact with it.

I brought this up with Fair Trading NSW, which has since told me the company has all necessary approvals for these converters. This doesn't necessarily make them safe. If these do comply with Australian Standards then maybe this needs to be looked at. Fair Trading seems to think that because there were no reports of injury that they must be safe (note: they said the same thing about asbestos, cigarettes, etc.). If someone was injured then Fair Trading may act but I would think that prevention is better than the cure, especially in the case of a death.

What are your thoughts?

Regards,
Bill Larkin

Hi Bill,

You are correct. Even if the unit was designed to have the outer contact as neutral it could never be guaranteed as the active and neutral wiring can be connected to either of the terminals in the BC batten-holder.

You should report it to your local state regulator for review. It can be considered quite dangerous.

The Office of Fair Trading NSW has a complaint contact on its website, I am sure.

-Gary

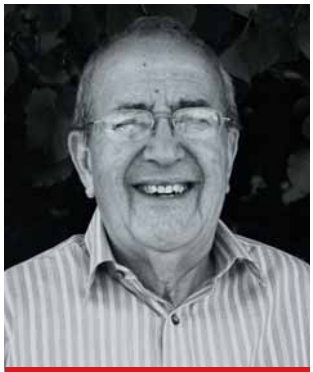
CONTRIBUTORS

BRIAN SEYMOUR

Estimating

Brian Seymour MBE, industry consultant, author of *Electrical Estimator's Labour Unit Manual* and *Starting Out*, conducts regular industry training programs throughout Australia on behalf of the electrical and air conditioning industries.

> See page 26



PHIL KREVELD

Let's Get Technical

Phil Kreveld is an electrical engineer with broad experience in electrical and electronic instrumentation, including relay testing power and power quality analysis.

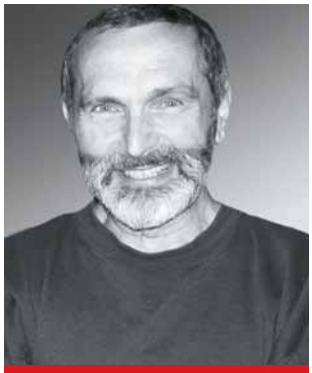
> See pages 38 and 54

MATIAS PELUFFO

Standards Update

Matias Peluffo is Solution Architect, Asia Pacific, for Enterprise Building Solutions. He has more than 25 years' experience in the cabling industry and an expert member of ISO/IEC JTC1/SC25 WG3 since 1996.

> See page 74



GEORGE GEORGEVITS

Technically Speaking

George Georgevits manages his own engineering consultancy, Power and Digital Instruments, established in 1980. PDI specialises in lab and field testing and troubleshooting of cabling systems and components.

> See page 70

WES MCKNIGHT

McKnight On The Town

Wes McKnight has over 31 years of experience as an electrical contractor under his belt. From 2008 to 2013, he was also the president of the National Electrical and Communications Association (NECA).

> See page 28

DR BERNIE CRIMMINS

Bloke's Health

Dr Bernie Crimmins has been a medical professional for more than 30 years. In that time he has developed a special interest in men's health and has authored two books on the subject.

> See page 60

REBECCA MAIR

Bec Sparky

Rebecca Mair is a qualified electrician and renovation expert who currently works as a consumer brand ambassador at Clipsal by Schneider Electric. She hopes to share important tips on safety, energy saving and products.

> See page 48

PAUL REILLY

Testing Times

Paul Reilly started his apprenticeship in 1977 in Shepparton and founded PA & WM Reilly Electrical Contractors in 1995. A 'one man show' for 14 years in a rural area gave plenty of opportunity for diversified experience. He now employs five staff.

> See page 72

We're not good at everything...

But, we're really good at providing technology for data centres

Sometimes the pros make things look easier than they really are. We're not professional mountain bikers, but when it comes to data centres, we can make things easy by maximising the performance and scalability of your data centre applications. Whether it occupies one room, one or more floors, or an entire building, AFL can supply any or all of the components for an end-to-end Tier 1 to Tier 4 operation.

- Fibre distribution frames
- Fibre cabling solutions
- Connectivity
- Fusion splicers
- Test and inspection equipment

AFL

www.AFLglobal.com
AU 1300 232 476
NZ 09 927 7140

NECA ANNOUNCES NEW LEADERSHIP TEAM

The National Electrical and Communications Association (NECA) has announced its new office bearers for the coming year, following the conclusion of its annual elections.

The appointments include:

- National president: Alan Brown (NSW)
- National vice president: Greg Hodby (SA)
- National treasurer: Jim Heerey (TAS)

Alan Brown is the group executive director of Fredon Industries and serves as the vice president of the NECA NSW chapter. Greg Hodby is the chief executive officer of Oliver J Nilsen Australia and also serves as vice president of NECA's SA chapter. Jim Heerey, the managing director of Heerey Electrical, will continue in the role of national treasurer.

Dave McInnes is stepping down as president but will remain on the National Executive as the Qld delegate, having served as president for almost two years. Mike Green leaves the National Executive after many years as a national councillor from WA. Mike has served as NECA's vice president since 2012.

NECA thanks outgoing office bearers Dave McInnes and Mike Green for their contribution over the past two years as president and vice president respectively.

The incoming team marks the beginning of a new era for NECA, which is also welcoming two new Executive Committee members, Alan Charlton as the WA delegate and Mike Purnell as the Victorian delegate, in the coming year.

AUSTRALIA ADOPTS INTERNATIONAL REFRIGERATION SAFETY STANDARDS

Strong industry and government engagement has seen Australia adopt international (ISO) standards for refrigeration safety. These documents supersede the AS/NZS 1677 series.

"PRIME – the HVAC&R industry strategy to transition to low emissions – identified early on that AS/NZS 1677 had to be reviewed," says AIRAH chief executive Tony Gleeson.

The changes were first proposed by AIRAH in 2010.

"In response to stakeholder needs, Standards Australia worked closely with industry and government and supported PRIME to achieve this major milestone."

Significant changes have been made to refrigeration standards, with the following now published and available:

- AS/NZS ISO 817:2016, Refrigerants – *Designation and safety classification.*
- AS/NZS 5149.1:2016, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria.*
- AS/NZS 5149.2:2016, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation* .
- AS/NZS 5149.3:2016, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site.*
- AS/NZS 5149.4:2016, *Refrigerating systems and heat pumps – Safety and environmental requirements* – Part 4: *Operation, maintenance, repair and recovery.*

"The adoption of these standards is an important step as the HVAC&R industry transitions to a low-emission future," says AIRAH executive manager – government relations and technical services Phil Wilkinson.

"Last weekend saw the announcement that global agreement had been reached on an HFC phase-down and this international alignment of standards supports our shift away from HFC refrigerants and towards low-global-warming refrigerant alternatives."

As direct or modified adoptions of international standards, AS/NZS ISO 817 supersedes AS/NZS 1677.1:1998, *Refrigerating systems – Refrigerant classification.* The AS/NZS 5149 series supersedes *AS/NZS 1677.2:1998 Refrigerating systems – Safety requirements for fixed applications.*

CLIPSAL SHOWROOM OPENS IN NSW

Clipsal by Schneider Electric has officially opened the doors to New South Wales' first Clipsal Showroom, located at Marsden Park.

The full range of switch plates, home automation systems and Bluetooth audio solutions – as well as Clipsal's newest product, Clipsal Iconic – will be on display to help put consumers' home vision into reality.

As well as physically seeing products, visitors have access to experts who can recommend solutions to match individual requirements – helping consumers make the right decision to suit their style. These experts can also help create a home electrical plan, through the Clipsal by Schneider Electric Clipspec consultation process. As well as receiving expert advice and a detailed home electrical plan, a Clipspec consultation will also provide visitors with an itemised bill of materials and an end user pricing guide to provide their electrical contractor.

Are you monitoring your energy consumption?

As the importance of energy conservation continues to grow, monitoring your energy consumption is the first step in reducing your carbon footprint.

If you cannot measure it, then how can you improve on it? The key is a complete energy management system to help understand, tune and track your sustainability initiatives, ultimately improving efficiency.

It is this combination of scale and knowledge that makes NHP a valuable partner that not only provides an energy management solution, but provides the confidence and peace of mind to go with it.

Take the first step to achieve an energy management solution. Visit nhp.com.au/more/EM for a free brochure download!

NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD
1300 NHP NHP | nhp.com.au |

NHP

NELECTCONNECTJULY_3577_06/2016

APPY DAYS ARE HERE AGAIN

A Queensland-based start-up is aiming to short circuit red tape for sparkies.

Kurt Alexander is a man on a mission to modernise safety certification for electrical contractors, simplifying red tape and making life easier for the 35,000 licensed sparkies in Queensland.

In partnership with the Chamber of Commerce and Industry Queensland (CCIQ) and start-up 'accelerator' BlueChilli, Kurt has developed QuickSafety, a mobile application that enables electricians to complete safety certificates quickly and easily on their mobile device, securely storing the completed certificates for access by the electrician, the company and regulatory bodies for five years.

"It's hard to believe, but electricians around Australia still have to fill out paper-based electrical safety certificates each time they complete a job," says Kurt, who has been working out of the Collaborate hub in Brisbane.

"This is frustrating for the electrician, a huge admin overhead for the business, and exposes both the electrician and the business to regulatory risk due to incomplete and lost certificates, or failure to store certificates for the required five-year period."

QuickSafety solves this problem and has just released its first version of the QuickSafety App into the Apple AppStore.

"It was a huge day for QuickSafety and seeing our app go live was a huge milestone. We've gone from a concept to a fully working product in less than seven months," he said.

Developed through Collaborate, an initiative of CCIQ, BlueChilli and Suncorp Bank, QuickSafety is one of the first cohort of Suncorp Bank #SmallBusinessChallenges winners, a competition that ran in February 2016 to find start-up ideas which could solve real problems facing small business.

Having worked in the electrical industry since 2000, and then consulting back to the industry in 2009, it was dealing with clients' frustrations that Kurt saw an opportunity to make a difference and alleviate the pain that sparkies encountered on the ground.

When the opportunity came to pitch for the Collaborate #SmallBusinessChallenges competition, he grabbed it with both hands.

CCIQ Collaborate general manager James Flaherty said it was precisely what was envisaged from the Suncorp Bank #SmallBusinessChallenges competition.

"Kurt is exactly the sort of founder and QuickSafety the perfect business for Collaborate and our Suncorp Bank #SmallBusinessChallenges campaign," James says.

"Kurt has identified a clear problem for an industry sector and worked to develop a simple, low cost and easy to use solution that will make form filling easier, quicker and more efficient.

"That has to be good news for the 35,000 sparkies in Queensland."

QuickSafety is now building on this amazing start to secure customers and to grow the profile of the application and the story behind what will go on to become a successful Queensland start-up.

To find the app, search QuickSafety in the AppStore, or visit: http://www.quicksafety.com.au/

GENERAL CABLE TO CLOSE ALL A/NZ OPERATIONS

General Cable Corporation has announced that it plans to close its New Zealand manufacturing and support operations, based in Christchurch and Auckland, through a managed process during 2017.

The news follows a July 2016 announcement that the company would close its Australian operations on 25 November 2016.

Initially, Australian customers were directed to the company's regional headquarters in New Zealand.

"The closure of our Australian offices is part of a program to ensure the business is aligned with market structure and conditions in this region," managing director - Oceania David Peterson said in July.

"We intend to maintain supply to key projects and customers in Australia, sourcing as required from General Cable's global manufacturing network."

The proposal to close the NZ business follows a review of various options for its strategy, structure and ownership over recent months. Sales of product sourced from the international manufacturing network of General Cable Corporation would continue in the region after the closure if the proposal is confirmed.

"The proposal has been made with reluctance after reflection on the performance and long-term prospects of the business in its current form and the overall industry conditions in the region," David said.

"We have made a concerted effort to change the business to meet market challenges, through a reorganisation in New Zealand and through the closure of the Australian sales offices. Regrettably, these changes have not been sufficient to overcome the fundamental issues.

"We anticipate that if the decision is made to proceed with the closure, manufacturing would continue until end March 2017."

NHP OPENS MELBOURNE TRAINING FACILITY

NHP has opened a training facility in Mebourne called the NHP Power Hub. The facility showcases a range of power distribution solutions highlighting medium voltage capabilities.

Equipment displayed includes the DF2 demountable switchgear with a variety of functional panels, withdrawable switchgear, ring main units, oil immersed and cast resin transformers, agile protection relays and a 2MVA kiosk substation.

To complement the central facility and upon request, NHP has a range of switchgear products that are available to visit interstate and remote customers for training purposes.

To further expand on the offering, Competency Training (CT) will be using the facility for its High Voltage Switching Operations course to give students the ability to undertake a variety of practical activities and applications in a safe and controlled environment.

To organise a tour, contact your local NHP sales representative.

GERARD LIGHTING WINS INTERNATIONAL LIGHTING DESIGN AWARD

Gerard Lighting has been presented the 'Award of Excellence' in the IESANZ International Lighting Design Awards for Australia and New Zealand for its GenLED One Luminaire.

Judged by Warren Julian and Peter McLean, these lighting awards represent the pinnacle of recognition by the Society towards those that practice lighting design. Considered a significant improvement in the design of an LED troffer, Gerard Lighting's GenLED One Luminaire offers excellent light output and low UGR and was designed specifically for the International Towers Sydney (ITS) at Barangaroo, NSW.

The ITS project at Barangaroo is now the largest commercial office installation of LED lighting ever undertaken in the Asia Pacific region. The GenLED One is a uniquely aesthetic recessed office luminaire that complies with Green Star, UGR and best in class energy efficiency.

The GenLED One luminaire features a row of low output LEDs in the diffused side panels, designed to ease the visual transition from unlit ceiling tiles to the high brightness LED modular cells. Another feature, placing this product among a list of 11 taking out the Award of Excellence, is its aesthetics. The judges describe it as, "not just a box with a light but a very attractive fitting, with good performance, well worthy of this award."

RJ-45 PLUG

Optical Cable Corporation
www.occfiber.com

To ensure that Category 8 adopters will effectively reach data speeds of up to 40Gbps, OCC is introducing a new RJ-45 plug with integral circuit board technology that provides advanced control of crosstalk, return loss and other impediments, ensuring consistent performance at higher frequencies up to 2,000MHz.

The new plug is ideal for direct-attach, high-speed links and data centre server connections.

The plug provides consistent and reliable terminations that are guaranteed to meet or exceed the recently approved Cat 8 standard when paired with compliant Cat 8 cable. The new RJ-45 plug model is fully backward compatible with existing RJ-45 infrastructure used by a majority of Ethernet connection ports, including Cat 6A, 6 and 5e cabling.

CURRENT-LIMITING CIRCUIT BREAKER

Rockwell Automation
http://ab.rockwellautomation.com

Industrial automation customers can improve their short-circuit protection with a new line of current-limiting, moulded-case circuit breakers from Rockwell Automation. The line expands the Allen-Bradley Bulletin 140G moulded-case circuit breakers and offers more comprehensive, fast-acting short-circuit protection.

The line expansion protects against overload, short-circuit and ground-fault conditions. The new line reacts to circuit overloads two to three times faster than standard circuit breakers.

TIME SWITCHES

Legrand
www.legrand.com.au

The Legrand Digital and Astronomical family of programmable time switches are installed with the same software and data key, which makes the programming process quick and easy.

For extra-added security, these time switches come equipped with a security PIN code, as well as a memory for backup switching programs.

Alternativelv. Legrand's Analogue Time Switches (pictured) operate to the highest precision, with a clock precision of ±0.2 sec per day. They even hold their time-precision integrity during daylight savings by automatically adjusting to suit the time change.

MODULAR MICROGRID

ABB
www.abbaustralia.com.au

ABB has announced a modular and scalable 'plug and play' microgrid solution to address the globally growing demand for flexible technology in the developing market for distributed power generation.

The cost-efficient, containerised solution is relevant for mature and emerging countries and will help maximise the use of renewable energy sources while reducing dependence on fossil fuels used by generator sets.

SEARCH LIGHT

Milwaukee Tools
www.milwaukeetools.com.au

Milwaukee Tools has introduced the M18 LED search light. Designed to provide maximum performance and versatility in the toughest jobsite environments, the new light boasts a beam distance of more than 640m and 1,250lm of light, allowing users to spot farther and flood brighter.

The new M18 LED search light is the ideal solution for users who need to illuminate or spot an area at long distance or overhead, but also often need flood lighting for task work. With four modes to address a variety of lighting situations, just one of these search lights can do the job of two lights at once.

PFC CONTROLLER

NHP Electrical Engineering Products
www.nhp.com.au

For the automatic switching of capacitor banks, NHP has released its new RL8 and RG8 power factor controllers.

The new series offers plug and play accessory modules providing flexibility to meet any application requirement with options from master-slave configurations to contactor or dynamic switching of capacitor banks.

Features include IP65 front protection, network measurement values including harmonic measurement, step status information and defined alarms.

FIBRE DISTRIBUTION FRAME

AFL Global
www.aflglobal.com/au

AFL has released the Mini Infinity Fibre Distribution Frame (IFDF) – a high density optical interconnect solution suited for a range of communication environments.

It is the smaller version of the in-demand IFDF, however accommodates 12 sub frames in comparison to 26. The Mini IFDF is ideal for high density fibre management in data centres, co-location and telecommunication environments.

It is a left and right sectioned mounting frame that is populated with modular swing out sub frames as required. This allows both inbound and outbound cables to be separated, each section will accommodate six sub frames, totalling 12 when both are fully populated. A range of modules are available to suit fusion splicing, patching, passive device module patching and MTP patching.

CIRCUIT BREAKER ANALYSER SYSTEM

TechRentals
www.tr.com.au

The Megger TM1760 circuit breaker analyser system offers powerful technology that achieves safe, efficient and reliable circuit breaker testing. This advanced system includes a built-in PC and the patented DualGround method, which keeps testing safe and saves time by keeping the circuit breaker grounded on both sides throughout the test.

Galvanically isolated inputs and outputs make it possible to perform all relevant measurements in one test, eliminating the need for new setup and re-connections. This unit includes three static and dynamic resistance modules with up to 220A test current, a 3-channel dynamic capacitance module and a full set of required cables.

Applications of the TM1760 circuit breaker analyser system include timing measurements, coil current testing and dynamic resistance measurement.

INTEGRATED STEPPER MOTORS

Motion Technologies
www.motiontech.com.au

JVL Industri Elektronik A/S has announced a complete new generation of the NEMA23 integrated stepper motors.

The integrated motors in NEMA23 size flange have an RS485, an optional CANopen or an industrial Ethernet interface as well as an easy programmable motion controller. All the necessary electronics in a stepper system is integrated in the motor. JVL has used the latest technology to achieve the incredibly high step resolution of 409,600 step / revolution, resulting in unsurpassed smoothness and silent running.

LASER LEVEL

Fluke Australia
www.fluke.com.au

Fluke Laser Levels are a new line of professional-grade tools that are designed to survive a 1m drop and keep working. The Laser Levels feature a fast settling, self-levelling gimbal that quickly delivers accurate reference points, expediting electrical and HVAC layouts.

The Fluke Laser Level family includes the Fluke-3PR (red laser) and Fluke-3PG (green laser) Point Laser Level. Accurate to 6mm at 30m, it includes a floor stand for fast, easy overhang and centerline measurements. The green laser is up to three times brighter for improved visibility in outdoor and long range applications.

LED LUMINAIRE

Zumtobel
www.zumtobel.com.au

Zumtobel has unveiled the sixth generation of the MELLOW LIGHT LED.

MELLOW LIGHT has been extensively developed and is now available in two versions: MELLOW LIGHT evolution and MELLOW LIGHT infinity. Both variants ensure the balanced illumination of work surfaces, walls and ceilings to create an open room atmosphere in which glare and shadows are a thing of the past.

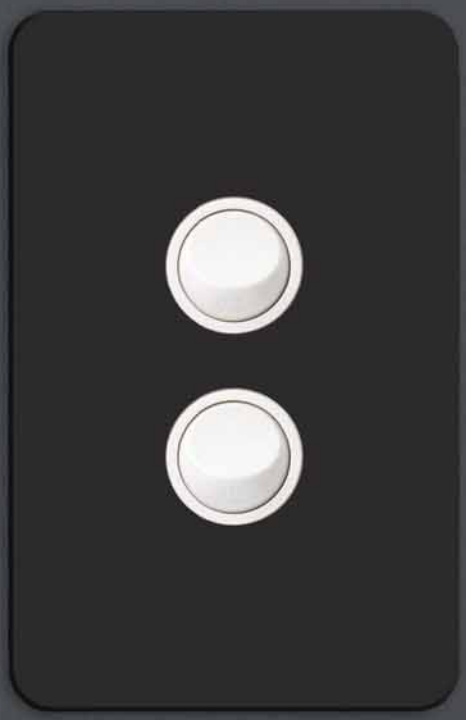
Both versions are available with tunableWhite technology by Zumtobel, allowing the light intensity and colour temperature to be independently adjusted between 3,000 and 6,000K.

FIBRE TERMINATION SYSTEM

Siemon
www.siemon.com.au

Siemon has announced its new LightBow fibre termination system that improves fibre termination speed, performance and reliability while reducing cost.

Part of Siemon's LightHouse advanced fibre optic cabling solutions, the new LightBow termination system features an exclusive patent-pending termination tool and pre-polished mechanical splice connectors that together reduce termination time, prevent fibre end face contamination and air gaps, and enable easy verification of termination quality.



So fine, just stunning **silhouette**

GOOD DESIGN® Award

The new silhouette range

Boasting a clean, modern design, with covers available in real aluminium, real stainless steel or matt black and at only 4mm off the wall, the silhouette range has been crafted with distinctive elegance in mind. With the choice of standard switch mechanisms or our new electronic push button switches and dimmers, silhouette brings a much needed fresh and stunning design to the Australian market.

www.hagerelectro.com.au/silhouette

hager

WHO'S THE BOSS?

HOME AND BUILDING AUTOMATION IS A VERY REAL PART OF THE ELECTRICAL INDUSTRY OF TOMORROW. WHAT YOU MAY NOT REALISE IS THAT IT IS ALSO A BIG PLAYER TODAY. PAUL SKELTON REPORTS.

For the best part of a decade, if not longer, home automation has been considered 'on the horizon' – something that is so close to practicality and yet so far from reality. It always seems to be spoken about as if its arrival is imminent but it's not here just yet.

Well, the truth is it is here now... and it has been for some time.

As the editor of *Electrical Connection*'s sister publication *Connected Home+Business*, I have been immersed in the home and building automation sector for just over a decade. In that time, I have seen it grow from being a young, niche market to one that now draws attention from the likes of Apple and Telstra (neither of which actually offer 'home automation' solutions; rather, they sell 'smart devices' under the banner of automation.)

The terms home and building automation actually denote a holistic, integrated system that encompasses technologies like lighting control, energy management, AV and security. And at the centre of it all is a control system that acts as, well, the Fat Controller from *Thomas The Tank Engine* – nothing happens without its knowledge.

So it's understandable that finding the right control system for your project is imperative to a job's success. What you may not know is that there are dozens of control systems on the market and they all offer installers something different.

So, where do you begin?

WHY AUTOMATION

Before we get to comparing and contrasting these systems, it's important for sparkies to understand why home automation is important.

"The electrical sector is dynamic and keeps changing, so you can't sit still and expect to thrive," Convergent Technologies managing director Nick Libertone says.

Convergent Technologies is the Australian distributor of Lutron, Vitrea and Transformative Engineering control solutions.

"The home and building automation market is completely different to 15 years ago. When I started with control system manufacturer Crestron back in 1998, it wasn't easy getting systems integrators on board because they didn't want to touch IT. Today, if these same guys didn't have a control system then they'd be in all sorts of trouble.

"The electrical contracting market is heading in the same direction.

"While some products become commoditised and others fall out of favour, contractors have to always be moving forward and doing something new to remain relevant. You have to jump on the latest products; you can't do what you were doing five years ago and just cruise by.

"Now more than ever, people are learning about home automation and they want it in their homes, and it's your job to give your clients what they want, even if it's not something you personally want at home."

Rene Rieck is automation manager for manufacturer WAGO.

"'Intelligent buildings' adapt dynamically to a user's needs and surroundings. High convenience, low power consumption and great reliability: those are the primary demands of today's customers for modern building services.

"There is a constant rise in the prices for oil and energy. This offers opportunities for automation. Conscious use of energy ensures our future and makes homes and buildings more economical.

"For electricians, being able to offer smart home and building solutions can bring a number of benefits that will help your business to grow. You can differentiate your company from others; increase the value of projects; spend less time pulling cables and more time programming; offer a higher value service; and, build lasting ongoing relationships with customers ensuring referrals and repeat business."

So what do you look for when buying a control system?

"For the automation novice, there are a few things to consider when selecting which system to specify. For example, simplicity to program and a brand that offers a complete solution so you don't have to patch different systems together to get results," Nick says.

"Dealing with an established company is also important. Lutron, for example, is the world leader in lighting control so they have longevity and ease of service. There are so many products coming on to the market that are start-ups, or haven't been in the market for very long, so the products may not be supported as well as they are with someone like Lutron.

"With electronics, it's not a matter of 'if' but 'when' it will go down, so service is vital.

"Work with a company that is progressive and accommodates future technologies, rather than a company that isn't as quick to move. You should also look for software that is progressively growing and a company that has a track record of innovation, that way you'll know that you will be looked after."

In addition to working at WAGO, Rene is also a certified KNX trainer.

KNX is an open global standard for home and building control and automation.

"Electricians should be making use of the possibilities created by intelligent home and building system technologies, like KNX, for their professional success," he says.

"Your customers' needs change constantly. They want independence, and they require compatible system solutions that have a future. This is what KNX offers.

"With KNX, you are one step ahead. By correctly adjusting the parameters of heating, lighting, shutter control, etc, and the communication between them, you can drastically reduce the energy consumption, daily life becomes easier, more flexible and future proof in many ways."

There are undoubtedly some readers of *Electrical Connection* who picked up a control system several years ago and thought 'this is too hard', or 'I'm not paying someone to program'.

Well, things have changed.

"Ten to 20 years ago, to become a control system installer you needed a fairly advanced knowledge of logic and programming. Today, almost all of the systems mentioned in this guide have a simplified method of programming that is quick and efficient," Nick says.

"Now, practically anyone can program one of these systems."

Nick suggests looking at various manufacturer product training sessions to find out more about a specific system, but to get a foundation you need to learn basic networking skills.

"More and more as you move forward, the progressive electrician needs to look at this technology; it's a springboard to other things."

> "The electrical sector is dynamic and keeps changing, so you can't sit still and expect to thrive."

As an introduction to the control market, we have compiled a comparison guide on 31 of the control systems available in Australia. Other companies were invited to participate but failed to reply prior to print.

The main takeaway for electricians, however, is hopefully an understanding that home and building automation is here now and ignoring it won't make it go away. In fact, it could end up costing you in the long run. ■

- **Convergent Technologies**
  www.c-t.com.au
- **WAGO**
  www.wago.com.au

				FUNCTIONALITY																
MANUFACTURER	PRODUCT	DISTRIBUTOR	NZ DISTRIBUTOR	Residential/Commercial	IP	Distributed audio	Distributed audio zones	Distributed video	Distributed video zones	Lighting control	HVAC	Blind control	Security	Keyless entry	Energy management	Smoke, fire and carbon monoxide detection	Remote monitoring	Scenes	UPS backup
ABB	free@home	ABB Australia www.abbaustralia.com.au	ABB New Zealand new.abb.com/nz							•	•	•	•		•	•	•	•	•
ATEN Simply Better Connections	VK2100 + VM1600	Madison Technologies www.madisontech.com.au	PB Tech www.pbtech.co.nz		•	•	16	•	16	•	•	•	•		•	•	•		
CLIPSAL	C-Bus	Schneider Electric www.schneider-electric.com.au	Schneider Electric www.schneider-electric.co.nz		•	•		•		•	•	•	•	•	•	•	•	•	•
clarecontrols	CLIQ Host	Australian Control Solutions www.networkav.com.au	N/A		•	•	Unlimited	•	Unlimited	•	•	•	•		•	•	•		
COMMAND FUSION	Solo	CMI Music & Audio www.cmi.com.au	Intelligent Environments www.intelligentenvironments.co.nz		•					•	•	•	•				•		
commBOX	Control Pro	CommBox www.commbox.com.au	CommBox www.commbox.com.au		•					•	•	•	•	•	•	•	•		•
Control4	EA-Series Controllers	Control4 www.control4.com	AVA Pacific www.avapacific.co.nz		•	•	16	•	16	•	•	•	•	•	•		•	•	
CRESTRON	Crestron	Crestron www.crestron.com	Crestron www.crestron.com		•	•	72	•	128	•	•	•	•	•	•	•	•		•
ELAN	ELAN g!	QualiFi www.qualifi.com.au	Wildash Audio Systems www.wildashaudio.co.nz		•	•	64	•	16	•	•	•	•	•	•	•	•		
environexus	Nero	Schneider Electric www.schneider-electric.com.au	Schneider Electric www.schneider-electric.co.nz		•					•	•	•	•	•	•	•	•	•	
Extron Electronics	TouchLink Pro	Extron Australia www.extron.com.au	AVW www.avw.co.nz		•					•	•	•	•		•	•	•		
FIBARO	FIBARO Home Center 2	FIBARO Australasia www.fibaro.com/au	FIBARO Australasia www.fibaro.com/au		•					•	•	•	•	•	•	•	•		
hager	Tebis KNX	Electrical wholesalers	Electrical wholesalers		•	•		•		•	•	•	•	•	•	•	•		
iRidium mobile	iRidium Pro + Server	JAMware Australia www.jamware.co.nz	JAMware www.jamware.co.nz		•	•	Unlimited	•	Unlimited	•	•	•	•	•	•	•	•		
legrand	MyHOME Home Automation	Legrand Australia www.legrand.com.au	Legrand NZ www.legrand.co.nz		•	•	8	•	96	•	•	•		•	•	•	•	•	•

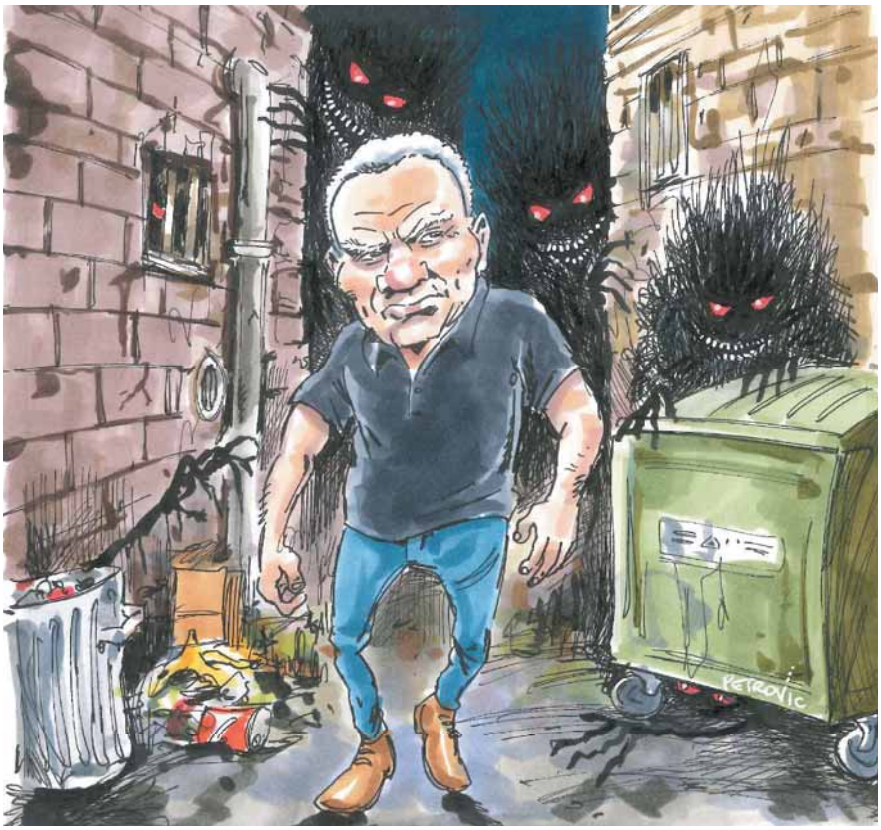
INTERFACE				CONNECTIVITY							SUPPORT				
Touch screen controller	App interface	Voice control	Smart watch app	WiFi	ZigBee	Z-Wave	Bluetooth	RS-232	IR	RF	Dealer certification	Pre-programmed	Helpline number	Warranty	point of difference
•	iOS, Android	•		•									1800 222 435	1 yr	ABB free@home delivers home automation that is easy to understand and simple to commission saving contractors time and offering competitive advantages.
	iOS, Android			•				•	•			•	02 9114 9933	2 yrs	ATEN offers control without complication, an expandable device database and simplified setup.
•	iOS, Android	•		•				•	•		•	•	1800 369 233	2 yrs	C-Bus is a wired automation system capable of expansive control and monitoring. It is an award winnning system that has proven reliatbility and control from award winning electronic switches, apps and touch screens.
	iOS, Android	•		•				•	•		•		0402 479 704	3 yrs	Clare Controls offers cloud-based programming, remote access from any computer and simple programming. Consumers can create UI and scenes, and the system is fully expanable.
	iOS, Android	•						•	•		•		Skype: commandfusion	2 yrs	CommandFusion is an all-in-one networked controller with expandable cards for DALI, relays and I/O. It comes with web configuration interface with optional cloud management, IR learner and blaster built in.
								•	•		•		02 9975 6001	4 yrs	CommBox allows control from any device with a browser; no apps required. Simple drag and drop cloud-based programming can be done by anyone. Very competitive pricing.
•		•	•	•	•	•			•	•	•		+1 888 400 4070	2 yrs	Control4 EA-Series Controllers allow devices in any sized home to work together, including lighting, security, music and video.
•	iOS, Android	•	•	•	•		•	•	•	•	•	•	1800 555 040	5 yrs	Crestron offers an end to end solution. One platform, one brand.
•	iOS, Android			•		•		•	•				0407 284 791 0439 071 066	2 yrs	ELAN offers ease of programming in a fully scalable and customisable solution with excellent training and product support.
	iOS, Android	•	•	•	•	•	•	•		•	•		1300 369 233	2 yrs	Environexus is an affordable, scalable retrofit solution that allows you to build your dream smart home, one switch at a time. Your smart phone or tablet becomes the control interface for your all your connected devices, seamlessly merging lifestyle and technology into one.
•	iOS							•	•		•		1800 997 637	3 yrs	Fully configurable conditional logic, variables, and macros provide greater flexibility for more elaborate control system designs from simple to advanced multi processor applications.
	iOS, Android	•	•	•		•		•	•		•		+64 9 521 6582	2 yrs	One of the highest specification Z-Wave controllers available. Fibaro is a global, innovative market leader expanding into 118 international markets in less than five years.
•	iOS, Android, Windows	•	•	•									1300 850 253	2 yrs	Tebis KNX is an open protocol with 300+ manufcturers and 4,000+ products that communicate with each other. Almost anything is possible.
•	iOS, Android, Windows	•	•	•				•	•		•		1800 474 348 +64 508 526 927	2 yrs	iRidium is open software to create interfaces, integrate automation systems, AV and IoT. iRidium server is a logical controller with monitoring, scheduling, trends/charts and importing/exporting databases.
•	iOS, Android, Windows, Linux		•	•	•			•	•	•	•	•	1300 369 777	1 yr	MyHOME is a two-wire system that is easy to install and configure. It is controlled by a range of stylish Arteor user interfaces or a 10" multimedia touch screen.

MANUFACTURER	PRODUCT	DISTRIBUTOR	NZ DISTRIBUTOR	FUNCTIONALITY															
				Residential/Commercial	IP	Distributed audio	Distributed audio zones	Distributed video	Distributed video zones	Lighting control	HVAC	Blind control	Security	Keyless entry	Energy management	Smoke, fire and carbon monoxide detection	Remote monitoring	Scenes	UPS backup
LEVITON	Leviton	Alloys www.alloys.com.au	Alloys www.alloys.com.au	•	•	•	16			•	•	•	•	•	•	•	•	•	•
LUTRON	Lutron	Convergent Technologies www.c-t.com.au	Audio Video Designs Limited www.avd.co.nz	•	•					•	•	•	•		•		•	•	
NESS CORPORATION	M1 Controller	Ness Corporation www.nesscorporation.com	NFS www.nfs.nz	•	•					•	•	•	•	•	•	•	•	•	•
ON CONTROLS	On Controls	NAS Australia www.nasaustralia.com.au	Midwich www.midwich.co.nz	•	•	•	Unlimited	•	Unlimited	•	•	•					•	•	
PHILIPS dynalite	Dynalite	Lightmoves www.lightmoves.com.au	Philips Lighting www.lighting.philips.co.nz	•	•					•		•			•		•	•	
PRO CONTROL	ProLink Z Processor	Avation www.avation.com.au	Avation NZ www.avation.co.nz	•	•					•	•	•	•	•				•	
push	Push Controls & Push Plus	Schneider Electric www.schneider-electric.com.au	Schneider Electric www.schneider-electric.co.nz	•	•	•		•		•	•	•	•	•	•	•	•	•	
RTI	XP-8 Processor	Avation www.avation.com.au	Avation NZ www.avation.co.nz	•	•					•	•	•	•	•				•	
SAVANT	Smart Host SHC-2000	Emersive Technologies www.emersivetech.com	Emersive Technologies www.emersivetech.com	•	•	•	12	•	12	•	•	•	•	•			•	•	•
simplecontrol	Simple Control	AV Supply Group www.avsupply.co.nz	AV Supply Group www.avsupply.co.nz	•	•					•	•	•	•	•	•	•	•	•	
TE Transformative Engineering	Transformative Engineering	Convergent Technologies www.c-t.com.au	Convergent Technologies www.c-t.com.au	•	•	•	244	•	244								•	•	
URC Control the Experience.	Total Control	QualiFi www.qualifi.com.au	Audio Video Designs Limited www.avd.co.nz	•	•	•	32			•	•	•	•	•	•		•	•	
VANTAGE	Infusion with Equinox OS	Techstyle	Techstyle	•	•			•		•	•	•	•	•	•	•	•	•	•
vera	Vera Edge	Digital Home Systems www.digitalhomesystems.com.au	Digital Home Systems www.digitalhomesystems.com.au	•						•	•	•	•	•	•	•	•	•	
VITREA	Vitrea	Convergent Technologies www.c-t.com.au	Convergent Technologies www.c-t.com.au	•						•	•	•			•		•	•	
WAGO	WAGO BA	WAGO www.wago.com.au	WAGO global.wago.com	•						•	•	•	•		•	•	•	•	•

INTERFACE				CONNECTIVITY							SUPPORT				
Touch screen controller	App interface	Voice control	Smart watch app	WiFi	ZigBee	Z-Wave	Bluetooth	RS-232	IR	RF	Dealer certification	Pre-programmed	Helpline number	Warranty	POINT OF DIFFERENCE
•	iOS, Android, Windows	•	•	•	•	•	•	•	•	•	•	•	03 9411 180	2 yrs	Leviton products keep you safe, manage energy consumption and provide entertainment. Solutions for home or business are available for every income level and lifestyle.
•	iOS, Android, Windows	•	•	•				•	•	•	•		03 949 0888	7 yrs	Lutron offers advanced lighting and shade control. Lutron is a manufacturer of lighting control and advanced silent shades.
	iOS, Android	•	•	•		•		•	•	•		•	1300 551 991	3 yrs	The M1 controller is a genuine integrated security, access and automation controller with powerful rules/macros easily programmed by the installer.
	iOS, Android			•	•	•		•	•		•		07 3015 8700	2 yrs	Winner of the CES 2014 Control Product of the Year, the On Controls platform is highly customisable, scalable and cost-effective.
•	iOS, Android			•				•	•		•		03 9701 2500	2 yrs	Intelligent, reliable and scalable networked lighting control and building automation system with elegant and intuitive switch panels and sensors.
•	iOS, Android	•			•			•	•	•	•		07 5580 3300	1 yr	Very broad product range that is fully customisable for residential commercial and hospitality applications.
	iOS, Android	•	•	•		•		•	•	•	•	•	1800 369 233	1 yr	Push is an award winning control system and user interface. Scalable smart technolgy solutions for new build, renovation and retrofit markets. It is locally developed and supported.
•	iOS, Android	•		•	•			•	•	•	•		07 5580 3300	1 yr	Very broad product range that is fully customisable for residential commercial and hospitality applications.
	iOS, Android	•	•	•			•	•	•		•		03 9800 2954	2 yrs	Unrivalled performance linked with an easy-to-use contemporary app and remote control, Savant offers a unique and memorable user experience.
	iOS	•	•	•				•	•		•	•	+64 9 274 9172	2 yrs	Simple Control is an IP-based, award winning home automation solution for today's world. Simple enables effortless integration and control with AV and home devices.
	iOS, Android, Windows			•				•	•	•			03 949 0888	3 yrs	Transformative Engineering offers low cost HDMI video processing, control and distribution.
•	iOS, Android	•		•	•	•		•	•		•		03 8542 1111	1 yr	URC is a processor-based system that comes with unlimited iOS and Andriod site licences with each processor. Quick and easy to program by following the steps using the URC Accelerator software, the software creates the GUI and macros with one button press.
•	iOS, Android			•				•	•	•	•		+64 9 377 3778	5 yrs	With Vantage Controls, you can commission a 64 channel lighting system with home theatre, multi-room audio, HDMI matrix, doors and security in under three hours.
	iOS, Android	•	•	•		•		•	•	•			1300 099 283	1 yr	VeraEdge is a powerful and flexible Z-Wave based smart home automation, with secure remote access, simple to install and use, multiple intefaces, no monthly fees.
	iOS, Android, Windows			•	•			•	•	•			03 949 0888	2 yrs	With Vitrea, unique glass keypads with advanced customisation are available.
•	iOS, Android			•	•		•	•	•	•	•	•	03 8791 6300	2 yrs	WAGO enables modularity. Free programming (not parametrising) is possible.

CLAUSE FOR CONCERN

ELECTRICAL ESTIMATORS MUST BEWARE OF DETRIMENTAL CLAUSES IN TENDER DOCUMENTS. BRIAN SEYMOUR HIGHLIGHTS THE RISKS.



Electrical contracting can be a bit of a gamble, in that a tender is submitted and the hope is that the project runs to schedule.

Contractors risk their solvency on a multitude of factors, many of them unpredictable. The weather, adequate design drawings, timely delivery of materials and the builder's efficiency play a large part. Nowhere is this risk better demonstrated than during the competitive tendering process.

The soundness of a construction estimate is contingent on the amount of information available at tendering time. Interpretation of scope, accuracy of quantities, quality of materials and assumptions of productivity all combine to produce a cost – exclusive of overhead and profit – for completing the project.

Most estimators use similar take-off methods, and the material pricing and labour units allocated by various estimating programs can often result in close tender figures. However, most variance arises in the figures attributed to company experience with the contract type, labour-saving methods, and overhead and profit.

The primary job of estimators is to produce accurate costings, but they also have a responsibility to protect their employers and themselves from risk. Irrespective of company size, someone has to assess and deal with the risks related to signing a contract and performing the work.

The days are gone when the electrical estimator only had to complete a take-off, price the material, allocate labour, add sub-contractor quotes, establish a realistic mark-up and submit the tender.

These days it is more complex. Almost everything we do in the business world involves a risk of some kind – customer habits change, new competitors appear, factors outside your control cause delays.

RISKY BUSINESS

Before deciding to tender on a project, you must evaluate the risk factors.

The following are some of the risks that should be identified, assessed for likelihood and appraised for possible effects:

- Liquidated damages – especially if the head contractor has a reputation for late completion.
- Project duration – a drawn-out program may have a disastrous effect on cash flow.
- Liability for worker injury – an unsafe working environment must be avoided.
- Onerous conditions restricting rights to a fair contract – this may put you in an iniquitous situation.
- Procedure for arbitration – to ensure important facts are recorded and contract conditions met.
- Variation clause – ensure there is an approval clause before installation.
- Payment clauses – clarity and certainty as to payment.

TIMING MATTERS

Tony Lim (Doyles Construction Lawyers, Australia) has covered an important topic

BY
BRIAN
SEYMOUR

in the UTS ePress article *Essence of Time in Construction Contracts.*

Abstract: The building industry has in recent years seen huge costs incurred due to disputes arising on notice requirement clauses. These claims could have been averted if the parties had been diligent in providing the necessary notices. This article sets out to explore the law briefly as interpreted by the courts in common law and equity and to discuss the possibility of defence under the principle of promissory estoppel.

More important, it also shares the author's view on how such pitfalls could have been prevented by giving the proper notices within the timeline required by the contract conditions.

Numerous contractors have suffered losses due to the head contractor's mismanagement of the project, including delay, disruption, acceleration, out-of-sequence work, stacked trades and interference between trades.

This is a difficult issue for many estimators, and before signing a contract it is wise to have a qualified person review it. It is good practice to do this before starting an estimate, including allowances for uncertain language used or contract clauses that contain illegal requirements – and to be careful about clauses that make it impossible to profit from variations.

At common law, there is no automatic right to delay damages. As with all damages claims, delay damages can be recovered only if they can be proved to be damages resulting from a breach of contract.

As regards a construction project, the contractor must show that the loss suffered arose naturally from the principal's breach, or may 'reasonably be supposed to have been in the contemplation of both parties' at the time the contract was entered into. Delay damages can be recovered automatically only when a contract specifically allows.

Clause 34.9 of AS 4000-1997 and AS 4902-2000 provide that, where an extension of time has been granted, the contractor is entitled to 'delay damages' for every day falling within an extension of time for a 'compensable cause'.

In the recent case of Adapt Constructions Pty Ltd v Whittaker [2015] ACTSC 188, the ACT Supreme Court found that a construction contract based on a standard form, which left blank the amount for liquidated damages to be paid for delays to completion, did not prevent the principal to the contract from recovering unliquidated damages at common law for that delay.

It is difficult to prove damages. To calculate labour losses from start-and-stop work, double-handling of materials and shifting of labour, such losses are commonly categorised as loss of efficiency, but in many ways this heading is misleading.

It is not so much that the electricians are inefficient while they are working, it is that they cannot get to the work. Time is lost waiting, being reassigned to other areas, gaining access to work areas, and other mobilisation and demobilisation cycles. Also, there are real costs associated with a loss of 'learning curve' and morale.

There are many factors to consider in the selection of labour units to be used in a competitive tender. Understanding the effects of a particular project or installation, and adjusting the labour units, will determine whether you win or lose the tender. Once you win the tender, it will also determine whether you will be profitable.

Consider the different elements of the project to be sure you have selected the best labour units for the material and application to enter in the estimate. Do not use the same level of units for every estimate: different parts of a project may require different labour unit levels.

For instance, if you are installing runs of 25mm conduit in a concrete pour and also in a false ceiling, this would require different labour units for the same material.

You also have to look at repetitiveness. Installing one run of 25mm conduit in the concrete pour will take longer per 100m than four parallel runs of the same conduit. The same labour discounts apply when installing two 600 x 600 flush lighting fixtures in one room versus 300 of them in an open office. You gain productivity.

Issues to consider when applying labour units:

- Higher ceilings increase labour.
- Increased quantities increase productivity and decrease labour units.
- More parallel runs will decrease the labour unit per 100m.
- Equipment choices can affect labour units – scissor lift, scaffold, cherry pickers, etc.
- Multiple floors of a building will increase the labour for that installation.
- The further the material storage is from the workface, the more walking time must be allowed.

Other considerations include the following:

What is the condition of the worksite, and will there be clear access to installation areas? Is it likely that mechanical services, materials and equipment, or stacked ceiling tiles will inhibit access?

How good is the head contractor at keeping the project clean and tidy? Will there be stacked trades at the workface? This is why it is important to know the head contractor you are tendering to.

How good is a particular head contractor at keeping the project on schedule? A project that stays on schedule usually results in lower labour cost.

Weather has an effect on the project. Extreme temperatures can have a demoralising effect on productivity. When is the site or slab work scheduled on the project? Is it in the exhausting heat of summer or the extreme cold of winter? The project location will be the guide.

As one can see from the above, the application of labour to any project cannot be merely entered straight from the labour units without intelligent consideration of the contract conditions, project conditions, and labour and material availability. ■

A TEACHING MOMENT

WES MCKNIGHT BELIEVES APPRENTICES ARE THE FUTURE. TEACH THEM WELL AND LET THEM LEAD THE WAY.

For all my sins, every year I help with judging the National Electrical Trades Teacher of the Year Award for NECA. And each year my associate judge and I reflect on the same things after the winner is determined. We are continually impressed by the finalists' passion for teaching and assisting with the development of their students. Not just in their chosen trade, but as people.

In 2016, the quality of the finalists reached a new level. These teachers spend a vast number of hours outside the classroom in their own time developing teaching aides, new testing facilities and even arranging overseas aid programs where the students (who fund their own travel costs) travel to third world countries to work as electricians (supervised) on aid projects.

Typically teachers in our industry are not thought about much. We as an industry talk about apprenticeship numbers, completion rates, TAFE facilities, private RTO funding, pre-apprenticeship placement outcomes, relevance of modules, training packages, etc.

We don't spend anywhere near as much time on the people who have as much to do with the quality of the people coming into our industry as managers/supervisors of the apprentices in the work place. NECA's decision to continue to provide the awards and elevate the status of teachers in our industry needs to be applauded.

For those of us who have come through the apprenticeship system, we will all have memories of good and bad experiences with different teachers. I have a theory though that in all our time at school there is one teacher that stands out. One who really connected with us – this is true with primary and secondary schooling as well. And then, of course, with trade school. This one teacher is the one who helped and communicated with each of us better than others. This must be a great feeling for a teacher to see and help a student complete a tough task. Each of the finalists mentioned this point and the joy they get from these situations.

Our registered training organisations (RTOs) will tell us that finding people who want to be trade teachers is getting more difficult by the year. Without people with the passion and commitment to teach at the trade level our industry will not survive at the level we are now and can't hope to develop further. Knowing the curriculum is one thing, having the skill, patience and passion to teach this to people aged 16 through to 45 is another. Teaching is a skill that needs to be taught. We can't take experienced tradespeople off sites and walk them into a classroom, give them the curriculum and let them go.

Developing teachers is an industry issue that needs to be discussed, solutions developed and funded. Talent identification systems implemented so experienced electricians can have a career plan that shows them that they can use their skills and experience for many years. This career path won't suit everyone but the industry needs to find a way to capture this experience and to transfer it to our next generation. Another source of new teachers would be experienced tradespeople who by way of injury are unable to return to their original full time work. We need people who will assist in delivering the training package backed up with real work experience.

Experienced tradespeople think outside the square when teaching the practical aspects of the curriculum. Some of the

BY
WES
MCKNIGHT

systems and teaching methods I have seen in my time are quite brilliant. There is a level of information and system sharing beginning to occur between some RTOs, again a necessary development.

These methods and systems have been created by experienced tradespeople. People who know what real world issues our apprentices are going to face. The more we use their real work experience the better apprentices will be trained.

The identification of suitable candidates that can transition from full time tradesman to a trained teacher is a costly process. Firstly though, we need to communicate that this career course is available. Teaching is not an obvious career option for experienced tradesmen in our industry. We need to change this.

We could articulate that it is time to 'put back into the industry', but this won't appeal to everyone. Providing a clear career option broadly across our industry is the first stage. In the past, moving from tradesman might mean working for a supplier or wholesaler. We need teaching to be thought of in that way. New teachers might be able to be found during periods of redundancies. Potentially redundancy funds could be used in the teacher identification process.

Once trained; teachers can have a flexible work/life balance. Hours to suit and can be engaged on a casual basis if, for instance, they want to continue a small contracting business at the same time.

Maybe it is my looming 'milestone' birthday next year or the recent judging of the teacher's award, or the regular conversations I have with executive directors of TAFEs and RTOs around the country discussing the shortage of teachers that has turned my mind to a career option for experienced tradespeople from our industry. When we are able to tap into the decades of real world installation/construction/maintenance/design experience the next generation of tradespeople the apprentice, the training institution (through better completion rates) and the employer win.

I look forward to this conversation gaining some momentum. Then one day the thought of teaching will be an automatic career option for our industry and not an afterthought. ■

GETTING UP TO SPEED

TO ACCOMMODATE THE GROWING DATA DEMANDS OF END USERS, THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) HAS RATIFIED THE 802.3BZ STANDARD FOR ETHERNET AMENDMENT: MEDIA ACCESS CONTROL PARAMETERS, PHYSICAL LAYERS AND MANAGEMENT PARAMETERS FOR 2.5GBPS AND 5GBPS OPERATION. JACOB HARRIS REPORTS.

Touted to address connectivity needs now and into the future, IEEE 802.3bz facilitates the incremental evolution of access layer bandwidth beyond 1Gbps. It will allow for speeds of up to 5Gbps over structured twisted pair wiring over existing cabling networks.

"2.5GBASE-T and 5GBASE-T Ethernet is needed to leverage the vast installed base of Category 5e and 6 cabling in the enterprise sector and allow for increased access layer bandwidth beyond 1Gbps to serve emerging needs. By employing 2.5G/5GBASE-T networking over this installed cabling, performance benefits can be realised while deferring the high cost of cable upgrades and delivering the right long term cost/performance point for many applications," says Intel Data Centre Group principal engineer and Ethernet Alliance board member David Chalupsky.

2.5Gbps and 5Gbps are intermediate speeds between the current standards of Gigabit Ethernet (1000BASE-T) and 10 Gigabit Ethernet (10GBASE-T). The idea of intermediate speeds came into play around 2014 when it became clear it would not be possible to distribute 10GBASE-T over Cat 5e and only over limited distances with Cat 6 – Cat 6a cable is the minimum requirement to reach 100m. The high equipment costs associated with installing new cable networks, combined with its inability to deliver Power over Ethernet (PoE) are both potentially contributing factors to slow uptake of the 10GBASE-T Standard.

For these reasons, intermediate speeds are necessary for exploiting existing cable networks. When you consider that reportedly over 70 billion metres of Cat5e and Cat6 cabling has shipped since 2003 and that it accounts for the majority of installed data cabling worldwide, the importance of exploiting said networks is clearly apparent.

"Because 2.5GBASE-T and 5GBASE-T are designed to operate on up to 100m of Cat5e, Cat 6 or better cabling, they provide higher speed data networking capability for virtually all existing enterprise category cabling infrastructure where 1000BASE-T is used today.

"Significant value is achieved by

supporting faster speeds without requiring a costly cable upgrade, which could run hundreds of thousands of dollars for a campus-wide retrofit. Aside from the installation costs, wholesale replacement – if even possible – also requires time, and invasive disruption to the day-to-day operations of any enterprise building," says David.

The IEEE 802.3bz specifications for 2.5GBASE-T and 5GBASE-T are compatible with the NBASE-T specification. Products based upon NBASE-T have been in the market for over a year, so there is a range of compatible products already shipping.

"The compatibility and interoperability of these two specifications were demonstrated in October 2016 at the BASE-T Plugfest co-sponsored by the Ethernet Alliance and the NBASE-T Alliance."

Perhaps counterintuitively, one of the key applications the standard will benefit is wireless internet. The development of fast WiFi protocols has given rise to a significant demand for cheap uplinks faster than the current 1Gbps.

One immediate application area is wireless LAN access points based upon IEEE 802.11ac Wave2, which can require uplink bandwidth into the wired LAN well over 1Gbps per access point. An important attribute of using BASE-T networking over twisted pair category cabling is that the same cable can be used to deliver power to the device using PoE and wireless LAN access points commonly make use of this capability.

"Additional applications include any area which requires higher network bandwidth than 1Gbps over up to 100 metres of cabling. Medical imaging, scientific/research computing, content editing, industrial design and machine vision just to list a few. This technology allows suppliers to right size the network bandwidth for the capabilities of the network end device (e.g., IEEE 802.11 WAP, host NIC, etc.), and network providers to leverage the installed cabling assets to serve new need," says David. ■

> **Ethernet Alliance**
> **www.ethernetalliance.org**

THE GREAT APPRENTICESHIP SHAKE-UP

FOR SCHOOL-LEAVERS AROUND THE COUNTRY WHO DON'T WISH TO PURSUE A UNIVERSITY CAREER, BEING AN ELECTRICIAN IS A VERY PROMISING CAREER. IT JUST TURNS OUT THAT NOBODY REMEMBERED TO TELL THE STUDENTS THAT.

Listen to any FM radio station on your way to work and you will notice a recurring theme. Ad after ad spruiks courses in massage therapy, audio engineering, aged care and the like; it seems like every second person is becoming a personal trainer or barista nowadays.

This should be a wake-up call for the electrical industry. We need to get to grips with the fact that there are a lot more vocational options than ever before for today's youth. And not only are vocational options increasing, other service industries are investing in proactively marketing themselves to young people.

So for the electrical industry to grow its apprentice base, it has to embrace the challenges of dynamically promoting itself to the best young people with the practical and intellectual capabilities needed to thrive. This will ensure a high industry standard is maintained and the ever-increasing demand for sparkies can be met.

The demand for sparkies is increasing due to economic growth and senior workers retiring at an ever increasing rate. National data suggests the number of sparkies coming through the ranks appears to be either stagnant or decreasing.

This is despite the great selling points that are bandied about for an electrical career. It generally pays well; there is an abundance of work in most areas; job security; and, transferable skills. Even more attractive is the possibility for a

sparky to be their own boss before the age of 25.

We decided to do a small survey to get a feel of where the electrical industry sits as an option for students who are about to make some serious decisions about their future.

We surveyed 22 year 10 students from Mazenod College, a Catholic boy's school of 1,500 students based in Melbourne's south east. It was the nearest college to our office, in a mortgage belt area of Melbourne. And while this 'one class' survey doesn't pretend to be a fully representative sample, it did highlight some fundamental shortcomings of the industry.

Although these students had been through a comprehensive and compulsory Year 8 class of wood/metal work and other hand skill introductions, not a single student surveyed was aware of the career pathways an electrical apprenticeship can lead to.

Yes, most electrical RTOs, GTOs and TAFEs can get applicants but the question that needs to be asked is this: 'Is the industry attracting and selecting from the best available pool of talent?'

Many schools, parents and students tend to see university acceptance as their metric for success and going into a trade career can be seen as a failure to reach that (parental) goal. At Mazenod College, over 80% of surveyed students aimed to go to university. Only two students planned to do a TAFE course.

While it may be harder to get into university, trade qualifications lead to careers that often merit better outcomes in earning potential, employment rates and ultimately career satisfaction. The electrical sector is a prime example of a tertiary career that has higher earning potential and employment rates than many university course-based careers.

With diminishing numbers of overseas students, less recognised universities are dropping their entrance levels to achieve budgeted student numbers – thus pushing even more kids into unproductive outcomes and away from the trades.

Our student survey suggests today's youth has a narrow-minded view of the electrical industry. Drawing associations of grubby clothes, old utes, pulling wires in roofs and always going on 'smoke-o' is not exactly a winning formula.

Changing the perception of the industry may seem like a herculean task but the industry can take inspiration from companies that have managed to successfully shift public perception of their 'brand'. It's not impossible to do.

Remember when Old Spice was known, unofficially, as domain of granddads, never to be considered by the younger generation? A marketing campaign featuring a former NFL player popularised the product among young people and sent the company's bottom line soaring. Brands are not necessarily the same as an industry, but getting the image and marketing right is a great start.

The electrical industry could likewise re-image and market itself, to enhance its attraction as a career option.

While the electrical industry should be working on increasing interest among young people, work can also be done to help students with the attributes, skills and interest in the field, to find their way to doing an apprenticeship and not be steered off course by external pressures along the way.

> It seems like every second person is becoming a personal trainer or barista nowadays.

WHAT THE INDUSTRY CAN DO

We spoke to Mazenod College careers coordinator Vivian Seremetis and VCAL coordinator Matt Johnson to find out what the electrical industry can do to better engage the students at Mazenod.

They made two critical suggestions on ways the industry can help to inform school students about the industry.

1. **The industry needs to provide information resources to schools, students and parents.**

It is hard for career guidance councillors to know the ins and outs of every possible career choice out there. To help careers teachers, the electrical industry needs to create resources for councillors to provide to students and parents.

"The meat industry for example has a really good website about careers in meat and the benefits of being in the industry. It shows the meat industry is not just about being a butcher and there are many different roles available in the meat industry," Vivian says.

"It would be great for the electrical industry to provide councillors with printed materials we can hand out, videos we can show and websites we can give links to, all providing information on the many benefits of working in the electrical industry and the career paths electrical can lead to."

2. **The industry needs an apprenticeship officer to assist students who want to do work experience in the electrical industry, directing them to electrical companies that are happy to take on work experience students.**

"We've been struggling for many years to get students placed in electrical businesses," Matt says.

"We had a student who really wanted to be a sparky, he was very proactive and wrote to many electrical companies but he just couldn't get a spot. He got frustrated

trying tirelessly to get his foot in the door but couldn't.

"I had another boy who wanted to be a bricklayer. I went to the association of bricklayers and asked if they had a list of brickies who are taking on students. Their response was: 'No we don't'.

"I would have thought that would be the first thing they had.

"We need a better way of matching students who want work experience with workplaces willing to give students that opportunity."

Ideally a nationwide system should be put in place to help match school students and electrical workplaces.

It would be mutually beneficial for schools and the electrical industry to form a networking partnership facilitating better communication so students have good access to all the information and opportunities available.

ALTERNATIVE PATHWAYS

In July 2016, the National Electrical and Communications Association (NECA) commenced a project that would trial new methods of delivering electrical apprenticeships, among other things, across the country.

Known as the Innovative Delivery and Pathways Project, or the Alternative Pathways Project (APP) for short, this pilot program aims to test and open up alternative training approaches on a broader scale providing greater skills development, choice and industry acceptance.

"The APP is one outcome of the employer engagement aspect of the Federal Government's Mentor Advisory Program (MAPS)," NECA chief executive Suresh Manickam says.

"MAPS was essentially designed to prove one thing: if you boost the number of mentors, or target them more effectively, you get a better outcome and better completion rate.

"Of course, this has long been seen as common sense, but now there is science behind it."

Suresh explains that while the MAPS program was a good exercise, NECA wanted to take things further.

"We wanted to truly understand what employers want to get out of employing apprentices, what apprentices want as well as RTOs and GTOs. Instead of looking at one plane, we wanted to look at multiple planes.

"This led to the creation of a report that generated some 30 different recommendations surrounding apprenticeships.

"We took this to parliament and explained to everybody who would listen that we had an opportunity to refine the apprenticeship program. The government agreed and allowed us to refine four distinct areas within the larger apprenticeship.

"This is where the APP comes in."

The APP will operate across Australia for a two-year period and will be delivered by both public and private sector training partners across the electrical contracting sector. It will explore opportunities to encourage broader skills development approaches for entry level and qualified tradespeople to enter the sector.

Within the four core activities there are a prescribed number of programs that will be developed and trialled to address a number of critical issues needing attention in skills development and training approaches in the highly regulated electrical and communication industry. Each initiative will be developed in consultation with partner providers, i.e. NECA, relevant departments, and employers.

"The first area we are looking into is 'pre-vocational'. We are looking at numeracy and literacy standards as well as our learning management system (LMS) and how to make that better," Suresh says.

"The second area is emerging technologies that are entering our market. Arguably there are more emerging technologies in our market than any other, particularly around renewables and energy efficiency. So is education keeping up with these technological advances?

"The next question is how do we attract more people to our trade? In particular, our current attraction rate for female and mature aged apprentices is very low. As is our participation rate in rural and regional areas.

"There are different reasons for each of these groups. For rural and regional areas there's the tyranny of distance issue as well as funding and scheduling. For mature aged apprentices, there's an ongoing issue of wage rates - mature aged apprentices offer better productivity than their younger counterparts but they cost more.

"If you want to look at addressing the skills shortage, you have to look at broadening your participation rate.

"The fourth area we're looking at is what we're doing as far as workplace support is concerned and the effectiveness of current measures."

This is a very significant undertaking on the part of NECA, but changing attitudes towards the electrical industry as far as potential apprentices are concerned can't be left to one organisation.

Together, we can ensure the best people are entering the workforce... and staying there. ■

While the MAPS program was a good exercise, NECA wanted to take things further.

> **NECA**
> **www.neca.asn.au**

My world of installation.
Electrical installation at home made easy.

Our comprehensive product portfolio offers a complete range of solutions and services for all installation requirements in residential buildings. Our focus on easy installation speeds up your projects while meeting people's needs for safety and comfort in their home.

Find more information about our complete offer on:
www.abb.com/world-of-installation

Power and productivity
for a better world™

ABB

NO SINGLE SOLUTION FOR REQUIRED TRADES OVERHAUL

The option of trades and apprenticeships as a career choice needs to be promoted from early childhood if we are to turn around the current deficit of people taking on apprenticeships, says Laser Group managing director Steve Keil.

As Australia's largest network of plumbers and electricians, the Laser Group has over 1,500 trade qualified employees with over one-third currently completing their apprenticeships, including a large percentage of mature aged apprentices.

"We really need a multi-pronged and timed approached when looking for a solution," Steve says.

"The Government is investing money to encourage businesses to take on apprentices now; however, many of these grants are only available to businesses that use Group Training Organisations (GTOs), which means the small businesses that hire apprentices directly miss out.

"For our members, only one-quarter use these services and for those not hiring apprentices, the reason is primarily financial."

Current reports state that 85.5% of apprentices gain full time jobs six months after completing training. That rate compares with 68% of university graduates finding work in the same time frame.

"By the time our kids are reaching the end of their secondary schooling, the focus becomes one of getting good grades to enter university. We need to change the perception that finding a trade apprenticeship is not a viable outcome and that having a degree will ensure a long-term career.

"Careers teachers and parents often miss the possibilities that come with being a qualified tradie including, owning your own business, or growing your qualifications into specialisations leading to a world of opportunity. By starting these conversations in primary school, we are also able to reach young girls before they become influenced by social perceptions that

particular trades are for men only."

Census data shows that between 1996 to 2006, apprentices over the age of 25 increased from 8.4% to 26.1% while females accounted for 2% of construction, automotive and electrical tradespeople. In a period of trade labour shortages and successful government initiatives to grow the numbers of apprentices, why are we still seeing an overall trade shortage?

As well as supporting individual businesses hiring mature apprentices, the Government also needs to address the gap for those aged between 21 and 24 where the employee is too old to be paid junior wages but not old enough for the employer to receive subsidies. At the same time, they are still being trained and are unable to do the job of a qualified tradie leading to employers to avoid employing this age group. Yet, internal research showed this age group to be most likely to apply for an apprenticeship and be committed to the job.

> Teachers and parents often miss the possibilities that come with being a qualified tradie.

"Reform of the apprenticeship programs is needed nationally, but there is no one single fix and stakeholders need to be engaged along with those in the careers and education industries," Steve says.

"Let's start the conversation about trades early so that children appreciate the value and importance of a trade as a career and change the perception of it being something that kids do when they can't finish school.

"Most importantly, let's find ways to support the many small businesses that hire the apprentices and teach them the trades, ensuring the industry continues to grow into the future." ■

> **Laser Group**
> **www.lasergroup.com.au**

LED BY EFFICIENCY

THERE IS MUCH TO BE GAINED FROM USING DC RATHER THAN AC AS PRIMARY INPUT FOR LEDS. PHIL KREVELD EXPLAINS THE TECHNICALITIES.

We live in a 24/7 world, in which artificial lighting represents a huge part of humanity's energy use.

Electric lighting is mainly provided by alternating current (AC) with direct current (DC) being sourced from batteries and solar panels.

In Australia and elsewhere in the 'first world', the development path has been to higher-efficiency lighting, with light-emitting diodes (LEDs) leading the way in energy conservation. The luminous efficiency of LEDs far surpasses other technologies and drawbacks such as colour and small angular dispersion have been overcome.

However, we are not taking full advantage of the technology. We could be availing ourselves of more DC energy than is commercially on offer. There are substantial efficiencies to be gained by using DC rather than AC as primary input.

This article looks at short-term and long-term developments in the energising of LEDs and takes a brief peek at a world in which much AC low-voltage reticulation is being replaced by DC.

DC is already being used with USB-powered LED strings – clearly a hobbyist's venture but nevertheless an indication of things to come.

LED illumination products have become so well established in a relatively short time that the basic understanding of circuits and physical properties now seems unimportant. Yet these basics provide further insight into development opportunities for custom lighting designers and experimenters.

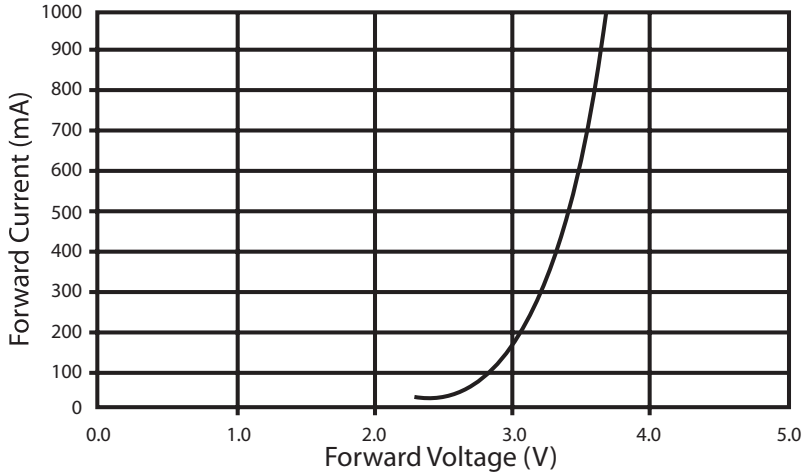


Figure 1: Forward voltage characteristic of an LED.

A BRIEF TOUR OF LEDS

The light-emitting diode is in many ways barely a diode.

It quickly exhibits avalanche breakdown under reverse polarities of 5V reverse bias or more, therefore requiring protection against such events by means of clamping diodes.

The basic operation in the forward direction is like that of any semi-conductor diode. By increasing the positive voltage in the P (acceptor) region, electrons from the N (donor region) are encouraged to flow to the P region.

In LEDs electrons lose energy as they jump back from the conduction band to the 'valence', or bound region (where they form part of the bonding links between neighbouring atoms). This energy is emitted in the form of light quanta.

LEDs are therefore very similar to photovoltaic cells, in which the reverse process takes place. However, the photovoltaic effect can also happen in LEDs. In fact, it can be used for testing LED wafers, thereby avoiding damage to delicate copper conduction terminals.

In Figure 1 the forward voltage characteristic of an LED is shown. The equation governing the current/voltage relationship is standard for any semi-conductor diode:

$$I_f = I_o\left(e^{\frac{aV}{kT}} - 1\right)$$

In this relationship, q is the charge in coulombs of the electron, V is the forward voltage on the P-N junction, k is a constant (Boltzmann constant), and T the junction temperature (in Kelvins, i.e. absolute temperature). I_o is the saturation (dark) current also flowing at reverse bias voltage.

Light output as a function of junction temperature is shown in Figure 2, and light output as a function of forward

BY
PHIL
KREVELD

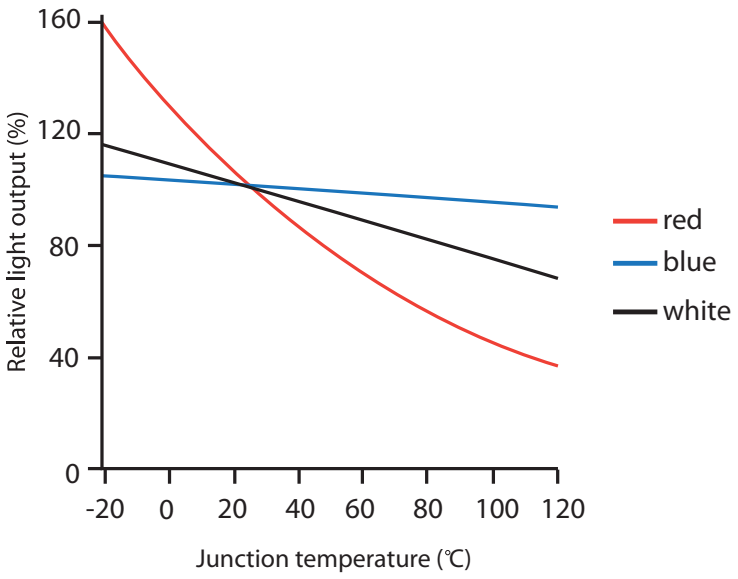


Figure 2: Light output as a function of junction temperature.

current is shown in Figure 3. This graph shows typical behaviour which, not unexpectedly, is approaching linearity but should not be taken as applying universally, since packaging plays a large role in light output.

From the equation for forward current, I_f, it is evident that it decreases with an increase in junction temperature, and light output also decreases.

The light quanta emitted fall in fairly narrow wavelength bandwidths. Each light quantum carries an energy of hc/λ where h is a constant (Planck's constant), c is the speed of light, and λ is wavelength.

Inherently, LEDs provide colour so that for white light two methods present themselves:

- mixing the light of blue, green and red LEDs; or,
- using a phosphor capable of producing effectively white light through the use of short-wavelength LEDs (about 470 milli-microns).

In the latter method short wavelengths excite yellow colour in the phosphor, and the balance of blue light not absorbed mixes with the yellow to produce white light.

DC POWER FOR LEDS

The flicker fusion threshold of the human eye requires in practice a DC power source for LEDs.

This is the case even though an AC voltage could be applied (bearing in mind that reverse voltages should be limited by clamping at a low reverse voltage level).

LEDs fire and switch off essentially without delay (unlike incandescent lamps or fluoros powered by electronic ballasts) operating at frequencies of 20kHz or higher. This makes for uncomfortable viewing at AC power frequency.

However, by virtue of DC power being the natural choice, higher 'system' efficiencies can be obtained.

Although DC power is generally more efficient than AC, the difference is not great. Furthermore, it is a theoretical consideration inasmuch as it cannot practically be employed other than for a fixed distribution voltage.

Yet by eliminating needless conversions al low voltage levels, worthwhile energy savings can be made in practice.

As replacements for dichroic filters, LEDs come with a bridge rectifier circuit as a built-in feature so that they can make use of the same 12V AC transformers. In some cases an attempt is made to provide better impedance matching between the LED luminaire and transformer.

However for commercial installations,

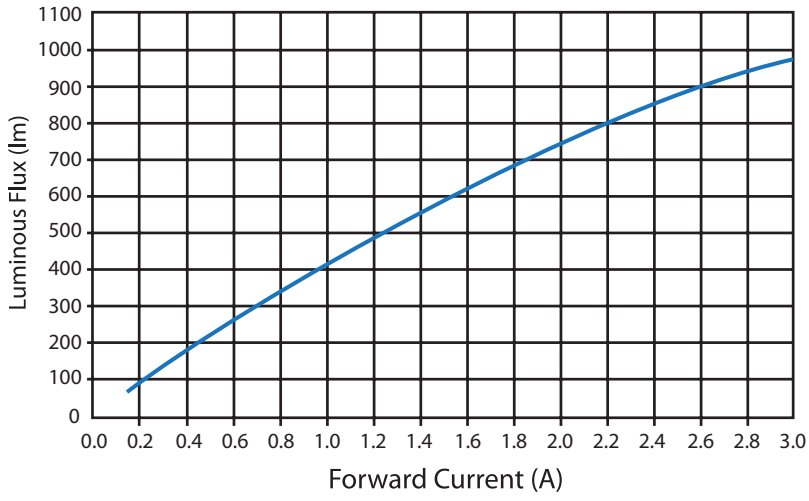


Figure 3: Light output as a function of forward current.

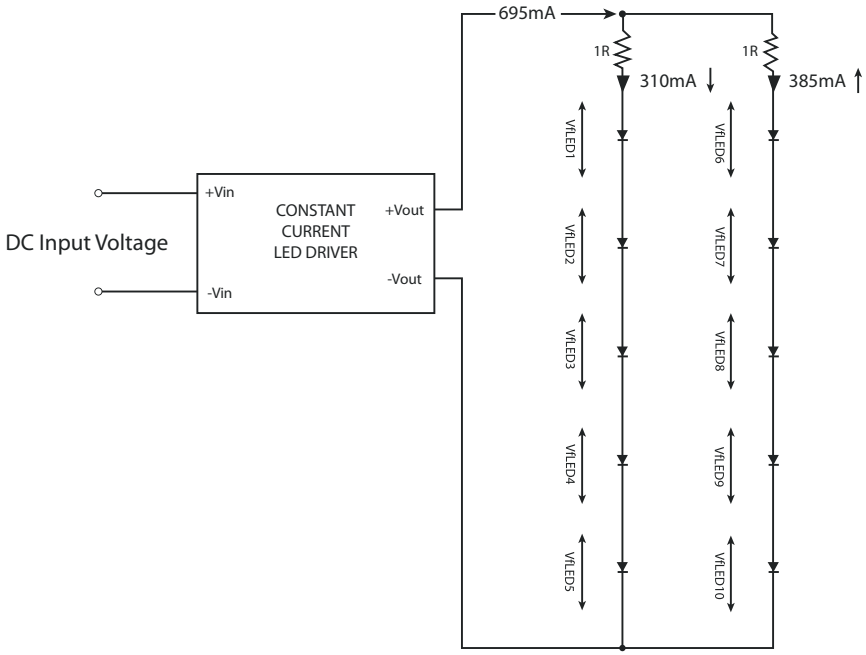


Figure 4: A combination of parallel string clusters.

DC power supplies are the preferred solution. At a typical forward voltage of 3.3V, a string of eight LEDs requires in excess of 26V.

For lower voltages, fewer LEDs can be incorporated, or parallel connections must be employed. The latter topology can exhibit problems with unequal current division, as there will always be some differentiation between individual LED forward bias characteristics.

Variation in forward voltage can be about 20%, so significant voltage differences can occur on series strings.

To ease the difficulty of paralleling strings, LED manufacturers make use of fairly elaborate binning procedures. The aim is to match LEDs on the basis of forward voltage and also for current-luminous flux and spectral distribution.

In many embodiments of luminaires for commercial and industrial use, reliance is placed on LED drivers for correct biasing, rather than on the selection of matching components.

In larger power luminaires, a combination of parallel string clusters is employed (Figure 4). For these arrangements care must be taken to provide current balance in the strings. Ideally, current balance is provided through the use of constant current sources.

The simplest arrangement for a constant current source is the use of a high-value resistor, but a relatively high voltage is then required. In practice a constant current source relying on feedback is the best solution. To achieve this a power supply with feedback is employed, as shown in Figure 5.

The current regulator requires a constant voltage on the sense rail so that all three LED strings draw the same current. Should an LED open in one of the strings, excess current in the remaining ones should be avoided. This is achieved by using switching transistors Q1, Q2 and Q3, each with its own sense resistor.

If an LED fed by Q3 opens, the base and emitter of that transistor are 'commoned', opening up the collector.

Note: the LM317 is a popular Texas Instrument product. However, such linear current regulators have low efficiency, thus negatively influencing what is gained from the high inherent efficiency of LED luminaires.

The switch mode form of current regulator is not only more efficient but also provides for basic dimming capability. The basic circuitry is shown in Figure 6.

The LM555 is a Fairchild device for generating accurate time delays and oscillating waveforms. In the illustrated circuit the device is used as an oscillator, generating a square wave in conjunction with R1 and C1.

R1 is a potentiometer and allows the frequency to be varied. When the

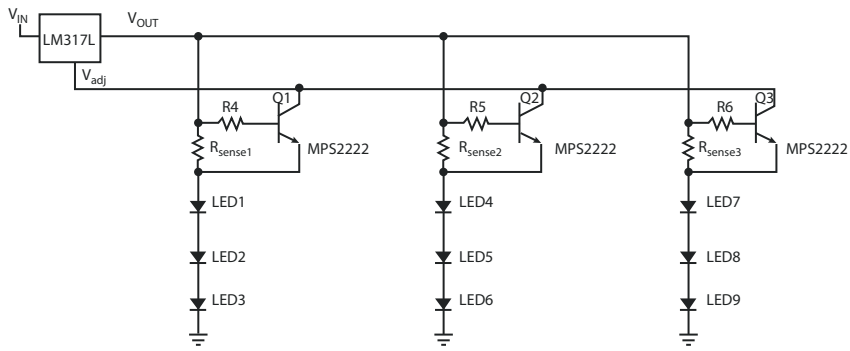
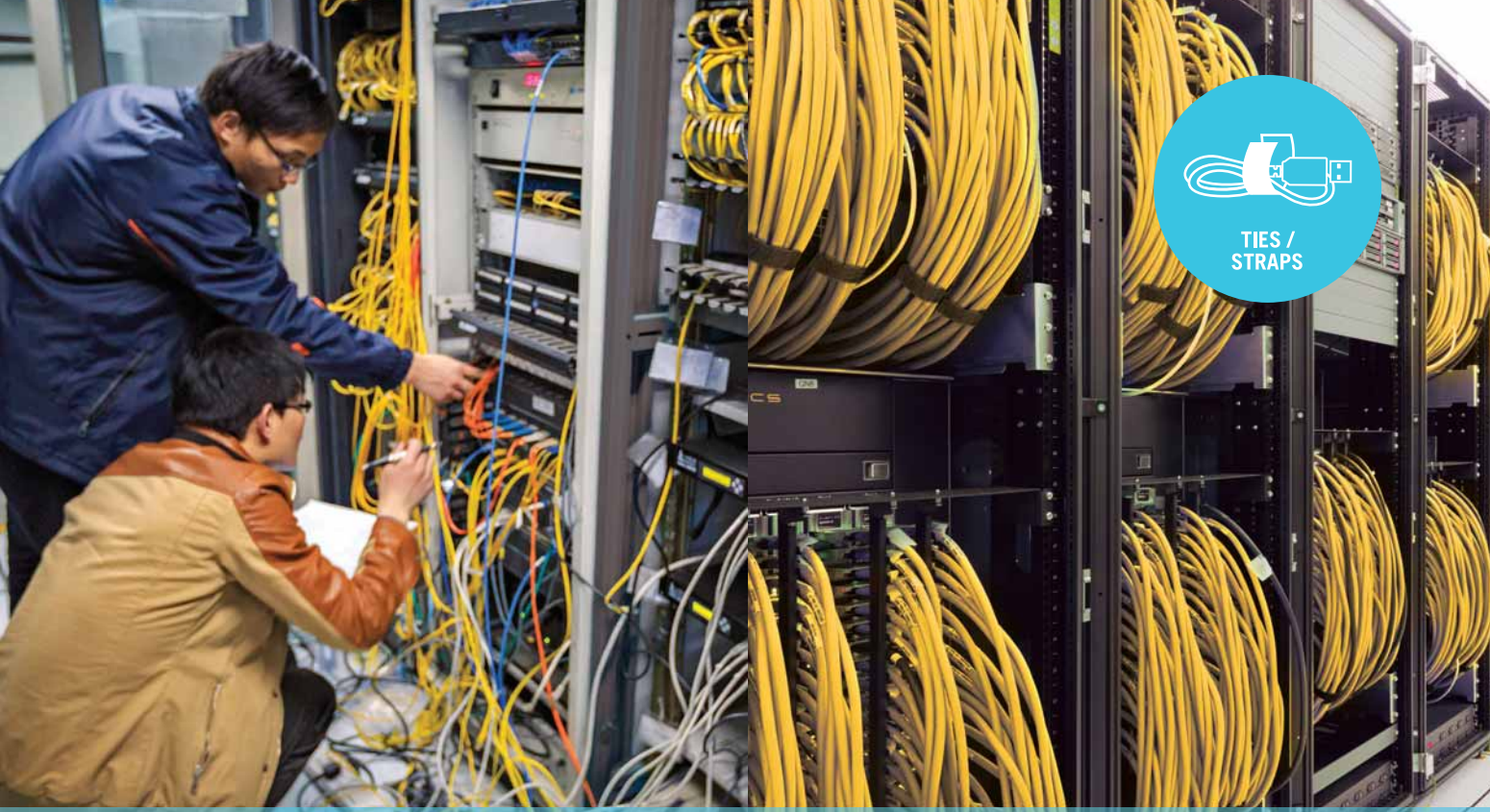


Figure 5: A power supply with feedback.



www.velcro.com.au · AMAZING CONNECTIONS...

VELCRO® BRAND

VELCRO® Brand ONE-WRAP® STRAPS & TIES

VELCRO® Brand ONE-WRAP® is a fastening system that features a polyethylene hook, flame laminated to a nylon loop. Reusable and infinitely adjustable, VELCRO® Brand ONE-WRAP® tape can be used for any size circumference and easily cut to length. ONE-WRAP® is ideal for: Cord & cable control, home and office computers, display & exhibitions and optical fibre cable management.

Available in the following colours.
Ties & Reusable Rolls: Brown, Black, White, Green, Red, Orange,Yellow, Royal Blue, Purple, Grey & Beige.






Available in a variety of colours and lengths to suit your needs.

Available in convenient industrial & consumer packs to suit various applications

Available at all leading electrical wholesalers

Proudly distributed by

repELEC TRADE SOLUTIONS

VELCRO®
THERE IS ONLY ONE.®

VELCRO Australia PTY LTD
5-11 David Lee Road, Hallam VIC 3803
Tel: (+61) 3 9703 2466
Fax: (+61) 3 9703 2305

1300 VELCRO (1300 835 276)
FREE CALL 1800 337 024
Web: www.velcro.com.au
E: AUS_Sales@velcro.com

Like us on Facebook

Certified System Quality ISO 9001 SAI GLOBAL
Certified System Health & Safety AS 4801 SAI GLOBAL

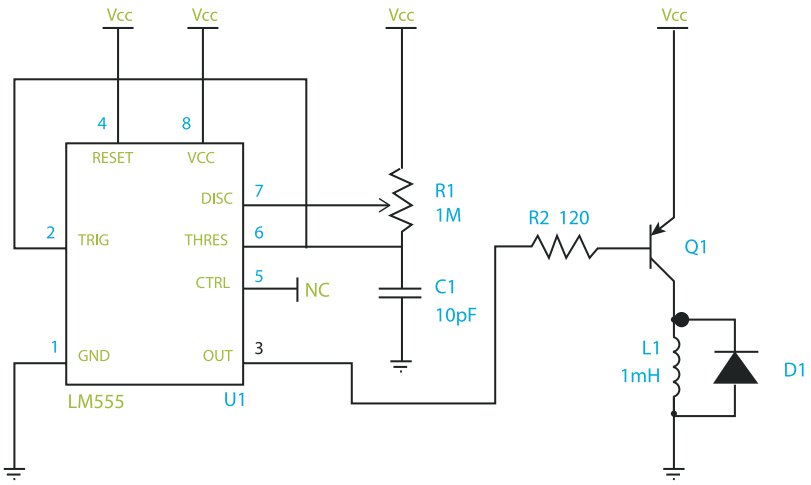


Figure 6: The switch mode form of current regulator.

output of pin 3 of the LM555 is low, transistor Q1 turns on and the inductor L1 stores magnetic energy while the LED conducts current. When pin 3 goes high, Q1 switches off but the LED is still being supplied with current via the L1 stored magnetic field.

Providing constant current is one thing; splitting current equally among several LED strings connected in parallel is another, and it becomes important in large luminaires.

That task can be achieved by current mirrors. A current mirror is a circuit block that functions to replicate the current of a particular active device in another active device. An important feature of the current mirror is a relatively high output resistance, which helps to keep the output current constant regardless of load conditions.

Another feature of the current mirror is a relatively low input resistance, which helps to keep the input current constant regardless of drive conditions.

A current mirror is shown in Figure 7. The sense resistor RS1 in the left-hand LED string sends a feedback voltage to the current regulator (not shown) feeding both strings.

Transistors Q1 and Q2 are identical types and ideally should be mounted on a common heat sink so that their thermal characteristics are matched.

Transistor Q1 with its collector connected to the base is turned on hard and supports only a small voltage difference between emitter and collector. Q2 is basically an emitter-follower circuit, that is, it replicates the base to ground voltage on the sense resistor RS2.

Therefore RS2 will be equal to RS1 in value or adjusted to be very close in value. In this way both strings draw equal current. Further strings can be added, and appropriate transistors must be chosen for that task.

Although it is simple circuitry, several disadvantages can arise. One is that matched transistor pairs are generally limited in power (thus limiting string current).

Another is that larger differences in total forward voltage in strings can also limit current. If, for example, the left-hand string has a larger voltage drop, the difference shows up in a larger collector to emitter voltage drop on Q2, thus limiting current in that string.

A more flexible form of individual string current control is shown in Figure 8.

In this circuit the two strings have the same supply voltage, as in the current mirror example. This voltage can be set at a level appropriate to the largest of forward drops likely to occur – and even to allow for a bit of extra 'headroom'.

The field effect transistors (FETs) (Q1 and Q2) can be thought of as trimming resistors. The operational (high gain) amplifiers feed the base regions of the FETs. By eliminating the difference signal (connected to the negative input), the voltage drop – and therefore the current – is kept constant on the sense resistors.

IS DC THE EFFICIENT SOLUTION?

The short answer at present is no, but there are some important qualifiers.

The first is that there isn't a range of commercially available DC-DC power supplies for LED lighting. What we have is a plethora of drivers, all of them with AC input.

Typically the spread of power ratings

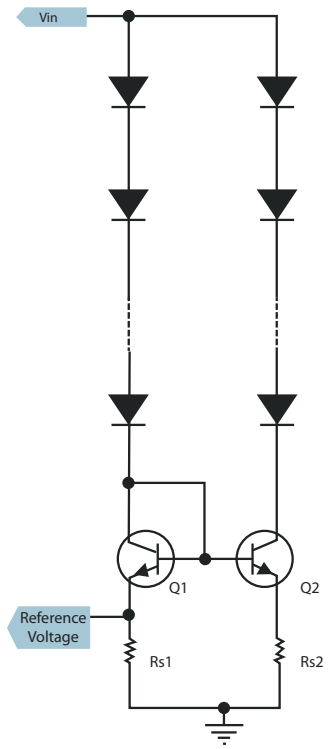


Figure 7: A current mirror.

is from a low of a few watts to 200W, with a maximum voltage about 60V volts and a maximum current of 4A. The larger the driver, the more likely it is to be of higher efficiency.

For larger drivers, efficiencies quoted in engineering articles are in the high 80% range. Figures are not readily available for the low end, but common sense indicates that with magnetising current forming a much larger part of small transformer input current the efficiencies will be 10 percentage points lower.

From an overall lighting efficiency aspect, the superior luminous efficiency of LEDs makes up for loss of efficiency in drivers. However, the AC to DC conversion, if eliminated, can lift the overall power conversion efficiency spread from 65-80% to 80-90% (This relates to power available to LEDs compared with input power. Luminous efficiency is not included.)

With the increase in rooftop photo-voltaic installations, the drop in feed-in tariffs, and the rising sales of battery storage systems, can DC input power for LED lighting be far off?

Is there any sense in supplying the nightly load of lighting by inverter-generated AC only to convert it back to DC? One efficient DC-DC converter for the home would take care of business. ■

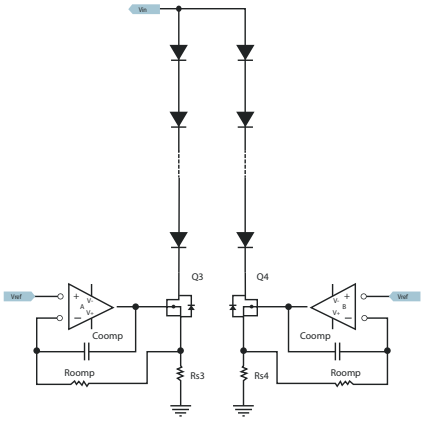
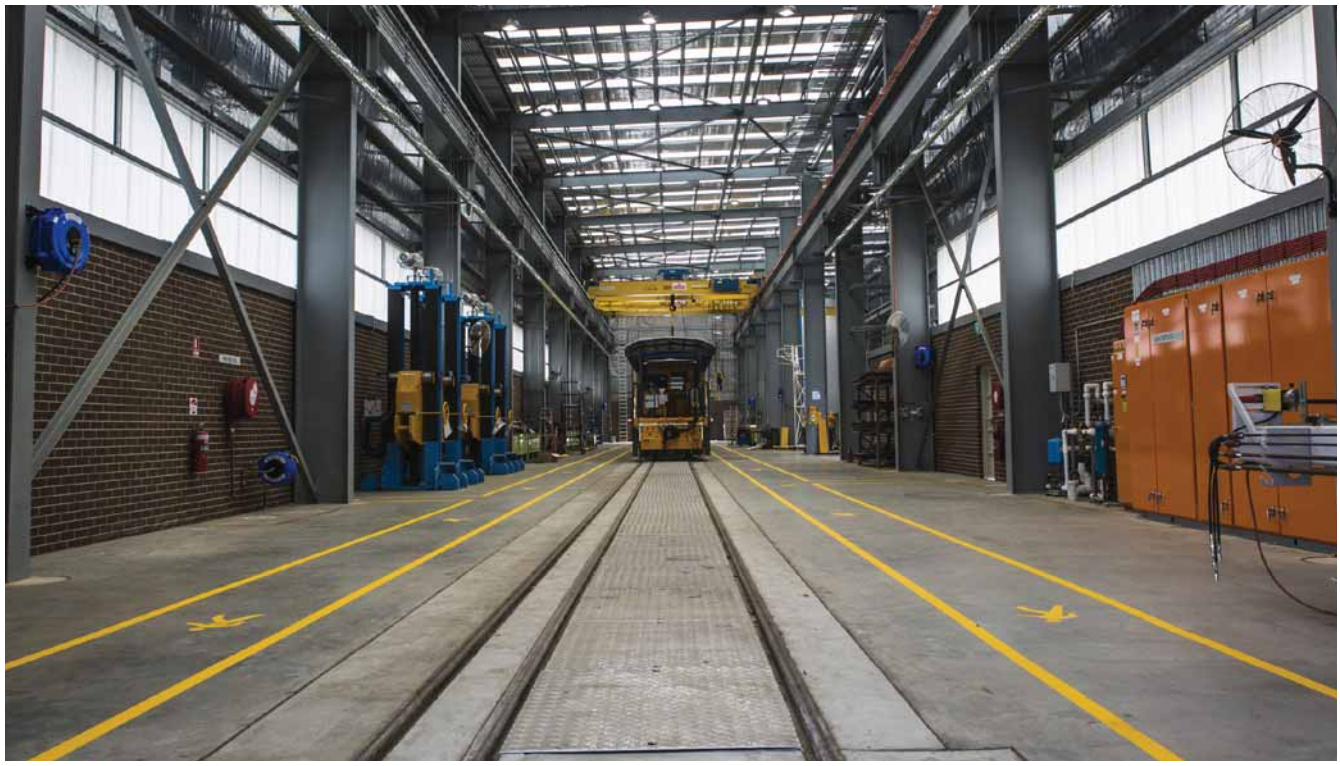


Figure 8: Individual string current control.

ELECTRICIANS ON THE RAILS



AN ELECTRICAL CONTRACTOR FROM NSW HAS PLAYED AN IMPORTANT ROLE IN SECURING THE FUTURE OF THE LOCAL RAIL NETWORK. PAUL SKELTON REPORTS.

Aside from being the subject of Blackfoot's 1979 rock anthem *Train, Train*, trains have long played a pivotal role in the global transport industry. The first railway in Australia was commissioned by the Australian Agricultural Company in Newcastle in 1831; now, the Australian rail network consists of a total of 41,461km.

And it keeps growing.

In November, NSW Premier Mike Baird announced plans to connect Sydney CBD with Parramatta in the city's west. And plans to connect Melbourne to the Tullamarine airport have been nothing if not persistent.

Understandably then, construction and maintenance of the rail network is big business.

Plasser Australia is a member of the Plasser & Theurer group of companies, which is the world's leading supplier of track maintenance and construction equipment.

Recently, Plasser was looking to extend its existing production facilities in Australia and, as a result, contracted electrical contractor Kerfoot to undertake the complete electrical services installation for the new workshop site.

Located in St Marys in Sydney's West, the project would see the construction of a new factory next to Plasser's existing workshop. It would include a production area with a service trench well over 80m long, for working under the trains; office facilities for production management; a wash down bay so workers could get under the trains for cleaning; overhead cranes; welding stations; new car parking facilities; and, a huge undercover storage area for all of Plasser's trains with a direct link to Sydney's railway network.

For Kerfoot, the project included the detailed design, manufacture and installation of a new power supply connection from the new pad-mounted substation. These works included the staged disconnection of existing services including a temporary connection

for the duration of construction to maintain the existing workshop's 1,500A supply; the replacement of a 35-year-old main switch board with a new 2,000A main switch board; as well as the installation of a power distribution system to feed four new power busbar distribution rails, two 50T cranes, a 10T crane and 20 new welding stations; along with all general electrics for the workshops new facilities.

A new lighting control system was installed that incorporated day light harvesting technology, to control the lighting throughout the factory, service trenches and carpark.

A new fibre link from the Telstra network was installed to service the expanding IT needs of Plasser. The fibre link installation was staged as the existing production facility needed to maintain its services while construction was under way.

Kerfoot also worked with the client to design a new CCTV system to help the client maintain a safe workplace – vandalism and theft in the area is quite high. A fibre link was installed between buildings to maintain the CCTV link, which was networked so it could be monitored remotely.

A wireless fire smoke and EWIS system was also installed, to cover the new factory floor, integrated with the existing factory's system.

"Our goal was to complete the project with no downtime. The careful planning and dedication of the project team helped us achieve this goal," project manager Josh Kerfoot says.

"As the support and cooperation of the electrical and network authorities were required to help with the staged disconnection and installation of new services, Kerfoot worked very closely with them to design a connection method that would comply with all of their requirements and also meet the critical milestone dates.

"Suppliers also had to be engaged very early as many of the components that were required had lead times well over three months. Much of the equipment was not your everyday components and any late deliveries would result in delays to the project."

The Kerfoot team also worked with the client to alter the sub-main requirements.

"There were several large sub-mains that had to be installed in multiple locations around the workshop. We used flexible cabling, which is commonly seen as being a more expensive product. While this is correct, with the right design input we were able to reduce the size of the sub-mains as the flexible cabling had a larger current-carrying capacity," Josh says.

"It also allowed us to cut installation time in half as flexible cabling is a lot easier to install and terminate. The cost benefit of this exercise was not only for Kerfoot – it helped shorten the installation time too which benefitted the client and head contractor."

Several of the electrical services needed to be installed in the ground at least two months before the building was erected, Josh says.

"This posed a challenge as it was not a simple trenching exercise," he says.

"Internally and externally the building contained hundreds of metres of rail lines that required footings deep in the ground. Further, the service trench and wash down pit took up a lot of space, which made it more challenging to find appropriate places to run the cable.

"Kerfoot's team worked with all of the other trades involved in the project to ensure all services were installed in the exact location they needed to be in, without affecting the building's structural elements."

Once the building had been erected, the installation of high-level services would need to be carefully coordinated as the use of lifting and access equipment around the services trench, wash down pit and rail track installation crews was considered high risk.

"One of the most difficult aspects of the project would be the installation of a new substation and the decommissioning of the old substation while keeping the client operational.

"The existing substation was located right in the middle of the new building's footprint and the construction schedule did not allow time to have the factory built

Kerfoot had to install a new power supply connection for Plasser Australia.

Several of the electrical services needed to be installed in the ground at least two months before the building was erected.

and water tight before the old substation could be removed.

"Kerfoot worked with the substation installation team, the supply authorities and the client to design a temporary connection that would allow the removal to the existing substation while ensuring the facility would remain powered.

"This involved expediting the installation of the new substation and the extension of the client's existing consumer mains so the facilities could remain powered while we waited for the new main switch room to be constructed.

Kerfoot designed a pit and conduit network that would service both the new main switch board and the temporary connection so when it came time to feed the new main switch board there was minimal down time.

"The temporary connection was simply disconnected and the new main switch board connected. There was no waiting for sub-mains to be installed and redirected as this had already been done."

Energy efficiency on this project was a priority as the client's running costs were already very high. A lighting control system was installed that used day light harvesting, to allow the client to only use lights within the factory and in the undercover storage area when required.

"PE cells were installed within the factory using the clear sections of roofing that had been installed to let natural lighting in, this saved a lot on money on installation cost as the PE cells did not have to be installed on the external facade of the bulling.

"The lighting control has been broken up into groups so if one area is darker than another it will turn on only the lighting in this first area, stopping the use of lighting when not required.

"Originally, the brief called for LED high-bay lighting for the entire factory. But the recommended brand's fitting was not only extremely expensive it was not very serviceable either. It would accumulate a lot of dust quite quickly."

Kerfoot worked with a local supplier to propose a fitting that would give the same light output but half the cost, particularly when it came to maintenance as the new fitting was designed to collect minimal amounts of dust.

A regular clean to help with the lights' performance would not be required.

Most recently, Kerfoot's work on the Plasser facility won the NECA NSW Excellence Award in the Industrial – Small Project category.

"It just goes to show how well our team has adapted to innovation, safety and code requirement changes and been able to help the company grow constantly over the last 40 years," Josh says. ■

> **Kerfoot**
> **www.kerfootelectrics.com.au**

PRYSMIAN

Easier to spot.

Blue Air - Con cables – an improvement coming from you.

Many of you have asked for simplified circuit identification. So to celebrate the arrival of another colourful summer we are making 1.5 mm^2 and 2.5 mm^2 blue sheathed 3 Core + Earth flats. Convenient for you to use on single and 3-phase installations, such as air conditioning, smoke alarms or electrical blinds. This is just one of the many features and services we offer to make your life easier. Stay tuned for more.

Australian made? Yes, of course!

We're happy to tell you more:
Ph: 1300 300 304 Fx: 1300 300 307
Email: sales.au@prysmiangroup.com
www.prysmiancable.com.au

A brand of the
Prysmian Group

GOING AGAINST THE GRAIN

REBECCA MAIR REGALES *ELECTRICAL CONNECTION* **WITH THE STORY OF HER JOURNEY AS A FEMALE ELECTRICIAN.**

As a child I loved watching my dad fixing things about the house; they're some of my earliest and fondest memories. I knew I wanted to follow in his footsteps, as I too loved using my hands to build and fix things.

Years later, when it became time for me to consider a career choice, I assumed I would enter a career fit for a woman - a 'clean profession' like administration, nursing, teaching, retail or child-care. As a teenager, the distinction between a 'woman's job' and a 'man's job' couldn't have been any clearer.

And while we'd like to think the situation has changed since those days, the reality is this gender perception of jobs has prevailed. Indeed, stereotypes engrained in our children from a young age have a huge impact on our future perceptions. A study of teenagers between 14 and 19 showed that despite not knowing the responsibilities involved in a certain job, nor the pay or lifestyle, they were able to easily identify 'girl jobs' from 'boy jobs'.

It's no secret that trades are traditionally thought of as boys' jobs. Even today, female apprenticeship numbers are less than 2% in areas like construction, electrical, automotive, carpentry and plumbing. Bearing this in mind, it really wasn't much of a surprise that I didn't follow my gut and pursue an electrical apprenticeship from the get-go.

Looking back on my career, I really am a prime example of how persuasive these gender stereotypes can be. Like many other young girls fresh out of school, I went straight into nursing. A hands-on role that involves plenty of problem-solving, I thought it would be the perfect fit. But it wasn't to be – after just a couple of years I left and moved onto reception work, before I once again quit for what I thought was my dream job, working with pre-school children.

The stereotype that being a tradie was only for men meant I never really

considered becoming an electrician. In fact, it was only when I met my now-husband, who is a qualified electrician, that it truly became a possibility. He encouraged me to really question the status quo – if I wanted to be an electrician, then what was stopping me?

Today, women make up 46.2% of all employees in Australia. In a country where the demand for technical proficiency and manual dexterity is on the rise, it makes sense for the number of female electricians to grow with the industry and the good news is there are more opportunities than ever for women wanting to break into the field. Yet if we want to tap into one of the nation's biggest assets, our female workforce, we need to close the gender gap; both the perceived and the actual.

By perceived I mean the mental barrier that women feel to starting an apprenticeship. If beginning a trade apprenticeship had been presented to me as a viable option, I would have jumped at it. As female electricians today we have a responsibility to young girls to not only be more visible but to be more vocal. Most young women don't know a female electrician, which is a huge reason they don't feel like they can be one. That's one of the reasons why I became a brand ambassador for Clipsal – to raise awareness of my career as a female sparky in the hopes of inspiring the next generation. Also as a mother, I want to be able to set the best example for my daughter by demonstrating that no barriers should stop you from reaching your goals regardless of the career you choose to pursue.

In terms of the actual gender gap, I am referring to the double standards women face in the workplace. Across the workforce full-time average weekly earnings for women are 16.2% less than for men and it's only more pronounced for sparkies. In fact, the electrical distribution trades industry has the third biggest pay gap between men and women with males on a salary of $93,377 and women $48,390. Women need to be treated equally in the workplace both in regards to the attitudes of their co-workers as well as numerically.

The truth is, despite having a foot in the door, I still faced resistance for being a woman. One of my early experiences of discrimination was as an apprentice when one company refused to have any females on site because it was 'too much hassle' or because someone might refuse to pay for the job. I also found that builders could get iffy about having a woman on site for no other reason than they weren't used to it. This was difficult to face regularly, even if I was following my passion.

> The stereotype that being a tradie was only for men meant I never really considered becoming an electrician.

So what can we do about it? The reality is that men are crucial to the cause – without their support and willingness to adapt, female tradies like me will keep on telling the same story. As shown in a recent survey, men perceive the challenges of women in the workplace in a very different way to their female counterparts. Interestingly, men believe that a woman's greatest challenges are feeling included, achieving work-life balance and dealing with childcare issues. Women, on the other hand, perceive promotions and pay as being the top obstacles they face.

There are many factors that contribute to this perception; namely the fact that women are outnumbered in many industries, such as the electrical industry, and that there's an under representation of women in management positions. This perception misalignment is something that must be taken seriously; it can impact how male managers manage women or even how they interact with their female colleagues. Until we're all on the same page, we will continue to have issues with gender stereotyping and equality.

It's my hope that by sharing my story more women will feel empowered to undertake an electrical apprenticeship regardless of the adversity they might face. As you can see from my story, it hasn't always been smooth sailing. But after trying many different roles I knew where my interests lay and I had to get there. Unfortunately, gender stereotypes still exist today and while many in the industry are far more open-minded, it would be misleading to say you won't face challenges because of your sex. As with any career, you will have times of hardship but it's up to you to decide if you'll struggle to feel engaged in a role you feel you should be in or if, like me, you're willing to persevere for a career you'll find rewarding.

I've faced many obstacles during my years as a sparky but do I regret pursuing the profession? Absolutely not! It's a really rewarding job and I couldn't be happier in my career. If you're a woman who's thought about a career in trade but quickly brushed it aside I want to encourage you to reconsider. If you're a business who hasn't been open to accepting female apprentices I want to encourage you to reconsider. The biggest lesson I've learnt from my experience is to put passion before gender and whether you're a business or an individual I'd like to ask you to do the same. ■

SCREWING UP SOLAR INSTALLATIONS

AN ENGLISH MANUFACTURER HAS RELEASED A SCREW DESIGNED TO MAKE SOLAR PANEL INSTALLATIONS 30% FASTER AND 30% STRONGER. BUT HOW IS THIS ACHIEVED WITH JUST A SCREW? JOE YOUNG REPORTS.

Attaching solar panels to metal roofs can be a difficult task. Not only because you are precariously perched on a slopped surface well above ground doing manual labour, but if not done correctly, leaks, rust and maintenance problems can result.

But could the solution to all your problems come in the form of a screw?

The EJOT EJOFAST screw has quickly become the best seller in its manufacturer's range as installers are finding it makes PV installations on thin metal profiles faster, stronger and cleaner while reducing maintenance issues.

As you might guess, there are some key differences to a regular screw.

A standard self-tapping screw cuts through the material it is securing into - whether it be metal or wood. EJOT screws, however, pierce the metal and pushes it aside rather than cutting through it. This gives the screw more material to engage with. It is then sealed by a stainless steel-backed EPDM sealing washer atop the screw. The manufacturer says the result is a hold around 30% stronger than a regular stitcher.

And because it isn't cutting away at the material it also means the roof isn't left with cracks or fine metal shavings. This may not seem like a big deal but over time fine shavings can cause permanent rust damage.

The other major difference is a standard screw can skid before it engages the material. The tip of EJOT EJOFAST screw has a feature called 'point geometry', which promotes instant thread pickup, which means it pierces the metal immediately.

So there; faster, stronger and cleaner solar panel installations just from a screw.

For installers who regularly do PV installations it may be worth getting a screw designed for exactly that. The main application for the product is fixing brackets, clips or pre-punched clamps to metal sheets or side-lap stitching roofing and cladding sheets on metal profiles 0.4mm-1.25mm thick.

But for installers who choose to use the screw there is some good and bad news.

The bad news is the screw needs a specific screwdriver to be installed, the EJOT power screwdriver. The good news is this screwdriver can be set to automatically disengage the clutch when the depth sensing nose piece makes contact with the surface of the material being fixed.

The EJOT range of screws and screwdrivers is distributed in Australia by MAK Fastener, which specialises in roof-top installations.

MAK Fastener general manager David Mc Donald says EJOT screws work well in conjunction with the range of S-5! products.

In fact, there are products in the 5-5! range that can even enable installations without piercing the metal roof, David says. This would be particularly attractive for customers who want to protect the warranty of their roof.

The S-5! clamps attach to the seam of a metal roof by inserting and tightening screws onto the seam, but only to a point where it will dimple the material.

The clamps can attach to almost any standing seam, exposed-fastened and corrugated metal roof profile.

While there is extensive coverage of technology developments in PV systems, there is a bit of activity in the area of installation of such systems as well.

With swarf-free, geometry tip features it makes you wonder, whatever happened to the humble screw? ■

> **MAK Fastener**
> **www.makfasteners.com.au**

AUSTRALIA'S LARGEST RANGE OF FANS

From designer pieces to energy efficient essentials, Beacon Lighting Commercial fans suit any space.

View the range and get a quote today at www.beaconlightingcommercial.com.au

Melbourne 03 8415 0277
Sydney 02 9699 7255
Brisbane 07 3216 9039
Perth 08 9444 9653

Beacon LIGHTING COMMERCIAL

Distributor GE Lighting

EKTOR EMERGENCY TEST SWITCH BASIC

EKTOR'S NEW EMERGENCY TEST SWITCH BASIC EV-EM-TIMER-BASIC MAKES IT EASY TO COMPLY WITH AS2293.1 WHEN IT COMES TO THE MAINTENANCE OF EMERGENCY LIGHTING.

The Emergency Test Switch Basic is ideal for commercial and industrial applications. The Test Switch is supplied with a surface mount enclosure with prewired contactor for easy installation and simple wiring. A 4-pole 25A contactor allows each unit to service up to 4 lines of emergency lighting. For installations that require additional time for regular lighting to be re-established, Ektor's Emergency test switch offers a prolong function to keep emergency luminaires lit for up to an additional 15 minutes to maintain safe light levels. Prolong functionality is perfect for installations using discharge lamps or other slow start lighting.

The Emergency Test Switch Basic provides the ability to perform both 90 and 120 minute tests meeting the AS2293 requirements for new or replacement emergency devices and routine maintenance. In addition, a walkaround time is provided by the test switch allowing a contractor to check the status of devices after the set duration has completed.

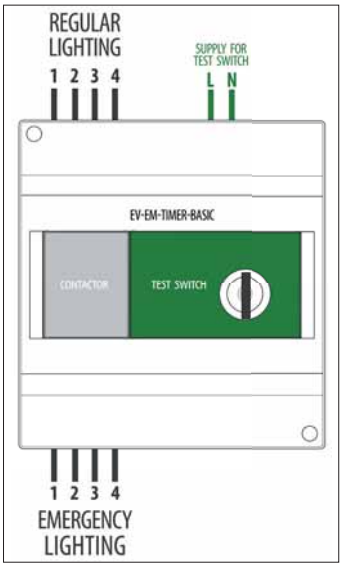
This Timer was designed to slot into the market, keeping in mind the small to medium building applications where more complex testing is not required. By doing this Evolt have managed to keep the pricing competitive without comprising on design, quality or performance of this product.

Ektor's Emergency Test Switch Basic is supplied in a surface mount enclosure and includes a 4-pole contactor for simple wiring and easy installation. See diagram below.

The Emergency Test Switch Basic features:

- Fully Compliant AS2293
- Easy Installation
- Advanced functionality (prolong and selectable test duration)
- Simple wiring
- Competitive Price

For more information on this product contact Evolt Pty Ltd on (02) 9502 1161 or visit our website evolt.com.au to view our full product range. ■



- **Evolt**
  www.evolt.com.au

ektor

MERCURY JUMBO

A NEW ERA OF EMERGENCY MONITORING AND TESTING

ONLY 2.2W
POWER CONSUMPTION

EV-MERCURY-40M

FEATURES

- Single and double sided decal
- **Fully compliant** (AS/NZS 2293)
- Excellent emergency classification
- Surface / suspended mounting
- Premium Lithium batteries **(LiFePO4)**
- Aluminium body
- Even illumination

DALI CERTIFIED:
Connect to a DALI system for testing

SINGLE POINT UNIT:
Out of the box works as a SPU

SELF TEST:
Capable of performing its own self test

WIRELESS UPGRADE
Automatically test and sync data to the Cloud

Ph: + 612 9502 1161 Fax: + 612 9502 1154 Email: sales@evolt.com.au **ektor.com.au**

a brand of evolt

LEADING THE CHARGE

BATTERY TESTING AND CHARGING FOR SUBSTATIONS AND ELECTRIC TRACTION CAN BE CHALLENGING. PHIL KREVELD DELVES INTO THE DETAIL.

Figure 1: The state of charge of VRLA batteries being checked on an IDCE840 battery tester. Image courtesy of Power Parameters.

The important difference between charging for substations or for electric traction is time.

In many traction applications, recharging a battery is compared to filling up quickly with combustible fuel; in substations, time is not an issue.

Lead-acid batteries are used in both areas, but lithium-ion batteries by virtue of their superior energy density are highly desirable for vehicles requiring an extended operating range.

However, the complexity of multi-cell battery packs takes away some of that inherent advantage. When it comes to testing, lithium-ion makes sense for stationary applications but is complicated for vehicles.

SUBSTATIONS

Without emergency power, substations would be severely compromised.

Protective relays may require emergency electrical supply in case of blackouts, but that is low-power stuff. Operating isolating switches and circuit breaker trip coils requires more power.

In some cases emergency power is necessary for motors that rewind breaker spring sets, and other tasks requiring AC voltage. For the latter, uninterruptible power supplies are used, and these also require battery banks. High-voltage substations often have primary and back-up battery supplies.

Battery testing at regular intervals is a given, and incoming inspection is also necessary. However, there is also a need for battery monitoring to provide a continual check. Battery monitoring relies on cell voltage, string voltage, string current and battery impedance measurements. The latter type of testing is particularly useful for UPS battery banks.

Figure 1 illustrates a discharge tester suitable for lead-acid cells. The apparatus allows for constant current, constant resistance and constant power discharge. Individual battery voltage is monitored during the discharge.

The batteries used in substations are flooded cell (VLA), valve regulated

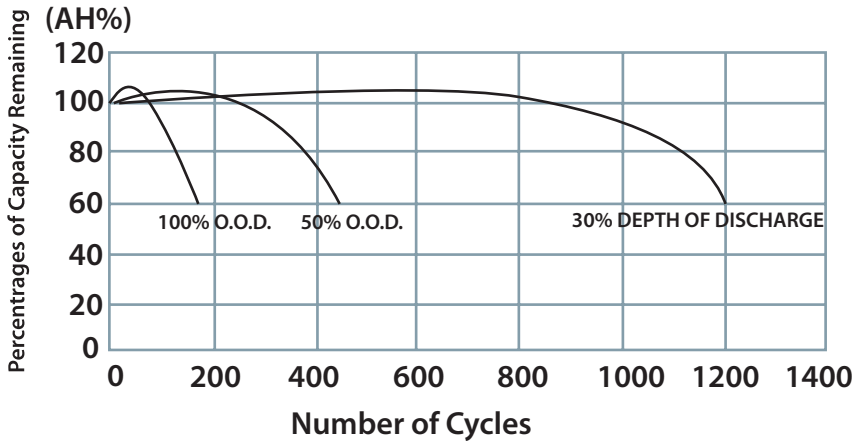


Figure 2: Lifetime Curves (Cycles).

BY
PHIL
KREVELD

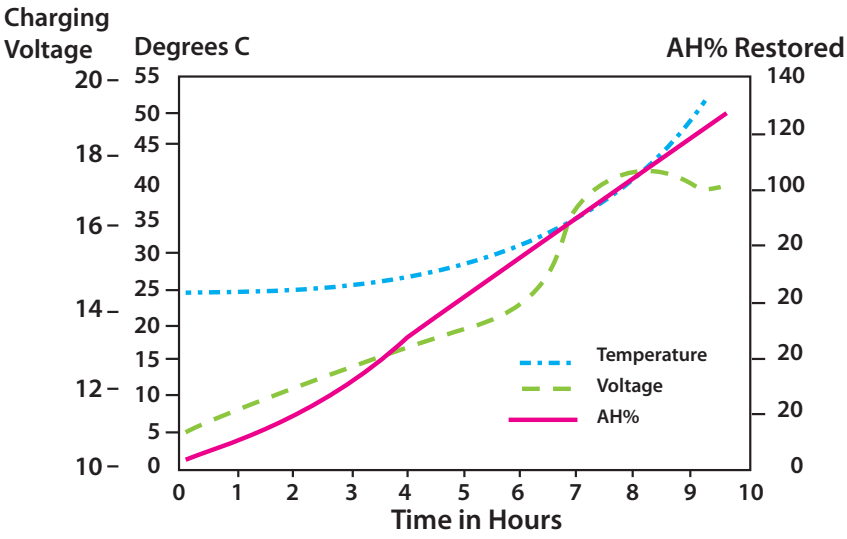


Figure 3: Constant current charging of a VRLA battery.

lead-acid (VRLA), vented nickel cadmium (Ni-Cd), and recombinant nickel cadmium (RNi-Cd). The testing regimes have to be appropriate to battery capacity characteristics.

The lead-acid VLA and VRLA require frequent testing by the time 80% of capacity is reached. Thereafter the testing frequency should be increased to yearly intervals.

With the Ni-Cd batteries, the test frequency should be at five-year intervals – and when at 90% of rated capacity it should be annual. The thing to realise is that rated life is a bit like how long a piece of string is. Figure 2 makes that plain

Regardless of the amp-hour capacity of a particular battery, the more discharge cycles it is subject to the shorter its lifespan will be. Battery tests, if they include a 100% depth of discharge (DOD) will, as the graph illustrates, shorten life the most.

Battery maintenance practice should include amp-hour data collection. (This is not a DOD statistic, since float charging takes place – or usually can be expected between discharge events.)

The VRLA battery is the most popular type in substations. Its one-way valve can, in cases of over-charging, vent gases (hydrogen and oxygen) but that's not what should usually take place.

In VLA (flooded cell) batteries the creation of hydrogen gas, H2 and oxygen radicals (1/2-O2) causes water loss in the electrolyte, and a reduction in the electrolyte specific gravity resulting a decrease in cell open-circuit voltage.

In VRLA batteries the electrolyte is immobilised by means of a porous separator between the positive plate (lead oxide) and the negative plate (lead, in sponge form). The separator is an absorbent glass mat (AGM) trapping the oxygen – or, better put, making the gas diffuse slowly to the negative plate where lead oxide is slowly formed during the battery discharge.

Despite the inherent ruggedness of VRLA batteries, over-charging will lead to oxygen generation in excess of the AGM's ability to trap the gas, and out-gassing will occur via the one-way valve. If the over-charging continues, a premature drying out will occur with a permanent loss in capacity. The recharging process is therefore very important.

Given a battery's capacity, C, in amp-hours, the total charge that needs to be replenished in order to restore its capacity is of the order of 1.10C. There's no such thing as a free lunch, and more energy needs to be put in than will be extracted during the discharge.

The energy loss in a battery during charging is I^2r_b where I is charging current and r_b, the internal resistance.

The specifics of battery charger operation are crucial for substations. They form part of the general DC power requirements during normal operation, thus requiring some special circuit considerations.

Under normal operation only the charge loss due to internal charge leakage needs to be made up. The process is variously referred to as trickle charging or float charging. Irrespective of the semantics, making up for more than the charge lost will

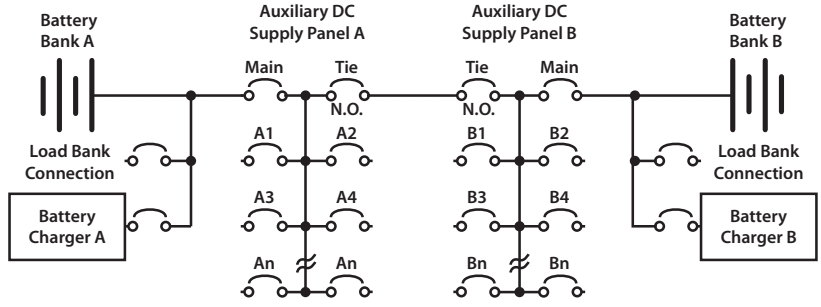


Figure 4: Typical redundant layout for a substation.

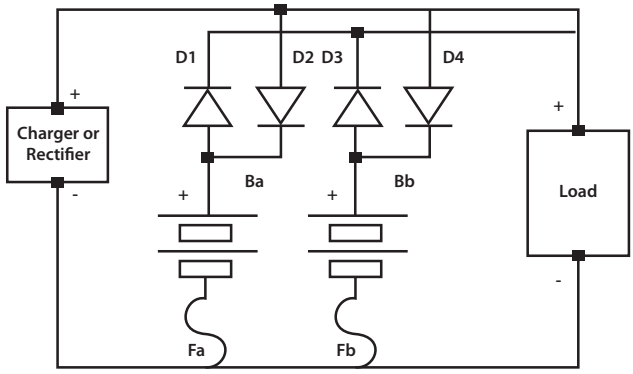


Figure 5: Protection of parallel strings.

shorten battery life in the long term.

Charging current Ic is equal to the difference in charger voltage and cell voltage divided by the total resistance, which takes into account any current-regulating resistance, circuit resistance and cell internal resistance.

The higher the charging rate, the more quickly cell voltage rises, necessitating a further increase in charging current and a rise in cell temperature.

Figure 3 shows the process for a 5C charging rate, that is, a 200A-h battery would be bulk charged initially at 40A. As the graphs show, temperature rises slowly initially but then takes on an exponential slope. It is clear that to prevent excessive temperature the rate of charge should be decreased as the battery approaches 80% charge.

BATTERY CHARGERS

Before looking at substation DC power reticulation, charging circuits should be examined.

A constant voltage charger should in the first place have an output above the highest open circuit cell voltage. It has the advantage that current decreases as the battery gains charge, but its charging rate will be considerably slower than with a constant current source.

However, such a charger should have a way of stepping the charger current down as the battery gains charge.

For substation duty some form of charger temperature compensation is important. This also applies to the battery bank room, which ideally should be held within a tight band of 15-25°C.

Temperature has a substantial effect on float current provided by a constant voltage source. The float current must roughly double for each 10°C rise in cell temperature.

Increased heating of cells and reduced heat flow from batteries increases the risk of thermal runaway. Higher ambient temperatures are obviously implicated here.

This effect is particularly observed in VRLA batteries rather than in vented (flooded) cells, because the formation of oxygen is an exothermic reaction. In the case of sealed VRLA batteries, the heating effect and joule losses can add up very quickly to higher temperatures.

The ability to de-sulphate the negative plate, which gains a layer of lead sulphate as the battery discharges, is an advantage. Some chargers incorporate a de-sulphating pulse, although its mechanism is not well understood, and some chargers use a form of pulse width modulation to control the charging process.

This latter method combines the advantage of constant current charging with the inbuilt feature of tapering current of constant voltage chargers. Using pulse width modulation, the current pulse width is reduced by means of an algorithm and/or a suitable feedback mechanism based on cell voltage.

DC CIRCUITS

Substation DC circuits vary, but there are some generalities as shown in Figure 4.

In the dual-battery system as shown, the chargers A and B function not only to trickle charge the two banks but also to supply the various DC circuits: that is, DC coils for circuit breakers, DC motors for energising trip springs, and protection relays.

Electro-mechanical versions are

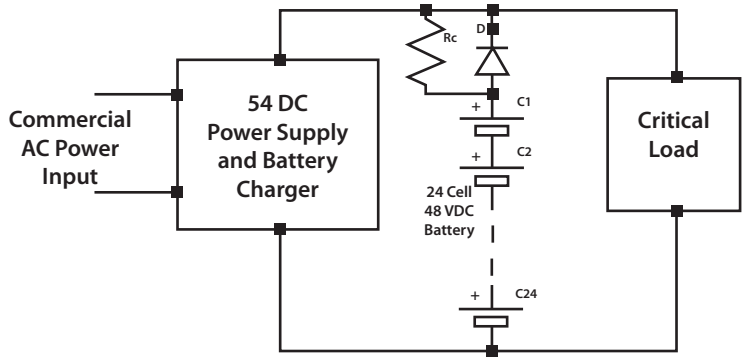


Figure 6: Parallel supply of load and float charge.

powered by potential and current transformers. However, many are now electronic, using microprocessors and requiring a constant DC power supply – or at least as an alternative if the normal energising is via a switch mode power supply.

Although we are focusing on batteries, charger functions should also be checked. The challenge in the above arrangement is to provide stable voltage under normal operation and appropriate voltage for the float charging process.

Furthermore, account must be taken of operating with parallel battery strings, and protection – for example, ensuring that one battery's shorting does not affect the others.

A very important parameter in chargers is ripple. The AC ripple sitting on top of the DC current component is deleterious to batteries. It may not be an intuitive reaction if one looks at a sine wave about a DC level. There are as many peaks going higher than the DC value as there are troughs below.

That might lead you to conclude that the net result is simply the effect of the DC component only. However this is not the case. The actual rms (heating value) is given by the formula:

In the formula, I_{eff} is the effective

$$I_{eff} = \sqrt{I_{DC}^2 + \frac{I_{AC}^2}{2}}$$

charging current, I_{DC} is the DC component, and I_{AC}, the AC component.

In substation maintenance, testing ripple is crucial. If the voltage ripple is sufficiently large during negative excursions to be under the open circuit cell voltage, discharges will take place.

The current ripple component provides additional heating. For minimal heating influence on the

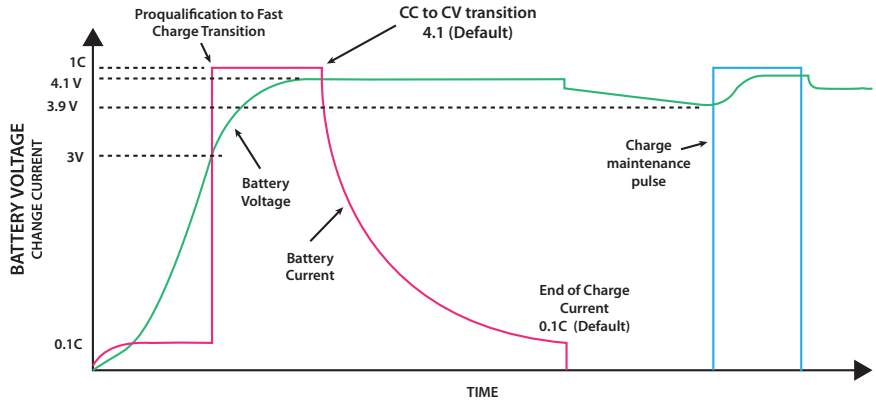


Figure 7: Charging profile for a Li-ion cell.

battery banks, ripple voltage should be well under 2% peak to peak, and under 4% peak to peak if discharge effects are to be avoided.

Although DC circuits in substations vary widely, there are several aspects that must be taken account of. The first one being protection against battery cell shorts.

The principle of the circuit is shown in Figure 5, in which two parallel strings are shown by way of example. The circuit would also apply to a large number of parallel strings.

The underlying assumption is that, apart from forward voltage drops in the steering diodes, the load and the batteries can use the same voltage. Yet that is often not the case.

If a battery cell or cells shorts in the second string then diode D3 will be reverse biased. Charging of the string can still take place via D4, but no current can be drawn from the first string.

In many applications, a float charge service is required whilst supplying the critical load during normal operation. In this instance charging current must be limited. The circuit shown in Figure 6 fulfils this function by means of a current-limiting resistor. The battery string discharges via the diode when main power fails.

Substation power supplies incorporating charging functions can be provided with a number of important features, including high and low voltage alarms, AC and DC output status, ripple alarm and battery ground detection for floating DC supplies.

A battery ground-detection system uses a resistive voltage divider so that positive and negative terminals of the battery bank maintain equal magnitude voltage values with respect to ground.

The resistive divider has an added benefit, namely to function as a bleed-off for any capacitively coupled voltages that might interfere with the operation of protective relays.

As a further improvement, battery monitoring can be installed. This is generally based on measuring two important parameters: cell voltage and impedance.

One method involves the injection of a very small high-frequency current and measurement of the voltage drop across the cell. Battery impedance coupled with open circuit cell voltage provides a very good 'state of health' for batteries.

TRACTION

Smaller vehicles are the focus here, including forklifts, ground equipment for airports, and short-range transport.

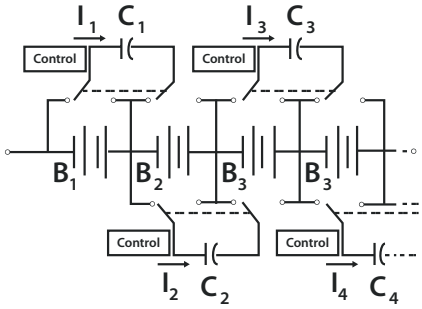


Figure 8: Voltage equalisation with flying capacitor circuit.

VRLA batteries are prominent, but so are lithium batteries because of their high ratios of energy to weight. More varied than for lead-acid types, the chemistry for lithium batteries is outlined below:

The cathode in such batteries is a lithiated metal oxide, and the anode is made of graphitic carbon with a layered structure. The electrolyte is made up of lithium salts dissolved in organic carbonates.

When the battery is being charged, lithium atoms in the cathode become ions and migrate through the electrolyte towards the carbon anode where they combine with external electrons and are deposited between carbon layers as lithium atoms. The process is reversed during discharge.

In outline, efficiency is close to 100% and life span approaches 3000 cycles at 80% depth of discharge. Operating temperature ranges from –30ºC to 60ºC, energy density is 90-190Wh/kg and self-discharge is about 1% per month. However, the higher cost is due to special packaging needs and internal over-charge protection.

On the basis of amp-hour ratings, the cost comparison with VRLA batteries is unfavourable. Yet when depth of discharge is considered the picture changes.

It is generally accepted that the most economic and practical DOD for a VRLA-AGM battery is 50%. For lithium-iron-phosphate (LiFePO4 or LFP) – the safest of the mainstream Li-ion battery types – 80% DOD is used.

CHARGING

The main aim in charging lithium batteries is temperature control to minimise the effect of lithium plating of the anode.

Much depends on the physical design. A thin, highly porous anode works best for very fast charging – rates as high as 1C.

Undercharged lithium batteries lose capacity permanently, requiring special precautions on recharge circuits. Lithium-ion batteries cannot absorb overcharge. When they are fully charged, the charge current must be cut off. A continuous trickle charge would cause plating of metallic lithium and would compromise safety.

Over time, the open circuit voltage will settle to between 3.70V and 3.90V per cell. A typical charge profile for a single cell is shown in Figure 7.

For a partly discharged cell, a pre-charge precedes the transition to constant current charging. Monitoring of cell voltage is essential, in order to switch over at the correct voltage to constant voltage charging.

When dealing with battery packs, equalisation of voltage between the cells is very important.

Unlike lead acid batteries, which can equalise simply through out-gassing, there is no natural equalisation mechanism for lithium batteries.

Their employment in strings and parallel strings requires that unequal cell voltages be eliminated. Methods for achieving this include flying capacitor circuits and many others. The flying capacitor circuit is illustrated in Figure 8.

Capacitors constantly switch between cells, thereby swapping charge from higher-charged cells to lower-charged cells. Each capacitor requires simple controls to activate the switches.

There are other methods, such as the switched transformer method.

Figure 9 shows the stack voltage being chopped by the transistor-control circuit, which also monitors individual cells, and the rectified voltage from the transformer secondary replenishes individual cells.

As will be evident, the voltage equalisation circuitry as described can form the basis of a battery monitoring system. This has been used, possibly experimentally, in some commercial vehicles. ■

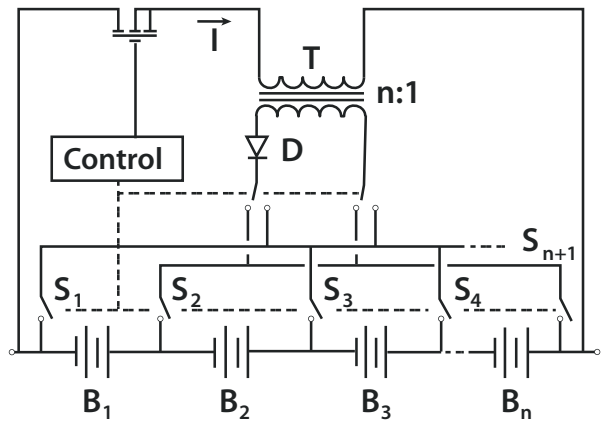


Figure 9: Switched transformer voltage equalisation.

Battery Storage Systems for Grid Connect Course

Get in now, so you don't miss out on work!

With more than 1 million solar systems installed in Australia so far and the majority being grid connected systems, it's clear there's growing interest in battery storage systems and the forecasts show that demand will grow rapidly as the cost of such systems comes down, driven by competition and technology.

neca | Education & Careers

national electrical and communications association

1300 827 832

apprenticeships | traineeships | training

necaeducation.com.au/battery

ABN:53 054 944 366 | TOID:21098

THE EYES HAVE IT

VISION CAN SO OFTEN BE TAKEN FOR GRANTED BUT AS DR BERNIE CRIMMINS EXPLAINS, IT DEFINITELY SHOULDN'T BE.

I looked at Bruce, eye to eye.

"You have to stop doing it Bruce or you'll go blind!"

"I know Bernie, my old man told me that when I was a little tacker, and he wasn't referring to smoking," Bruce replied.

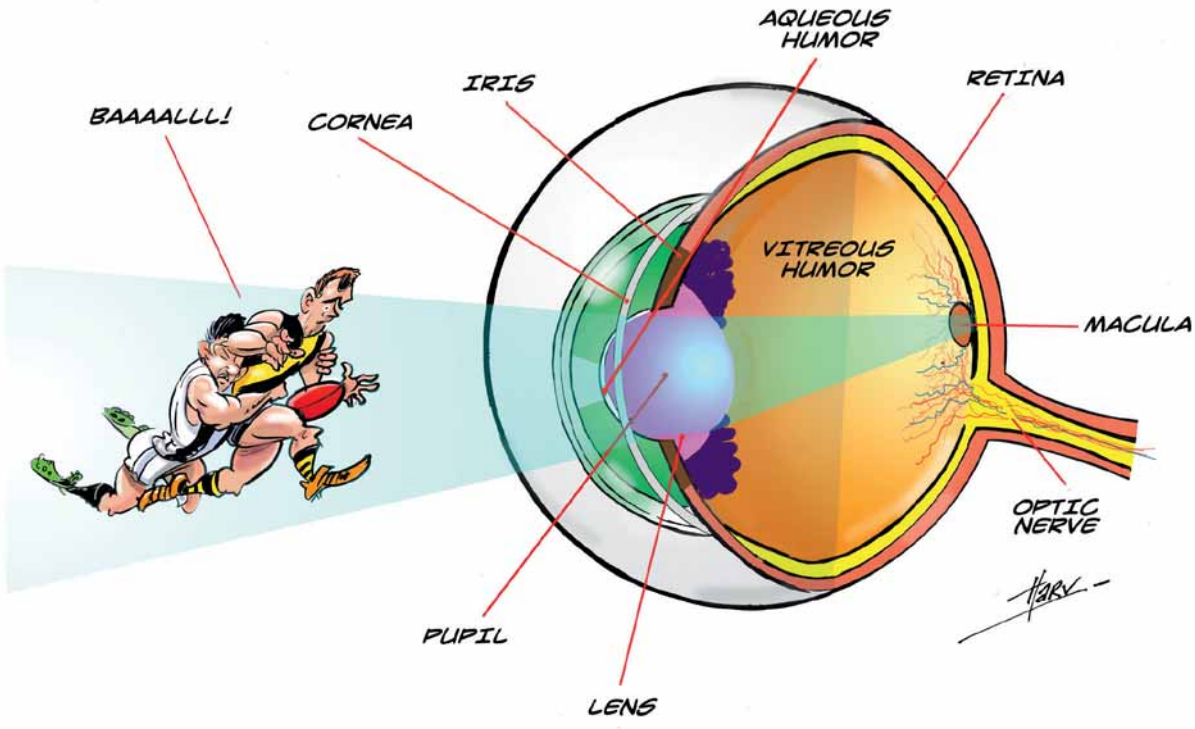
Bruce suffered from diabetes, high blood pressure and an elevated cholesterol level which were all being controlled by various pills... but he had gone back to smoking. I had his latest report from his eye specialist in front of me and it wasn't a good read. He had a moderate degree of eye damage caused by the effects of his diabetes called diabetic retinopathy. The cigarettes certainly weren't helping the condition. When vision is lost for various medical reasons it is very difficult to get it back so prevention is important. And vision is such a cherished sense.

THE ANATOMY OF THE EYE

Basically the eye is a glorified camera. Light passes through the front glass or cornea. The shutter is called the iris and it allows variable amounts of light through to the lens that then focuses the light to the screen or retina at the back of the eye, especially to a small area called the macula. The macula has a concentrated number of nerve cells present which passes the information to the brain via the optic nerve.

What conditions do I see as a GP relating to the eyes? Probably the commonest would be infections. The thin covering of the eye is called the conjunctiva and various bugs such as viruses and bacteria can go splat against it and cause an infection called conjunctivitis.

Conjunctivitis occurs particularly when people have coughs and colds or when people around them cough and splutter all over them. The eyes get sore and gunky (discharge) especially in the morning and it may be hard to open them when you wake up as the lids stick together. Cleaning with some warm salty water may help but antibiotic drops or ointment may be required. It is a good idea to go and get the eyes checked as



THE HUMAN EYE – (RARELY USED BY AFL UMPIRES!)

BY
DR BERNIE CRIMMINS

there are serious viral infections like a cold sore virus in the eye called herpes simplex keratitis that can cause ulcers and scarring on your cornea.

Shingles or herpes zoster infection may occur in the distribution of the nerve supplying the skin near your eye and can affect the eye seriously. It is caused by a reactivation of the chicken pox virus that you picked up as a kid which then lives in your nervous system for your entire life. It can be extremely painful. So, if you get pain near the eye followed by blisters in the same area, go and see your doctor pronto.

The conjunctiva can also be affected by allergies which cause the eyes to be very itchy, red and watery. This is termed allergic conjunctivitis and can settle with an antihistamine tablet and/or some anti-allergy drops from the chemist. It is the eye's version of hayfever and any of the common allergens such as grasses, pollens and dust mite can be implicated. The wateriness comes from the eyes' unique watering system that continually flushes the front of the eye including the cornea with fluid or tears in order to remove microscopic grit, grime and bugs hitting the eye from the environment. In some people, as they get older, this mechanism dries up and they end up with dry, gritty irritated eyes all the time. This is called dry eyes syndrome. Fortunately there are myriad drops available for this, effectively replacing your normal tears with artificial ones.

Ectropion is another common lid problem that occurs as we get older. It comes into play when the lower lid starts to sag, like everything else, and eventually everts itself. This disrupts the normal flow of tears and they continually drip down and over the everted lid which looks angry and red. The lid requires a bit of a tummy tuck to tighten it up and fix the problem.

Trauma to the eye is not uncommon and thankfully one of the serious mechanisms, a squash ball in the eye, has been lessened with the advent of wearing protective glasses when playing. Any direct blow to the eye should be checked out as the eye is quite a soft and intricate organ and serious things such as burst blood vessels inside the eye or a detached retina can be quite damaging.

Scratches to the cornea are quite common, particularly from sport or when blokes are out gardening. Getting something like a piece of grit in the eye on a windy day generally needs to be looked at as the foreign body can get stuck under the lid and be difficult to get out or it may even embed itself in the front of the eye in the cornea. Numbing (anaesthetic) eye drops and a deft hand are generally needed to remove these and in most instances your GP can do it or if difficult to find or remove, refer you to an eye specialist (ophthalmologist). A word of warning though: do not grind metal without safety goggles as bits of metal at high velocity flying up into the eye are very common and can be very difficult to remove.

Probably the scariest presentation with the least importance is when I see blokes who come in, or more than likely pushed in by their partner, because the white of the eye has suddenly turned blood red due to a burst blood vessel. It looks quite dramatic and scary and in most cases there is no obvious cause. It may happen if the person strains excessively or even coughs or sneezes violently. It is not a bad idea to get your blood pressure checked and if recurrent, a blood test to check your blood counts and clotting system. It will gradually dissolve like a bruise over a week and doesn't damage the eye or vision.

Vision is the prime role of our eyes and problems with vision can certainly indicate serious underlying issues. Any change in vision should be checked out by your GP or optometrist if you have one. Sudden loss of vision in one eye for a variable length of time may be due to a mini stroke caused by a clot going to the back of the eye. Clots are more prevalent if you have medical conditions such as diabetes, high blood pressure, high cholesterol or if you are a smoker. Get it checked, even if it is transient and goes away.

> Conjunctivitis occurs particularly when people have coughs and colds or when people around them cough and splutter all over them.

As we get older our vision may deteriorate due to problems with the lens. This mainly occurs due to changes in the shape of the lens which make it difficult to bend the light to exactly where it is needed onto the screen or retina at the back of the eye. This can be corrected by the wearing of glasses which has the correct lens to compensate for the deficiency in the natural lens. I am very much aware of this as I wear glasses for both distant and near vision, the latter being noted when I gradually had to hold the newspaper further and further away to read it until my arms weren't long enough. This is a condition called presbyopia and generally starts in the forties as the lens starts to stiffen and the little muscles that can alter the shape of the lens aren't strong enough to do the increased work required. Thus it was reading glasses for me as well.

The other very common condition affecting the lens is cataract formation. Normally the lens is clear like glass but for various reasons the lens starts to develop a foggy or cloudiness within it. The vision may gradually deteriorate and blur and there may be sensitivity to light. Cataracts tend to run in families and are

more prevalent in people with diabetes. Smokers are more at risk and the prolonged glare from the sun without the use of sunglasses may also predispose the eyes to cataract development. Stronger glasses and better lighting may initially help but the cataract frequently needs to be removed and often an artificial lens may be implanted to take over the role of the diseased lens.

Glaucoma is another very common condition that may affect your vision. The eye is not hollow but fluid filled and that fluid imparts a pressure within the eye. The fluid at the front of the eye is called the aqueous humor and is watery while the fluid at the back of the eye is jelly like and called the vitreous humor. The aqueous humor is continually circulating and if it gets blocked the pressure in the eye builds up which prevents the blood getting into the eye to nourish it and give it oxygen. The main nerve, the optic nerve that transmits the visual images we see back to the brain, may die off. Fortunately there are very good drops that reduce the pressure but it is important to get the diagnosis as early as possible. In very acute cases, sometimes laser surgery is required to clear the blockage. Your friendly neighbourhood optometrist is able to check your eye pressure as part of a general eye check-up and there is no need to get a referral from your GP and Medicare covers most of, if not all, of the check-up cost.

Like cataracts, glaucoma runs in families and is also a complication of diabetes which further emphasises the important need for people with diabetes to get a regular eye check-up. Trauma to the eye may lead to glaucoma and it may be brought on by drugs such as cortisone which may be used for various inflammatory conditions.

Macular degeneration is a chronic eye condition that has certainly come to the forefront of eye concerns in our ageing population. It is estimated that one in seven Australians will suffer from it and it is the main cause of blindness in Australia, contributing to 50% of cases of blindness. The macular is an area in the centre of the retina or screen which has the most concentrated number of nerve cells and hence we tend to focus what we see onto the macular for clarity and colour. For various reasons this area becomes diseased and the nerve cells are lost along with vision.

Aged over 50, smoking, diabetes, obesity and a poor diet particularly lacking in fruit and vegetables are implicated in causing it. The visual loss tends to be central and straight lines such as steps become distorted. There is no cure but diet, along with smoking cessation, are critical in lessening its impact. The diet recommended should contain daily fruit and green leafy vegetables along with fish 2-3 times per week. Nuts have also been shown to be of benefit. Sometimes injections into the eyeball are required to keep the condition under control and to save vision.

Diabetes is a very prominent risk factor for many of these conditions, especially cataracts and glaucoma, and if that isn't enough it has its own unique eye problem called diabetic retinopathy. A healthy retina is so important for normal vision. In diabetic retinopathy the high blood sugar levels from the diabetes cause damage to the little blood vessels supplying blood to the retina. The arteries get blocked, leak fluid and blood and form little swellings called micro aneurysms. The end result is a damaged retina and a visual loss which is mostly gradual but may be sudden. It is critical that people with diabetes get a regular eye check-up. It can be prevented if the diabetes is well controlled along with proper blood pressure and cholesterol levels... and no smoking, Bruce!

Probably the worst eye condition known to man and peculiar to the AFL is a condition called the One Eyed Collingwood supporter. Not a lot is known in regards to how the good eye is lost but perhaps they didn't listen to the wise words of their fathers! Now, where did I put my glasses?

Stay happy and healthy. ■

The Standard for Smart Energy Meters

Phone: (02) 4774-2959
www.satec-global.com.au

SATEC
Powerful Solutions

AN ENLIGHTENING EXPERIENCE

STEVEN ORR ELECTRICAL RECENTLY COMPLETED AN AWARD-WINNING LIGHTING JOB AT ITS LOCAL SPORTSGROUND. STEVEN CAUGHT UP WITH JACOB HARRIS FOR A FIRST-HAND ACCOUNT.

From its beginnings as just two qualified electricians in 1999, Steven Orr Electrical has grown to employ a team of 10 skilled staff members who live and work in the Echuca Moama district of Victoria. The business recently won a 'Highly Commended' award in the 'Lighting Project' category of the NECA Victoria Excellence Awards. The award was for the supply and delivery of light towers and fittings to Echuca Vic Park Recreation Reserve and Echuca South Oval.

"The Vic Park precinct is the main football ground here in the Goulburn Valley competition. It's used by about 10 teams plus Auskick [an AFL coaching program] as well as a secondary school that uses it as its sporting oval. There's even a couple of netball courts. It's the primary sporting hub in the shire of Campaspe," says Steven Orr.

The upgrading of lighting at Echuca Vic Park Recreation Reserve and Echuca South Oval – which included the design, supply and delivery of sports lighting towers, and the removal of old light towers – was a public tender formatted by the Campaspe Shire Council and was awarded based on points criteria, which outlined specific outcomes.

On winning the tender, Steven Orr Electrical commenced work in late March of 2015 and managed to complete the job within six weeks – no small feat for an outfit with just seven guys on the tools.

"We had done some bowling green and tennis court lighting prior to this but we hadn't really had a crack at a project of this size. We supplied and installed lighting towers to three brightness levels: 50lux, 100lux and 300lux. This gives user groups the ability to use the facilities in any capacity from training through to game day as per the AFL country standards. We also installed a Halytech Illuminator floodlight control and facility monitoring system which allows authorised users to control lights with their smart phones," says Steven.

Within just four days the team was able to dismantle the existing lighting before constructing, assembling and erecting four poles and a total of 72 lights. They also supplied and installed underground cabling to the four pole locations with minimal impact on the site thanks to underground horizontal boring.

During the works, the site had to remain closed to multiple user groups including schools, sporting bodies and the general public. The grounds being the main hub for exercise and sporting activities in the town heightened the importance of completing the job as quickly as possible.

Before they started the work, Steven and his team had to communicate with all the different user groups to make sure they were all aware the site was going to be closed down for a period of time. They were able to coordinate access for short periods to try and keep everyone happy (rather than just lock the site down for six weeks).

As it turns out, coordination (and not just of user groups) proved to be one of the project's major challenges.

The Vic Park precinct is the main football ground in the Goulburn Valley competition. It now meets AFL country standards for lighting.

"The biggest challenge was planning and working to time frames. Like all big jobs, waiting for materials to arrive was a big issue. The poles were ordered through an Australian company but they're actually manufactured in China so they came across on a ship and of course there were delays at the docks. Even getting the light fittings on time was difficult because there have been so many government grants for sporting facilities around Australia.

"We also had to factor in that the footings needed to be in for 28 days for the concrete to cure completely before we could stand poles on them. During this time, you still need to be progressing so you're ready to go by the time the concrete is ready.

"To get around these issues we pre-cabled everything in the workshop and then dropped it off on site – we were always trying to keep one step ahead even if we weren't on site."

Apart from issues with timing, Steven's team had to contend with the fact that the site has been there for a long time. There were demolished grand stands and concrete slabs around the precinct and while Steven was aware of their positions it was hard to know whether they'd been removed or not. This became an issue when they were boring foundation holes to the depths specified by the engineers.

"We were lucky that we didn't have too many issues with fill from previously existing structures. We were on a sand hill though, so that presented a few little hiccups along the way.

"When we bored out the holes (which were 6m deep and 1.5m round) the sand would dry out and as soon as it did, it would want to cave in. So from the time the hole was drilled to the time we set our rag bolt structure or our mesh in the ground we virtually had to poor the concrete straight away so we didn't get any infill from the surrounding dirt."

One light tower had to be repositioned so as not to impact spectator viewing. This was moved to behind a popular viewing area – a move that had no impact on the light level requirements at ground level.

"The existing lighting layout had a concrete pole in the path of view of where the majority of spectators sit. So we made a suggestion to the shire that we try to relocate that pole without compromising the design and the lighting output. We actually installed it behind one of the spectator sheds so that it doesn't impact on viewing and allows the Shire to renovate or extend down the track without much trouble."

The new lighting has achieved 100% ground coverage for optimised playing performance by exceeding the average of 300lux per AFL country standards. The brightness, lack of shadows, balance of lighting is what is required to enable the sports fields to be used for both playing and training purposes. The playing surface was divided into 15 metre grid points to enable accurate commissioning of each individual light fitting. Steven and his team were also able to halve the required spill lighting at surrounding residential dwellings.

"Because there are so many user groups down there it was really rewarding to see the end result. We've had some really positive feedback about it too; people have said how much it's improved the area.

"From our point of view it was great to actually finish the job – sit back and have a look at it and see what we achieved in such a short timeframe. A lot of time and effort that went into it: we were working 16 hour days just trying to make sure we were ahead of schedule and ready for the next day. The process itself was fairly stressful but at the end of the day it's a terrific outcome for us and the user groups in the shire." ■

> **Steven Orr Electrical**
> **www.soelec.com.au**

THE EMERGENCE OF DATA CONVERGENCE

IT IS PREDICTED BY 2020 THERE WILL BE 4.5 BILLION INTERNET-CONNECTED DEVICES IN THE WORLD. SO HOW IS THIS GOING TO AFFECT THE DATA CENTRE LANDSCAPE? JOE YOUNG REPORTS.

Over the past five years there has been a major shift in how companies use data centres. Not too long ago data racks used to be setup in a silo-like fashion in offices around Australia. Each server rack or sections of racks were designated to a particular aspect of the businesses storage needs. This often resulted in poor hardware use, rising operational costs and a reduction in productivity and flexibility driving IT managers to seek more efficient solutions.

Another trend across residential, commercial, industrial and manufacturing industries is challenging the centralised data centre model as we know it.

The rise of IoT connected devices and with it, a rise in edge computing. This is where information processing responsibility is taken away from the core of a network, the servers and to the edge of a network being computers, BYODs and other devices.

Consumers are demanding information instantaneously with reliability, lower latency and with low operating costs.

Vertiv managing director Robert Linsdell says there is a need for converged data centre infrastructure that provides scalable, agile and efficient support to networks amid the rise of IoT devices and edge computing architecture.

Micro servers can provide a good option to keep operational costs low and solutions in the space are becoming increasingly converged to be optimised for environments where many IoT devices are interacting within it.

Converged designs not only store data but compute and network it in a self-provisioning pool of shared resources.

These solutions combine thermal management, power protection and security in a row or rack-based enclosure which can be easily scaled. Remote management also enables IT managers to oversee core and edge infrastructure for optimal efficiency.

Such solutions are designed to reduce the manual labour and technical skills needed to operate and set-up the systems. They can be pre-configured so they can be up and running in hours instead of weeks.

These micro servers can be wheeled-in, incorporated into an office fit-out, plugged into a 20A circuit without affecting the structural layout of the office environment.

This is a far cry from the planning needed to set up a traditional silo line-up of server racks in a noisy designated computer room with cooling systems.

Over the last five years Robert has seen a “quite dramatic” transition from companies having these dedicated computer rooms to only keeping a few racks on premises placed in the general work area.

“Companies are choosing to store the bulk of their data in collocation sites and on the cloud, leaving only a small amount of data needing to be

stored on their premises," he says.

"You are often left with some residual data that people don't want to take off site; perhaps for security reasons, or perhaps they don't want to transfer security camera video over fibre optic cable because it can be very expensive."

Robert says many companies are using inefficient systems and even though they may have only a few servers, operational costs are still high.

"You can have a small data centre running at 200kVa with 200kW of cooling and they are only taking a load of 35kW, so they are very inefficient, but nobody wants to spend the money on the infrastructure because it's already a sunk cost. They don't want to downsize but they have these big bills and are missing the real estate that the racks are taking up."

Robert says a big mistake he sees people making is skimping on the cost in the initial set-up phase of on –site data centres and this can have adverse consequences down the track, not just with operational costs but also in emergency situations.

After working with helping clients to implement good practises so they are ready when faced with a massive power outage, Robert says the right infrastructure needs to be in place from the start.

He says the cost of losing data or having your servers go-down in a black-out or similar circumstances far outweighs the cost of having a good initial server set-up; and he mentioned the experience of Southwest Airlines as a cautionary tale.

Southwest Airlines had a data centre outage which lasted an hour. The initial cost that could have prevented the outage was predicted to be a few hundred thousand dollars and the estimated cost of the outage was around $62 million.

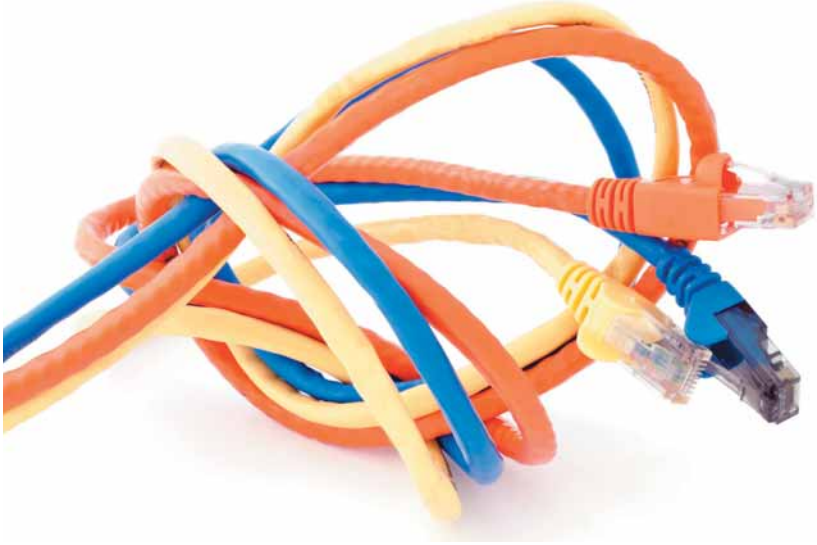
Installers and sellers of these solutions are constantly driven to push the price down and that presents a real challenge for the industry, particularly when offering higher rates than competitors can result in loss of business.

Consumer demand to access information reliably and instantaneously has resulted in increasing pressure to deliver distributed computing where it's needed. Robert says the market needs to embrace converged infrastructure solutions even though it may come at a larger initial cost. ■

> **Vertiv**
> **www.vertivco.com**

PATCHING INTO PATCH CORDS

PATCH CORDS ARE AFFECTING NETWORK AND SYSTEM RELIABILITY, WRITES VTI SERVICES TECHNICAL DIRECTOR MURRAY TEALE.



Poorly performing and unreliable patch cords are having a devastating impact on infrastructure network operations as well as the systems that run over them.

Patch cords (aka balanced cords) are proving to be the weak point in the reliability of networks.

Irrespective of the quality of a structured cabling system, poorly performing and unreliable patch cords are having a devastating impact on infrastructure network operations along with the safety and security systems that run over them.

The performance obligation for patch cords goes well beyond just using appropriate cabling components to construct patch cords. For example:

- AS/CA S008 (mandatory), AS/NZS 3080, ISO/IEC 11801 and IEC 61935-2 all have performance requirements for balanced cords that must be tested at the time of manufacture.
- AS/CA S009 (mandatory Wiring Rules) has a general requirement that the cabling be 'fit for purpose'.
- *Telecommunications - Types of Cabling Work - Declaration 2013* provides an exemption for specific balanced cords from being deemed as 'customer cabling'. This allows end users to undertake patching while not breaching any requirements of the Telecommunication Act 1997 or its amendments.
- The draft international standard ISO/IEC 11801-1 additionally includes environmental performance requirements that must be met.

Further, twisted cord performance requirements currently include but are not limited to:

- AS/NZS 3080
  - Return Loss
  - NEXT
- AS/CA S008
  - Insertion loss
  - Conductor identification
  - Insulation and sheath material
  - Tensile strength and elongation
  - Cord – plug anchorage
  - Flammability
  - UV resistance (if intended for use external to a building)
  - Conductor composition
  - Electrical withstand voltage
  - Insulation resistance
  - Metallic shield (if applicable)

On-site or workshop manufactured patch cords are highly unlikely to meet all AS/CA S008 and regulatory requirements.

Other factors to be considered should include environmental considerations and current-carrying and heat dissipation capabilities.

(26 AWG and 28 AWG patch cords may not be suitable to deliver power to a 95-100W PoE device.)

Poorly constructed twisted pair patch cords supporting electrical load switching equipment in a data centre have been enough to take down the whole data centre.

Patch cords can be tested in the field; however, it requires the use of specialised test adaptors. Channel test heads are unsuitable for patch cord testing due to the difference in gating (associated with the plugs) when testing a channel and a cord.

So, when specifying patch cords, the minimum specified requirement should be based on conformance to AS/CA S008 to ensure mandatory compliance, and IEC 61935-2 to ensure performance compliance and to help to establish the cords are 'fit for purpose'. ■

VTI Services
www.vti.net.au

IMPORTANT NOTICE

ARE YOU AN UNREGISTERED CABLER?

If you install or maintain telecommunications and data cabling in a customer's premises, you must be registered and eligible to sign off on a compliance certificate (TCA 1).

Not registered yet?

If you're still not registered, you risk a $20,400 ACMA fine or possible litigation if things go wrong.

That's the law.

Registering is quick and easy

Cabler registration is easy and affordable because the TITAB Cabler Registry is Australia's largest not-for-profit registry, specially created to look after the needs of Australia's Cablers.

Registration can also open up more opportunities for you as the NBN rolls out.

Registering with TITAB gives you:

- experienced advice making registration easy
- advice on training requirements and finding training providers
- specialist cabling (endorsements) recognition
- national website listing as a registered Cabler
- informative newsletter and email updates
- access to services on www.registeredcablers.com.au as an "NBN ready" Cabler
- links to our national network of industry affiliations

TITAB AUSTRALIA

REGISTER WITH TITAB NOW

It's protection for you and your customers.

Only $40 (1 yr) or $90 (3 yrs)

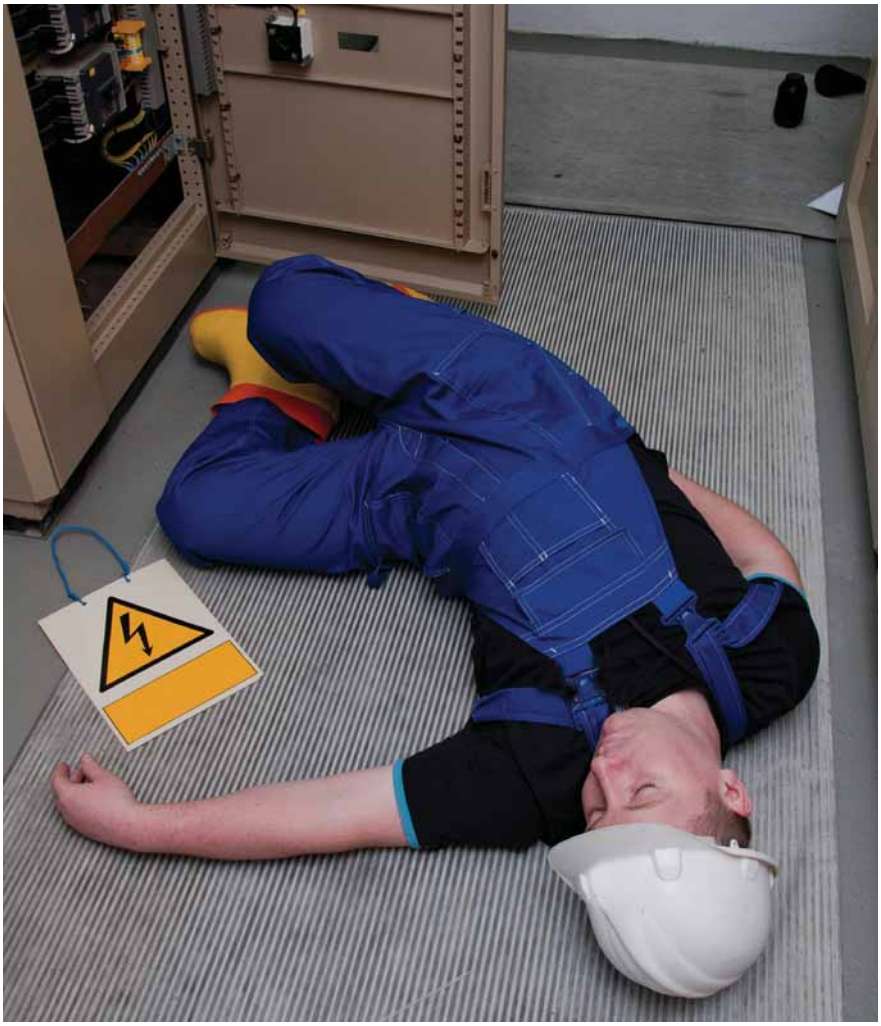
Call 03 9631 0800
info@titab.com.au
www.titab.com.au

The largest not-for-profit, ACMA-accredited cabler registry

CITT 51823

IT'S SHOCKING

TINY ELECTRICAL SIGNALS ARE CRUCIAL TO THE WORKINGS OF THE HUMAN BODY. GEORGE GEORGEVITS OUTLINES WHAT HAPPENS WHEN A LARGE VOLTAGE COMES CHARGING THROUGH.



Most of us have experienced some form of electric shock.

One common type on a dry day is the zap from a car door after you slide out of the seat.

Other types of shock have serious consequences and, under some conditions, can even be fatal.

Electricity flows in a circuit or loop, and current in the circuit is governed by the circuit elements, namely the source voltage and the circuit resistances.

These are related by Ohm's law: V = I x R, where V is the source voltage, I is the current flowing and R is the total circuit resistance.

For a given applied voltage the corresponding flow of current is determined by the total circuit resistance. This relationship applies even when parts of the human body are included in the circuit and form part of the circuit resistance.

EFFECT ON THE BODY

When electricity flows through a body that has become part of the loop, it must have (at least) two points of contact – an entry and an exit point.

In general, it is only the parts of the body that lie between these two points that are affected by the flow of current.

When taking off a jumper made of synthetic materials in a dark room, I was amazed to see sparks about 100mm long. Dry air has a breakdown strength of about 1,000V/mm, so there was about 100,000V between different parts of this jumper.

Yet I felt nothing, because electric shock is caused by the amount of current flowing through the body, not the applied voltage. The voltage was high, but the current was negligible due to the very high circuit resistance.

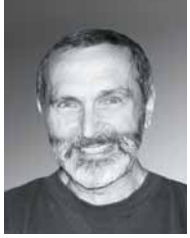
The human nervous system uses impulses of current for communication and to operate parts of the body.

When you grip something with your hand, a train of tiny current pulses is sent down the relevant nerves to operate the muscles – typically five pulses per second. When you grip harder, the pulses become more rapid.

Imagine you have come into contact with, say, a electrical appliance with a metal case that has become live due to a wiring fault. If you happen to be standing barefoot on a conductive surface (eg: a concrete floor) and you grasp this drill, a substantial 50Hz current will flow through your body between your hand and your feet (the entry and exit points).

This current is much larger than, but in many ways similar to, the signals that

BY
GEORGE
GEORGEVITS



usually appear in your nerves to operate muscles in your hand. This 50Hz signal will override the control signals from your brain and cause the hand muscles to contract tightly. You can't let go because the brain's signals have been swamped.

This 50Hz signal is likely to interfere with other muscles that lie in the current path, some of which are essential for keeping you alive (heart, lungs, etc).

If someone tries to pull you away, they are likely to suffer a similar fate, because they will become part of the conductive path. If they are wearing some form of insulated footwear and/or insulated gloves, they may have a chance.

However, the capacitances involved may still permit enough AC current to give them a shock. For this reason, it is essential to turn the power off as soon as possible – before trying to help.

Even a mild electric shock may cause a violent, unintended movement. Then there's the possibility of physical injury due to falling off a ladder or being 'thrown' back from where you got the shock.

In reality, you are not thrown – your affected limb muscles operate in an uncontrolled manner due to the flow of current through your body.

unpleasant and can cause injury.

Most 240V fixed wiring in premises is fitted with some form of residual current device (RCD). This is now required by the Wiring Rules for new installations (but not lighting circuits and some special purpose circuits).

The RCD senses the 'go and return' current in the circuit's active and neutral conductors. If the two differ by more than the rated trip point of the RCD, it assumes the difference in current is flowing through a person due to a fault. The circuit is then disconnected in much the same way as with a fuse or a normal circuit breaker.

RCDs are generally set to trip about 30mA current difference within about 0.3 seconds. The current level and trip time have been determined as a reasonable compromise between nuisance circuit tripping and personal safety. Faster trip times apply for larger current differences.

NETWORK ISSUES

Occasionally, people come into contact with the distribution network service provider (DNSP) side of the electricity network.

This can be in the form of the incoming 240/415V mains (eg: where the power comes in to a main switchboard), or with 11kV and higher voltages, as found in the distribution and transmission parts of networks in the street.

The danger with coming into contact with any part of the distribution network is that the circuit is protected only by a fuse or other protection equipment back at the feeding substation transformer. Such protection devices are typically rated at several hundred amps, offering little or no personal protection.

Some voltage must always be present for current to flow, as it is voltage that drives current around the circuit. Higher voltages will drive a higher current for a given circuit.

If the voltage is sufficiently high. and a live conductor comes into contact with the human body, the person will receive an electric shock. Also, tissue damage can result from arcing and from Ohmic heating in the parts of the body where the current has passed.

Furthermore, body parts vary in their ability to conduct electricity, so the tissue damage will not be uniform along the current path.

The current will keep flowing until the person is physically removed, thereby breaking the current flow, or the supply is switched off by the utility.

This is why such low impedance sources of high voltage must always be treated with the utmost care and respect.

If such a service is accidentally short circuited, a very large fault current flows (1,000A or more). So, a large amount of power is dissipated in the fault until the circuit protection operates.

People nearby will be subjected to a blinding arc flash and loud bang. Personal injury can result from ultraviolet radiation burns to exposed skin, eyesight damage from the arc flash, wounds due to fragments of flying molten metal, acoustic shock caused by the arc, and electric shock.

In addition, long-term psychological trauma may arise from the event.

Note that when an incident involves a phase to earth fault, despite the apparent severity of the fault, electric shock may not occur. This is because the active conductor is effectively grounded by the fault, so there is insufficient voltage to drive a harmful current through the body, particularly if the fault is caused by someone operating an insulated power tool (angle grinder, drill. etc).

In conclusion, it pays to always check that a circuit is dead before starting work on or near it. ■

It pays to always check that a circuit is dead before starting work on or near it.

PROTECTION

A normal circuit breaker or fuse is intended to protect fixed wiring circuits against overloads and short circuits.

Trip-out currents typically range from 8A for lighting circuits up to 20A for most power circuits. However, these ratings are much too high to protect anyone coming into contact with a live conductor.

In terms of sensing an electric shock, a 50Hz AC current of a milliamp or so is about the lower limit of our perception. Much above this quickly becomes

FLUKE THERMAL MULTIMETER 279 FC/IFLEX REVIEW

THE FLUKE THERMAL MULTIMETER 279 FC/IFLEX IS A THERMAL IMAGING CAMERA COMBINED WITH A MULTIMETER. SHEPPARTON-BASED ELECTRICAL CONTRACTOR PAUL REILLY TOOK ONE FOR A TEST RUN AND GIVES *ELECTRICAL CONNECTION* THE LOW-DOWN.

The Fluke 279 FC with its companion device iFlex has been put through its paces.

The Fluke 279 FC with its companion device, iFlex, is essentially a troubleshooting tool that helps you find, repair and report electrical issues. The thermal camera allows users to quickly check for heat spots on high voltage equipment and transformers, and detect heating of fuses, wires, switches and the like. Issues can then be analysed further with the multimeter.

For current measurements you do need the iFlex: a flexible ammeter clamp that can be purchased as a package with the 279 FC. The iFlex clamp has a large opening (which allows you to get around larger cables and busbars etc.) with long leads made of high quality silicone as opposed to plastic. It does have to be connected manually though so can't be used too close to anything else live. It features a retracting protective cover on the probe which I think is a great idea. It's a function that could minimise any possibility of shorting.

Combining a thermal imaging camera with a multimeter is a great idea but the 279 FC takes this device's functionality a step further by allowing the user to wirelessly transmit results to a smart phone (up to 20m away) using the companion app. This lets you monitor measurements live on a smart phone screen as well as create and email reports from the job. This feature would be handy in situations like a factory environment to send details to other staff members.

The unit has a large screen which makes thermal imaging easy but, like all coloured screens, it can be a bit hard to see outside – especially in bright sunlight. That said, we used the thermal imaging function to check for hot spots over solar panels and switchboard connections without too much trouble.

The tester has a min/max function which is a really handy feature, particularly while measuring current, as it lets you capture the maximum start current of a motor. This can be helpful for monitoring fluctuating voltages if you're observing volt drop in an installation. The meter also shows the frequency on the screen while you're measuring voltage which is handy to know.

A big negative for me was the battery charging set up. I found it a bit cumbersome and not designed with practical applications in mind. For one, you have to remove the battery

BY
PAUL
REILLY

and charge it separately from the unit which means you have to be organised enough to make sure the rechargeable lithium battery pack is charged before you're on site.

I'm sure most sparkies would agree, charging your multimeter battery before you go onsite is the last thing you want to be thinking about. Most guys I know carry a spare 9v battery in their van for their traditional meters. The problem is compounded further by the fact the battery pack doesn't fit in the same case as the multimeter. So there's a fair chance it could be lost or left behind – a spare battery would be good!

Overall, it's great to have a multimeter and thermal imaging combination like this – it's a handy little unit and I'm sure it will get a lot of use in many applications.

The Fluke Thermal Multimeter 279 FC has a nice robust design and feels very sturdy to hold and is not awkward at all. The iFlex clamp is also manufactured to a high standard. Both are typical of Fluke quality. ■

The Fluke Thermal Multimeter 279 FC has a nice robust design and is not awkward to hold at all.

BY
MATIAS
PELUFFO

TAKING AIM AT AIM

AFTER MUCH DELIBERATION, THE ISO/IEC AUTOMATED INFRASTRUCTURE MANAGEMENT STANDARD HAS BEEN RATIFIED. MATIAS PELUFFO FROM COMMSCOPE REPORTS.

After more than two years of development, the international standard for Automated Infrastructure Management *(ISO/IEC 18598 Information technology - Automated infrastructure management (AIM) systems - Requirements, data exchange and applications)* is now officially published.

The growing importance of AIM has already led the industry's standards-defining organisations to recommend the technology in a variety of standards, but the ISO/IEC 18598 standard is the first one strictly dedicated to AIM to specifically address its varied and powerful capabilities, from connectivity management to integration with external systems and processes.

The standard defines 'AIM' as an "integrated hardware and software system that automatically detects the insertion or removal of cords, and documents the cabling infrastructure including connected equipment enabling management of the infrastructure and data exchange with other systems."

AIM systems enable personnel to see, manage and optimise the connected environment in real time, enhancing the ability to:

- Plan and execute changes to the network.
- Troubleshoot connectivity issues in real time.
- Discover and track the location of connected devices.
- Manage and monitor capacity and asset information.

One of the key aspects of ISO/IEC 18598 is the inclusion of a common data exchange framework to enable interoperability and integration with external systems.

To illustrate the capabilities of an AIM system, the ISO/IEC 18598 standard refers to intrinsic and extrinsic benefits, as listed below.

Intrinsic benefits are enabled by functionality within the AIM system, and include:

- Accurate and automatic documentation to replace error-plagued manual tracking.
- Change management to help reduce the cost of moves, adds and changes.
- Incident management that can decrease downtime and mean-time-to-resolution.
- Capacity management, that enables higher port use and improves planning.

ASSET MANAGEMENT

Extrinsic benefits are enabled with other systems by the use of data exchange, and address:

- IT-related systems such as IP telephony management, helpdesk support and information security systems.
- Building management systems: including energy management, lighting management, security and access control.
- Data Centre Infrastructure Management (DCIM).
- Configuration Management Database (CMDB) applications.

The publication of ISO/IEC 18598 acknowledges the growing market momentum of AIM systems as well as the critical role AIM systems play in the planning, administration, and growth of enterprise networks. The publication also provides guidance those responsible for specifying an AIM solution, providing a common specification that will enable broader market adoption of AIM in buildings and data centres.

For more information on AIM technology and the ISO/IEC 18598 standards, download and read CommScope's recently released white paper: *The business benefits of automated infrastructure management in connected and efficient buildings*.

- **CommScope**
  www.commscope.com

CONNECT WITH US

/ELECTRICALCONNECTIONMAG

/ELECTRICAL-CONNECTION

A word from the CEO

Since my last message, the 2016 National Excellence Awards Finals have taken place, in Canberra this year, which concludes the annual series. It was a great event attended by almost 300 guests and as we were in the Capital, we had the pleasure of hearing from both a senator and a minister.

The Minister for Small Business, Michael McCormack, joined us for a lunch with our councillors and sponsors. He shared with us some of his ideas and aspirations for improving the lot of our smaller contractors – and we look forward to seeing the changes as they happen.

Senator Brigit McKenzie – from Victoria, was our guest speaker at our awards night, representing Assistant Minister Karen Andrews. The ABCC, VET reform and the Registered Organisations (RO) Act were the key strands from Senator McKenzie's address. Again with lots of change on the agenda.

The highlight of the evening was of course seeing the calibre of our winning projects – which are presented on the next page. Our awards are always a very special occasion as, apart from seeing the best projects of the year acknowledged, we also announce our three national apprentice winners and the trade teacher award.

VET reform squarely on the menu

Reforms to the Vocational Education and Training (VET) sector are also progressing in a healthy direction. The government's announcement to strengthen the performance of the sector and replace the largely discredited FEE-HELP program is encouraging. NECA praises Minister Birmingham's announcement, and has called on the Senate to support these reforms – given the reputational damage suffered by the behaviour of some rogue operators, and the poorly thought-through design of the loan fee program of former years.

The Apprentice Pathways Project – now commonly referred to as 'APP', which follows on form the highly successful MAPS project,

is well underway. By the time you receive this magazine we should be in the implementation phase of the pilot. And this is when the real work begins. So watch this space.

Tasmania scores a first for Australia!

Over the past 12 months or so, NECA has been working with the Tasmanian Department of Justice to support its launch of Continuing Professional Development (CPD) for the building and construction industry – including licensed electricians. This program was launched on 1 July this year. It means that from here on Tasmanian-licensed electricians will need to secure 12 points per annum to maintain their licence. The program will run for two years before becoming mandatory. But the government hopes this program will be embraced by the industry as a means of maintaining the safety and general awareness needed for our industry to grow and develop. NECA is one of the major providers of the courses and events that attract points, and we wholeheartedly support this initiative.

Time to have your say

As you may recall, we completed our most recent Market Monitor industry research in 2015. So by the time you receive this magazine the 2017 survey will be in full swing. Once again all of the major wholesalers, and the majority of the large manufacturers, are working with us on the 2017 questionnaire. This year we will be particularly interested in developments in the online space, and the relationship that exists in today's market between 'price and quality'.

To make completing the questionnaire even easier for you this time around, we have split it into four sections. That way you can give us your views in manageable 10 to 15-minute blasts. But don't worry, the system will come back to remind you to keep going until you have completed your feedback. The questionnaire will be up on our websites – and those of the participating wholesalers, from mid-December through to mid-February 2017. The results will be presented in April 2017.
Don't miss the chance to have your say.

Infinity Cables

While I hate to end my message on a negative note, the news regarding the Infinity Cables is not good. We are now well into the period where the cable may well start to deteriorate if it is in any way exposed. However, although the recall has gone well in a number of states, the recall in NSW is turning out to be painfully slow.

Unfortunately, NSW is also the state where the largest proportion of the cable was sold.

The Industry Reference Group we sit on – chaired by the ACCC, is currently reassessing the situation for NSW as we believe the only way to get the cable in NSW inspected, and replaced where needed, is via a consumer campaign. We will keep you updated. But for those of you in NSW, please do keep your eyes open for this cable and notify the owner immediately if you come across it. The ACCC website will help them then work out their options for any necessary remediation.
Finally, as we all head back to work after our various summer breaks, let's all hope that 2017 is a great year! ■

Best regards,
Suresh Manickam

The 2016 NECA National Excellence & Future Stars Awards

The nation's best electrical and communications projects, and our three apprentice-of-the-year winners, were recognised at the annual electrical and communications industry's Excellence Awards in Canberra in November.

State winners from across Australia attended the event at the Hyatt Hotel, Canberra and heard from guest speaker, Senator Bridget McKenzie, the Chair of Senate Education and Employment Legislation Committee about skills development, reforms to the Vocational Education and Training sector and the need for the return of the Austrian Building and Construction Commission.

Six Victorian projects, one New South Wales project, one Australian Capital Territory project and three Western Australia projects received the top national awards in front of 300 industry representatives including contractors, educators and government representatives. New South Wales and Australian Capital Territory also received commendations on projects that were narrowly beaten by the overall category winners.

2016 Excellence Awards winners.

On the same night some of Australia's brightest electrical apprentices were also announced. This year's guest speaker at the "Future Stars" event was Alan Tongue, the former captain of the Canberra Raiders NRL Club. Alan, a former apprentice himself, is an Australian Apprenticeship Ambassador and was recently named as the ACT's 2017 Australian of the Year.

And our two trade teachers sharing this year's award were Glenn McMurtrie and Brett Jotta.

Winners

	CATEGORY	COMPANY	STATE	PROJECT NAME
1	Domestic Residence	Argus Technologies Solutions	VIC	Private Residence - Sandringham
2	Contracting Business	Recips	VIC	Box Hill Institute of TAFE Lilydale Campus
3	Energy Efficiency and Environment	Martin Donnelly	ACT	1 Canberra Ave
4	Lighting Project	Gordon McKay	VIC	Pakenham Racecourse Night Racing Lighting
5	Industrial - Small Project	Nilson	WA	Perth Airport T1 Ring Main Unit Replacement
6	Industrial - Medium Project	Gordon McKay	VIC	Primary Electrical Distribution Replacement and Central Distribution Unit 3 High Voltage Upgrade
7	Industrial - Large Project	Downer EC&M	WA	Yandi Sustaining Project – Electrical Works
8	Voice/Data	Programmed Electrical Technologies	VIC	Victorian Comprehensive Cancer Centre
9	Commercial - Small Project	Kerfoot	NSW	Australian National Maritime Museum Warships Pavilion
10	Commercial - Medium Project	Fredon Electrical	WA	ALDI Distribution Centre Jandakot
11	Commercial - Large Project	Downer EDI Engineering Electrical	VIC	The Victorian Comprehensive Cancer Centre

Commendations

CATEGORY		COMPANY	STATE	PROJECT NAME
5	Industrial – Small Project	Kerfoot	NSW	The Plasser Rail Redevelopment
6	Industrial – Medium Project	RBD Electrical & Instrumentation	TAS	Hydro Tasmania Fisher Power Station Upgrade
11	Commercial - Large Project	Shepherd Electrical	ACT	AFP Forensics Facility Majura

Apprentice - Industrial

PLACING	NAME	STATE	EMPLOYER/HOST
WINNER	Thomas Townsend	NSW	NECA Group Training/Hosted by J V Holt & Company
2nd	Winston Waters	VIC	Floyd Industries
3rd	Harrison Gray	WA	Electrical Group Training/Hosted by Downer EDI Wheatstone

Apprentice - Commercial/Domestic

PLACING	NAME	STATE	EMPLOYER/HOST
WINNER	Ashley Hammond	VIC	Appselec Pty Ltd
2nd	Emma McDonald	WA	Electrical Group Training/Hosted by Team Electrical
3rd	Erik Roggensack	ACT	NECA Group Training

Apprentice - Communications

PLACING	NAME	STATE	EMPLOYER/HOST
WINNER	Jakeb Solley	SA	PEER VEET Hosted by Adelaide Health Tech

Trade Teachers

PLACING	NAME	STATE	EMPLOYER/HOST
WINNER	Brett Jotta	WA	College of Electrical Training
WINNER	Glenn McMurtrie	QLD	Skills Tech Australia

Apprentice finalists, hosts and Trade Teacher joint winners.

JOIN US IN *Port Douglas!* FOR THE

Our great program includes terrific speakers, unique tropical excursions and fantastic optional activities which feature the wonders of Far North Queensland.

REGISTRATION ENQUIRIES:

Found out more online at the event website:

www.necaconference2017.com.au

Email: neca2017@conceptevents.com.au

Telephone: +61 2 9436 0232

PROUDLY SUPPORTED BY OUR SPONSORS:

CLIPSAL by Schneider Electric · Schneider Electric · L&H AUSLEC · NHP · HPM · legrand

ELECTRICAL · AWM · HAYMANS · TLE · B.W

GERARD LIGHTING · PIERLITE · SYLVANIA · Crompton · DIGINET

Manage household electricity demand with AS/NZS 4755-compliant products

Standards Australia received the content for the following article from experts of the technical committee EL-054 ***Remote demand management of electrical products.***

Demand management is about matching electricity demand to generation output (rather than the other way around) and is not a new concept. A well known example is the controlled load water heater, where the utility offers a low energy tariff in return for the right to switch the load on and off. Apart from managing peak demand, this is a cheap and reliable form of energy storage for the grid.

Standards Australia's committee, EL-054, which covers demand management standards for various appliances and now battery storage systems, is an important piece in the smart-grid jigsaw. Under this committee, standards for the operating instructions during demand management events for air conditioners, electric water heaters and swimming pool pumps have been published. The most recent addition to this series is a standard on demand management for battery storage systems, the first of its kind in the world.

Tomorrow's grid needs more flexibility than ever, as increased use of renewable energy sources like wind and solar means generation output is more 'intermittent' and variable. Water heating time-shifting will continue to be an excellent example of a flexible load. Swimming pool filtration and pumping can also be time-shifted. The home cooling load, which has contributed so much to network peak demand and tariff increases, cannot be shifted from hot days, but it can be reduced by management of air conditioners.

The phenomenal growth of rooftop PV has introduced a new factor into grid management, and the expected surge in home battery storage and electric cars will complicate matters even more. How will all this be managed?

We could leave it to electricity pricing alone, but research has shown that customers will stay with flat tariffs unless they can manage the risk of high prices. Receiving a text saying that the price has jumped to $2 per kWh, would not overjoy any customer, but especially if they're at work with all their appliances switched on. Some appliance manufacturers offer a smart phone app that allows customers to switch things down or off remotely, but after a while this also becomes tedious. For most of us, life is too busy to constantly check electricity prices. Suddenly, the idea of letting a trusted third party manage your appliances, PV and batteries becomes very attractive, especially if they pay you for the privilege.

This management of appliances is made possible by the AS/NZS 4755 *Demand response capabilities and supporting technologies for electrical products* series.

AS/NZS 4755-compliant products have a standard interface (usually an RJ45 socket) to connect to an external "demand response enabling device" (DRED), which communicates with a "remote agent" authorised by the customer – the electricity distributor, the retailer or a load aggregator. The DRED passes instructions, or demand response modes (DRMs) to the end-use devices: DRM 1 "turn off" (i.e. minimise load but maintain power to electronic controls), DRM 2 or 3 "operate but at reduced load" or DRM 4 "turn on even if user-set controls do not call for operation right now." DRMs 1, 2, and 3 are needed when the grid is load-constrained, and DRM 4 helps when the renewable energy available (from the home's PV or the grid) exceeds the load.

Batteries may have up to four additional modes: DRM 5 "do not discharge to grid", DRM 6 or 7 "discharge permitted at reduced load" and DRM 8 "discharge to grid requested." The remote agent would activate DRM 8 when the value of export is high.

This demand response framework has taken 12 years to develop. It is simple, cheap, reliable and proven. There are over 850 AS/NZS 4755-compliant air conditioner models on the Australian market, and Energex now manages over 70,000 air conditioners connected to DREDs in south-east Qld during a few critical periods. In addition, five AS/NZS 4755 batteries have been claimed as AS/NZS 4755 compliant by manufacturers/suppliers. These batteries systems are also currently being tested with Energex.

Utilities and demand response aggregators are investigating DREDs with WiFi, internet or 4G communications, and the pairing of the DRED to smart meters. There are other ways of achieving demand response, but these tend to rely on proprietary combinations of product and software, and may lock the customer into dealing with specific manufacturers and utilities.

AS/NZS 4755 is a true open standard: any 4755-compliant DRED will work with any 4755-compliant appliance. The communications mode of the DRED and the remote agent can all change, without having to change appliances. In fact, future DREDs could cut out the remote agent, monitor electricity prices and manage 4755-compliant products according to the customer's pre-programmed preferences. Again, the appliances would not need to change.

AS/NZS 4755 is not a mandatory standard. Air conditioner manufacturers offer compliant products because under programs like Energex Peaksmart customers receive money for each PeakSmart air-conditioner when they connect to a DRED. The PeakSmart Program has shown that very few notice when the unit is made to operate at reduced load for limited periods. It is likely that utilities and demand response aggregators will offer similar incentives for other 4755-compliant products, including batteries.

As the Australian market for this technology continues to grow, global players are taking notice. The AS/NZS 4755 series has and continues to be recognised internationally as an early and influential example of standardising demand response and load-matching functionality. ■

RULING THE ROOST

UPGRADING 'REGULAR' DEVICES TO SMART ALTERNATIVES CAN BE AN EXPENSIVE CAPER BUT WHAT IF ALL IT TOOK WAS REPLACING THE BATTERY? JOE YOUNG REPORTS.

Now available in Australia, Roost is a 9V battery that will send a push notification to your smart phone before your alarm goes off in the event of a flat battery.

It's a home owner's nightmare to be woken up at 2am by a smoke alarm telling them, through an obnoxious and repetitive beep, that they need to change the battery in their smoke detector.

Now, a Californian start-up called Roost has released a 9V battery that will send a push notification to a home owner's phone before that dreaded alarm goes off.

It will also send a notification to the home owner if the alarm sounds.

It's no surprise that there are smart smoke detectors on the market like the Nest Protect but incorporating the smart technology into a battery is providing the market with a considerably cheaper alternative to completely upgrading an old smoke detector system.

"The Roost Smart Battery is the only smart 9V battery that is patented and upgrades a normal smoke alarm into a 'smart smoke alarm'," says Roost head of marketing David Henry.

Not to mention that the upgrade requires only a simple battery swap, a much easier task than re-wiring and installing a new system.

So how does it work?

Inside the smart battery is a primary lithium battery, a WiFi chip, a microprocessor and a piezoelectric sensor. When the alarm sounds, it wakes up the sensor which communicates via WiFi to the Roost Cloud which will in turn send a notification to the user's smart phone via the Roost app.

To be fair, Roost doesn't offer the same functionality as the Nest Protect, which offers IFTTT integration. But it can carve out its own section of the market for home owners who want a cheap yet basic smart upgrade for their smoke detectors.

In the US a Roost battery costs about $US35, compared to a Nest Protect at $US99. Roost is now available in Australia but as we went to print, no pricing information was available.

Like any standard 9V battery, the Roost battery will die after a few years but the user only needs to replace the chemical battery section of the unit, which is priced at $15 and reattach it to the part of the battery with the smart technology built-in. That cost is comparable to a standard 9V battery which is typically around $10.

The Roost app can show you if your battery levels are good, low or critical and if you have multiple batteries installed around the house, if set off, the app can show you which alarm has been activated.

"We started shipping the smart battery in the US almost a year ago," David says.

"Since then we have shipped thousands of batteries via retail, online and through insurance companies in the US."

But they haven't come to Australia yet.

The manufacturer is looking to increase its presence in the smart home protection market by launching solutions for carbon monoxide and flooding protection.

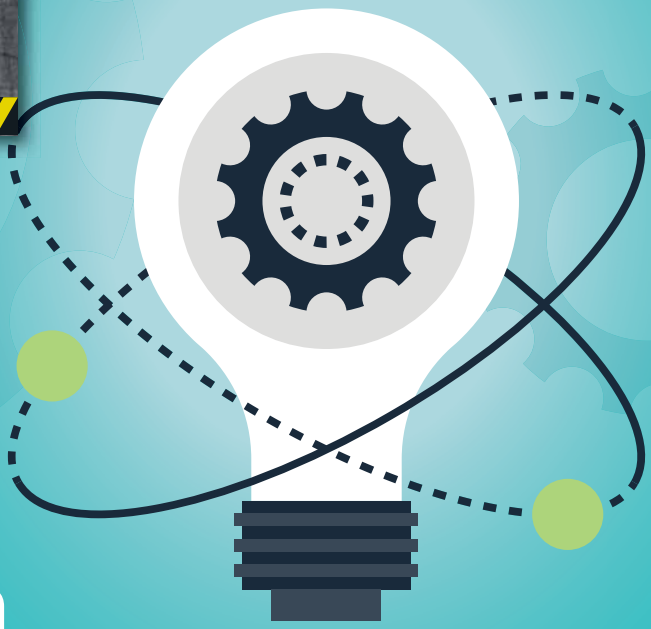
The RSA-400 is a smoke, fire, carbon monoxide and natural gas detection device and comes with the Roost smart battery.

Then there is the water and freeze detector. The idea is a home owner can place water sensors in appropriate places around the house, such as next to tap or shower fixtures or next to the toilet and when the sensor detects water leakage, it will send an alert to the home owner so they can stop a leak turning into flood .

It doesn't offer the same functionality as the Water Cop Pro, which shuts off the main valve automatically when a leak is detected, but again this solution can carve out its own part of the market where homeowners want a cheap and basic smart upgrade. ■

> **Roost**
> **www.getroost.com**

ATT
ACROSS THE TRADES
AUTUMN 2017



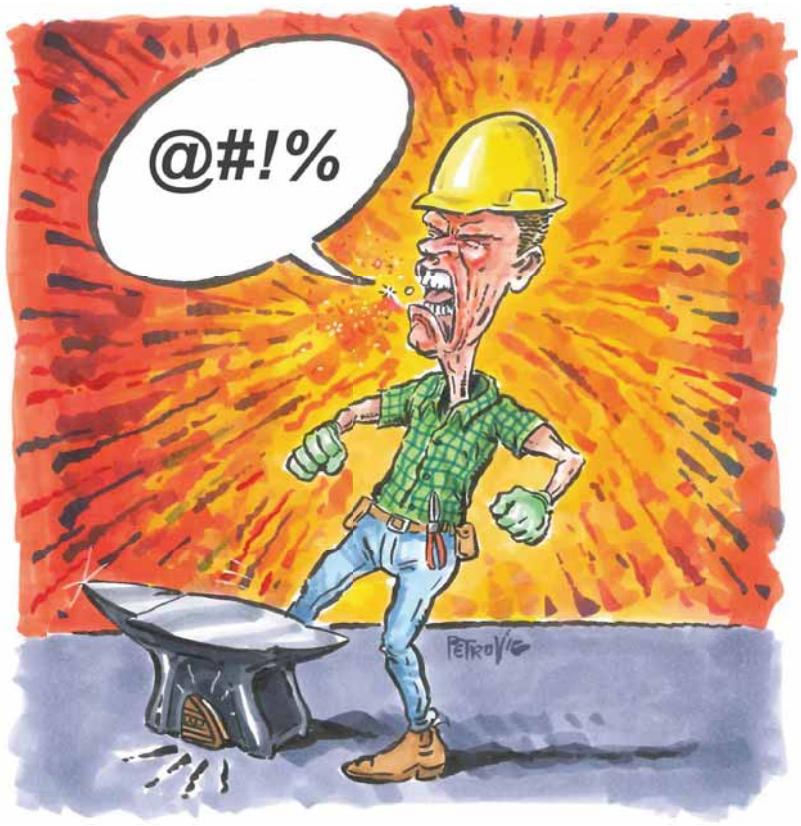
INNOVATION IN INDUSTRY

Products that change the way we operate

INSIDE:

THE JOYS OF BEING A BOSS...

Many tradies are also employers, responsible for not only managing the day to day operations of their business, but also the well-being and safety of employees. Mills Oakley special counsel Shelly-Anne Brace provides guidance on some common issues.



There is more to running a tradie business than simply keeping the customer happy.

Understanding the legal complexities around workplace relations compliance can be confronting for many businesses. What should you do if an employee turns up to work under the influence of drugs or alcohol? Is it legal for the employer to have surveillance cameras in the workplace? How do you define 'appropriate' behaviour in the workplace? In this article, we provide some practical advice to tradie businesses on how to handle these and other challenging scenarios when managing your workforce.

SWEARING LIKE A TRADIE

"Fudge buckets! Gosh darn it, that contractor really is the son of a mother trucker!"

These are two sentences you are unlikely to ever hear on a worksite in Australia. Let's face it – authentic blue language is as much a part of the Aussie site as the smoko or the mid-morning bacon and egg roll.

Most of us swear to some extent or another but if you are running a business that is exactly where the trouble can start. What is offensive to one person is totally acceptable to another. The devil really is in the detail.

So what's the legal position on swearing in the workplace? With the newspapers regularly running stories of the 'political correctness gone mad' variety, you might be wondering if it's even lawful to use swear words in the workplace these days. The truth is, the law is a bit more subtle than that. There is no straightforward 'one size fits all' checklist of what you can and can't say in the workplace – there is no Australian Standard for appropriate language.

As an employer, you need to make that call yourself. You need to assess your workplace and draw a line in the sand as to what is acceptable or otherwise. Your organisation needs to have a Code of Conduct which sets out expectations around language and behaviour.

A typical Code of Conduct should reflect certain obligations as set out in relevant legislation. *The Fair Work Act 2009* and the *Work Health* and *Safety Act 2011* are ideal places to start as they each set the groundwork for workplace compliance under our federal legislative framework.

However, you will be pleased to know that traditional commonsense also plays an important and prevailing role when considering what we believe to be "appropriate" or conversely, "inappropriate" language in the workplace. Essentially, it will come down to what would objectively, or ordinarily, be considered acceptable within the peer group.

By way of example, colourful language that may well be considered not inappropriate on a construction site might be considered awfully inappropriate if it is used in a professional services firm, such as a law firm – although the author, having worked in a number of robust law offices herself, may beg to differ!

This may sound quite subjective, but we make these kinds of calls all the

time without being aware of it. Saying the word 'shit' or using words such as 'pissed off' would be considered by most to be fairly mild swearing. Even the word 'f*ck' may be considered acceptable in some workplaces. However, you'd be unlikely to use such language with a new client whom you've never met before. It's all about context.

All of this raises a dilemma for employers: as we have seen, the law takes a flexible approach to workplace language. It does not require you to "sanitise" the language used by your employees beyond what is considered normal in your workplace. Indeed, any attempt to do so is likely to be unpopular with your workforce.

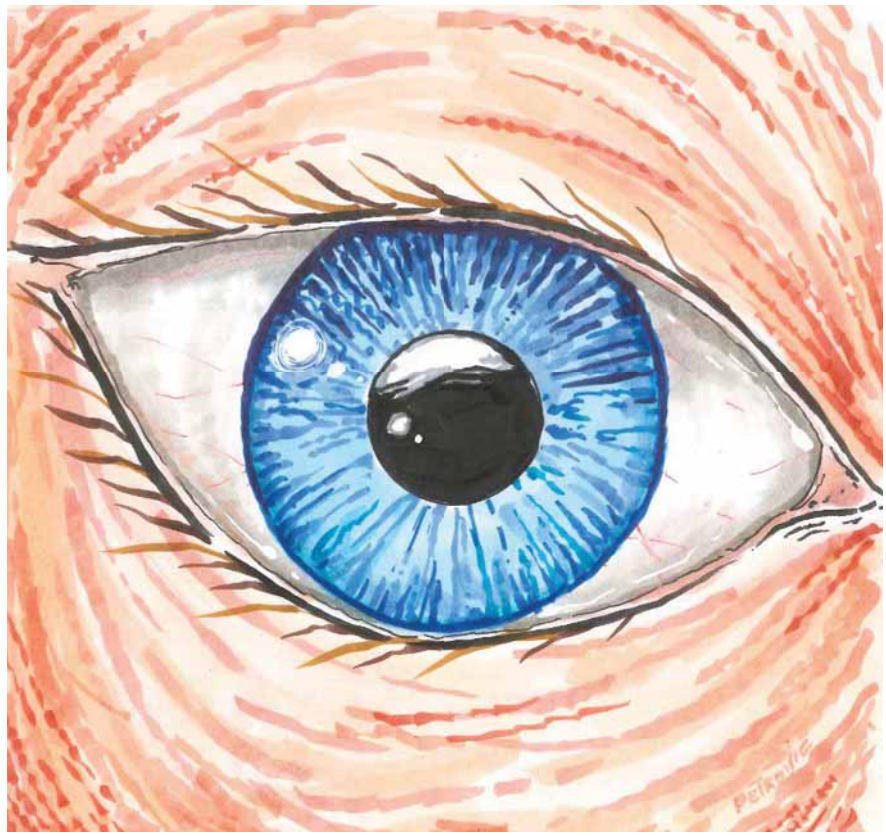
However, if you are serious about protecting your business from risk, you may need to apply a different or a higher standard than that required by the law. The key here is reputational risk: you need to set your organisation's standards of conduct at a level that reflects how you want your organisation to be perceived. This includes you, your employees, your customers, and your competitors.

We see this dilemma being played out in the media almost every week: what one person believes to be harmless workplace banter is often reported in the media as evidence of an organisational culture of bullying or harassment. Regardless of who is right or wrong, the reputational damage is irrevocable. The larger your business – or your aspirations – the greater the weight which needs to be placed on reputational considerations.

So, consider these questions when drafting your Code of Conduct: what are the values you wish to foster in your business? What are the risks? And most importantly, what stands up to a 'commonsense' test of behaviour?

No-one is going to judge your organisation harshly because someone let slip the F bomb after dropping a heavy tool on their foot. But if they are habitually using the same language to abuse junior staff members, that could be a completely different story.

Context and commonsense are paramount. They're the key to protecting your business – and your reputation.



BIG BROTHER IS WATCHING

It's a familiar sight in any public space – that ever-present black dome suspended from the ceiling, a single red light blinking away somewhere in the premises.

We've become accustomed to security cameras operating in public places and increasingly, they're becoming part of the workplace too. Contrary to popular belief, video surveillance is not just for 'spying' on employees: if you have a fleet of vehicles on the road, or if you have third parties – suppliers or contractors for example – entering your worksite, camera footage can potentially provide crucial evidence to protect your business from a claim if an accident or an injury occurs. Depending on who is at fault, having surveillance cameras in place are the ultimate 'cover your arse' safeguard.

But cameras will always generate paranoia of the 'Big Brother' variety and if you intend to go down the surveillance path, you need to be prepared for resistance from employees – and importantly, you need to operate within the confines of the law.

So is video surveillance actually legal? Unfortunately there is no black and white answer on this point. This issue falls under state jurisdiction, which means that different laws apply according to your location. NSW, for example, has strict laws which require the consent of the majority of employees before cameras can be installed. The cameras need to be visible and their presence flagged with warning signs. Similar laws also exist in the ACT, but no other state has specific laws relating to workplace surveillance.

Keep in mind that video surveillance is a separate issue from recording actual conversations within the workplace. As a general rule, you need permission from a party to the conversation before doing this, although this permission can be implied – for example, if you've plonked a digital recording device in the middle of a table at a meeting, your team should take this

as fair warning that the conversation is being recorded. If they fail to object, consent can be inferred.

Covert surveillance is another category altogether. In NSW, employers must receive authority from a magistrate before they can carry out covert surveillance and it must be solely for the purpose of establishing whether or not an employee is involved in any unlawful activity. Covert surveillance should be avoided except in very exceptional circumstances, such as to help prevent physical injury or a serious crime.

So the legality of workplace surveillance really depends on what kind of surveillance you're undertaking and what state you're undertaking it in. Generally speaking, the law is more employer-friendly in states other than NSW and ACT, but this does not mean that employers in other states have carte blanche – in particular, you're unlikely to get away with covert

UNDER THE INFLUENCE

surveillance or recording conversations unless there is a compelling reason to do so.

Your best bet is to be upfront and tell your employees if you are installing cameras. Tell them why you are installing cameras and what safeguards are in place. This might not always be completely necessary from a legal perspective – but you'll gain a lot more goodwill along the way from your staff.

In the good old days, ice was something you bought by the kilo at your local servo. Now, unfortunately, it's one of our most serious epidemics. Ice, or methamphetamine use has tripled in Australia over the past five years.

It's an issue which needs to be on the radar for anyone who employs a workforce. While the typical stereotype of the unemployed addict continues to hold sway, there is also evidence of increasing ice use among those holding a job. Estimates are that approximately 2% of the workforce have used ice at least once in the last 12 months, which equates to about 230,000 people. Tradies – particularly workers in the construction, mining and manufacturing industry – have been identified as having a higher prevalence of use.

With heavy vehicles and machinery being an inherent feature of the typical worksite, any substance abuse is of concern in a trade business, but ice presents a particular liability because of the propensity for users to engage in aggressive behaviour. A recent study found that 60% of users were violent when using the drug heavily. Reported behaviours associated with ice use include aggressive outbursts, paranoid and psychotic behaviours, mood swings, unexplained absences and making violent threats.

Despite the heightened drama surrounding ice use, there is no necessity for knee-jerk responses from employers. Any action you take needs to be measured, considered and process-oriented. This may sound counter-intuitive when you've got an employee who clearly deserves to be booted out the door – but if you don't follow due process, you're exposing your business to the risk of an unfair dismissal claim.

So what does due process look like in a tradie business? Again, it all starts with making your expectations very clear. Do you have a zero tolerance drug and alcohol policy? How often do you talk to your employees about their responsibility to remain 'clean'? Do you have a process for regular drug testing? Do you have a clear set of procedures which are triggered when you suspect that there has been

behaviour amounting to misconduct in your workplace?

If one of your employees turns up at work high or otherwise under the influence of drugs and proceeds to assault or injure another employee, the employer can be held liable for not exercising an appropriate level of care in the workplace. It is highly likely that the police and the relevant Work Health & Safety regulator will become involved and seek to conduct their own investigations.

What is the key to protecting your business? Process, process, process! If you can demonstrate that you have clear policies on drug use and clear procedures on what should be done when these policies are breached, you are far less likely to find yourself on the wrong end of a lawsuit or being required to pay an expensive fine.

Drugs, unfortunately, are part of the landscape of Australian society. There is no identikit for a typical user and there is no telling when this issue may impinge upon your workforce. Be ready to face the challenge – and make sure your employees are on the journey with you.

Shelley-Anne Brace is a Special Counsel at Mills Oakley, a national law firm. A former HR practitioner, Shelley now practises law in the area of workplace relations, employment and safety.

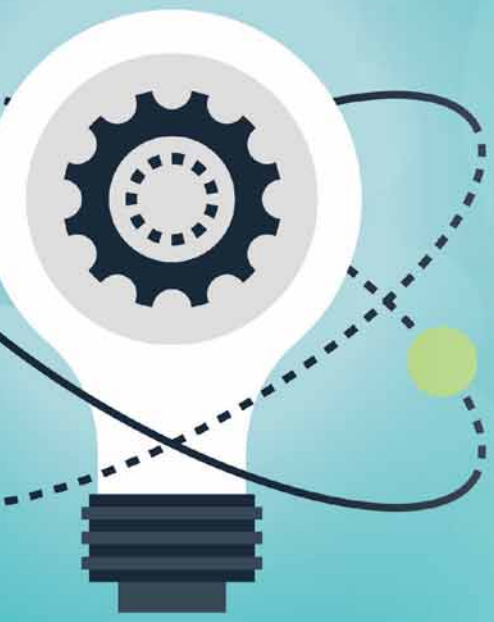
This article is for general information purposes only and is not (and should not be relied upon as) legal advice. You should seek specific advice from a professional legal advisor on matters arising from this publication. ▲

Mills Oakley
www.millsoakley.com.au

Photograph courtesy of: Elliot Tonk

Shelley-Anne Brace

INDUSTRY'S INNOVATIONS



The construction industry has always been a hotbed of innovation. In centuries past, inventions like reinforced concrete and electric welding redefined the limits of what we could build with steel and concrete, while more recent advances in battery technology allow us to complete power-hungry tasks with grinders and reciprocating saws chord-free.

In an attempt to look forward, Construction Skills Queensland (CSQ) and the CSIRO recently developed the report, *Farsight for Construction: exploratory scenarios for Queensland's construction industry to 2036*. And while it's impossible to tell the future, thorough analysis of industry trends and emergent technologies has allowed CSQ and the CSIRO to put forward four possible scenarios of what the industry will look like in about 20 years time.

1. **The Digital Evolution**: Robot labour technologies have not progressed as quickly as expected. Little has changed in the industry but most major projects are using BIM software, which provides 3D modelling and an all-encompassing system for managing every stage of the construction lifecycle. Tradies are still working in hands-on roles, but using exosuits to enhance their strength and agility. A range of wearables are also being used which offer biometric measurements such as heart rate and perspiration levels while monitoring the wearer's location to alert them to dangerous situations.
2. **Smart Collaboration**: The promise of smart robots has not been fulfilled but Australia is embracing prefabrication with large numbers of modular houses and buildings being built in factory facilities. The industry is harnessing new tools to make the construction process safer, more productive and less labour intensive. Drones are being used to undertake surveying work and autonomous vehicles are common on building sites.
3. **Globally Challenged**: This scenario sees the Australian workforce under pressure from advanced manufacturing and robotics facilities in Asia. The majority of construction work is being outsourced to more innovative and low cost producers, reducing the domestic workforce by 90%. Australia has failed to develop and use smart robots which are capable of undertaking a wide range of manual tasks such as bricklaying.
4. **Rise of the Robots**: Australia has emerged as a global construction innovation hub. The country is the go-to place for testing and refining exosuits and intelligent robots. Advanced prefabrication facilities are attracting massive foreign investment and creating high tech new jobs. Tradies are now working as 'building assembly technicians' and overseeing robotic systems. They are aided by virtual reality and 3D laser mapping devices which allow them to walk around and inspect augmented construction models in a real world environment.

We can't know for sure which, if any, of these scenarios will come into being. But one thing is certain – the industry will be very different from what we see today.

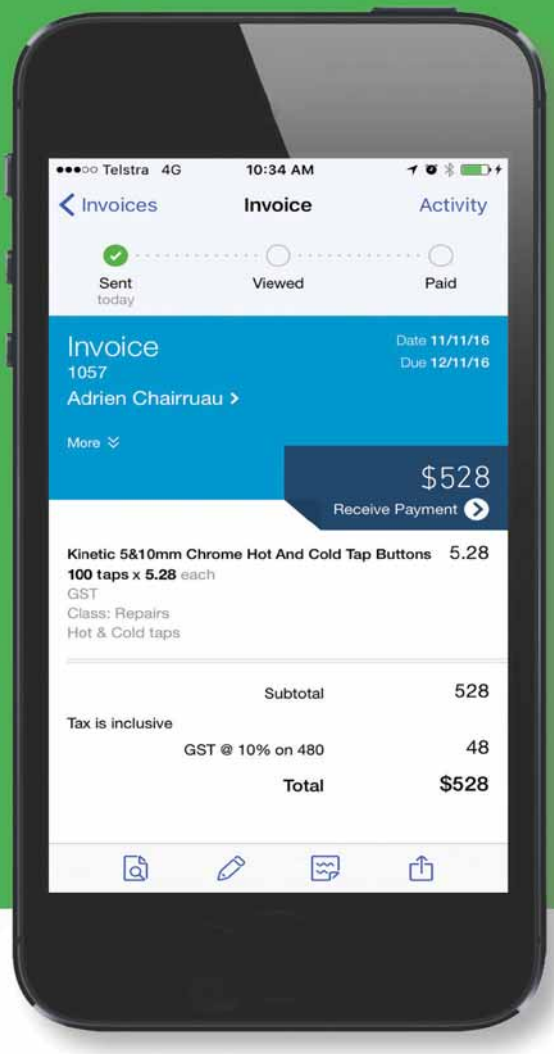
Sweeping change doesn't happen overnight however. It happens incrementally, one innovation at a time. And, most of the time, these innovations make our lives easier and/or safer.

With this in mind, *Across the Trades* has put together a collection of new, innovative products that we reckon will change things for the better.

The Tradie Accountant Australia

Get Paid 2.5 times faster and make your life easier with The Tradie Accountant Australia

With The Tradie Accountant Australia and QuickBooks Online, it is seriously easy to manage your business from anywhere on any device.



Send quotes and invoices instantly

Capture expenses & receipts

Lodge BAS, GST and manage cash flow

Expert tradie business advise

For more information and a free copy of our ebook visit www.thetradieaccountant.com.au

1800 95 75 85

www.thetradieaccountant.com.au

The Tradie Accountant Australia

intuit quickbooks.

For full terms and conditions visit quickbooks.com.au

3D IMAGING SENSOR

WalabotDIY connects magnetically to the back of Android smart phones, allowing users to see through plasterboard, cement and other materials. The technology is so precise it can determine the location of pipes, wires and even rodent's nests.

WalabotDIY is compatible with all Android smart phones 5.0 and higher, equipped with USB OTG. After downloading the WalabotDIY app via Google Play and a short calibration process, it can be used to scan the wall. The wall images are then projected on the smart phone's screen.

The tool also helps users know precisely how deep to cut or how far to drill to avoid damaging pipes, wires, and objects hidden behind walls. Its robust 3D imaging sensors detect both the depth and location of objects and easily see through up to 10cm of concrete or plasterboard.

WalabotDIY also features an adjustable sensitivity setting for optimal calibrations on specific renovation and construction projects, offers two sensing modes of pipes and raw data, and can easily snap photo screenshots for use in offline analysis. The powerful sensor technology will also enable added features for WalabotDIY in the future. Additional applications will be available via Google Play and will integrate seamlessly with the existing WalabotDIY tool as they are announced and released.

Walabot
www.walabot.com

DIMENSIONING INSTRUMENT

01 is the world's first dimensioning instrument. It rolls over straight, curved or contoured objects to capture, log, and share dimensions. Carved in aluminium, 01 is contained within a pen, pencil or stylus, and wirelessly connects to smart phones.

"We need to rethink how we capture and use dimensions. Measuring tape, for example, hasn't really changed since its creation in 1860," says InstruMMents founder and CEO Mladen Barbaric.

The InstruMMents team is a collective of veterans in device and software development, looking to tackle this problem.

"Mladen and his team are some of the best product designers I've ever worked with and have once again re-imagined an important product category," says ex-CEO of Apple and PepsiCo and co-founder of Misfit John Sculley.

01 uses a proprietary multi-sensor system, requires only one hand to dimension and is the only such device in the world that works on 3D surfaces. Used to design buildings or hang pictures, it helps makers intuitively capture linear or contoured lengths. No charging is required and batteries last up to six months. Users can also log, search, and share dimensions using the InstruMMents iOS and Android apps. Other features include:

- Unit Selection: convert between metric and imperial.
- Scale: dimension drawings or maps in any scale.
- Quick W-H-D: captures width, height and depth automatically, making dimensioning boxes fast.
- Blink Interval: Set up grids, hang things equally apart or gauge rough dimensions without your phone.

InstruMMents
www.instrumments.com

SQUARE HOLE SAW

For years, electricians have struggled with rulers, pencils and handsaws to cut holes in walls for electrical sockets and other boxes. This method lacks accuracy, creates mess, and can take over five minutes to cut a single hole (including 'making good').

Quadsaw solves this problem thanks to its unique four-blade technology, which enables users to cut square holes in seconds, with minimal dust and absolute precision.

No marking-up or measuring is required when using the Quadsaw as it has built-in spirit levels and a height gauge for ease of use. It is the ideal addition to any toolbox for professionals.

The Quadsaw is compatible with power drills and most battery drills.

"This is the first product in the world that can truly drill a square hole. The uniqueness of it is not just that it cuts the hole perfectly, but that it does so with total ease and minimal mess, making life easier for anyone who is using it," says Quadsaw designer Michael Sebhatu.

Quadsaw
www.quadsaw.com

BLUETOOTH PADLOCK

According to the Australian Institute of Criminology, one in three residential builders and tradies have had tools stolen from vehicles and building sites.

Research into on-site theft from residential building sites found that 44% of sites in CBD areas had been subject to theft and nearly one-third of all theft victims stated that the incident involved some forced entry.

Master Lock has revolutionised padlock security by turning your smart phone into a key.

The Master Lock Bluetooth Smart Padlock offers true keyless convenience for a construction site, gates and fences or anywhere access is required. Simply open your Bluetooth Smart Padlock with the touch of a button or a swipe on a phone using Bluetooth connectivity and a free, easy-to-use app.

You won't have to worry about losing keys, forgetting combinations or unauthorised key duplication again. It also allows for greater control and flexibility by managing real time access with numerous employees, clients or contractors. Monitor access history or receive tamper alerts for peace of mind.

The Master Lock Bluetooth Smart Padlock is equipped with anti-shim technology and a boron shackle for ultimate strength and security.

Master Lock
www.masterlock.com.au

MODULAR LADDER

The new modular height safety system from Branach is comprised of one base extension ladder with a closed height of 2.4m. Three modular sections can then be added to the base section. The sections snap in with a spigot socket joint that is easy to use, durable, and strong giving the ladder an optimal height of 7.6m.

This complete system is a different approach to height safety. It provides a multi-use system with maximum safety features.

These include:

- A walk-through section that attaches to the top of the system, providing handrails above the roof line for safe transitioning from the roof to the ladder
- The base of the ladder is fitted with a TerrainMaster that extends the base of the system to 1.4m across. It features large swivel feet for grip, independently levelling legs and a levelling bubble
- A fall control system that arrests the fall of the user while keeping the ladder upright. This is still under development but will include: harness; shock absorber; man down devise/ alarm; helmet; top attachment point with shock indicator.

Branach
www.branach.com.au

PASSING ON PAPER

More and more small businesses are doing away with traditional paperwork in favour of digital accounting software that allows users to quote, invoice, and accept payments from clients from a mobile device.

When your average work day consists of driving from job to job in a van or ute, keeping track of a bunch of paper receipts and invoices can be a real pain in the proverbial. Many tradies are now turning to the growing number of digital options that allow users to log and access this information with a mobile phone.

These services usually store information in the cloud so it can be accessed from multiple devices. They typically charge a monthly subscription fee and have different rates for varying levels of functionality.

"I recently spoke to an electrician who said that previously, when a client asked him to do an additional task, he would have to go home, write up a new invoice, email it to the client and then wait to get paid. This was taking him a significant amount of time but with our online mobile app he was able to create and send an invoice on the spot while he was still with the client. There are huge benefits in both time and money in being able to digitise that paperwork. It also enables you to serve your customers more quickly which is great for them as well," says Intuit Quickbooks vice president and country manager Nicolette Maury.

Traditionally, management of receipts involves a shoebox full of paper that is carried into an accountant's office at the end of the financial year before getting handed over. The accountant then works through it and lets you know how you did in the last 12 months.

"The alternative with an online solution is that users can throw away that shoebox of receipts and store their receipts on their mobile phone. This way their accountant is kept up to date in real time with how their business is going and it allows the accountant to be much more proactive in giving business advice and helping them with their on-going day-to-day business management as opposed to looking backwards and saying 'hey here's what you should have done differently in the last 12 months'. It creates a much more collaborative and value-adding relationship with the accountant as well."

Mobile accounting apps can also prove useful if you are struggling with designing your own invoice either through a computer or on paper. Most apps have fairly straightforward processes for setting up customised invoices, allowing you to add your company logo, choose the colour scheme and adjust the layout.

"One guy I spoke to last week said, 'I have an invoice book and I tear a page out of it and I write down the parts I'll need and the time required and I hand it to them on the spot. Compare this method to the electrician I mentioned who can create an invoice on his phone with his logo and his payment details on it. He's able to email that straight away and is able to create a quote first and have the customer sign that quote on the spot on the ipad or on the phone. This creates a much more professional look for that small business and it enhances the relationship with their customer because they are able to send the invoice straight away, the customer's not waiting to receive the invoice and it enables the tradie to get paid faster as well."

Nicolette also stresses is the importance of having a good relationship with an accountant. Enabling your accountant to see the same data as you real time, creates a stronger relationship and makes the business more effective, more in control for tax time and feeling more confident that they're on the right track.

Intuit
www.intuit.com.au

RENAULT
PRO+

Have another look. The judges did.

2015 DELIVERY MAGAZINE SMALL VAN OF THE YEAR

2016 DELIVERY MAGAZINE SMALL VAN OF THE YEAR

2015 DELIVERY MAGAZINE MEDIUM VAN OF THE YEAR

2016 DELIVERY MAGAZINE MEDIUM VAN OF THE YEAR

For the second year in a row, the judges for Delivery Magazine's 'Van of the year' awards liked what they saw. "Renault Kangoo is a great little van. It's comfortable, it's quiet, it steers, it turns. It's well equipped too."

And "After driving the Renault Trafic around Delivery's test route, I was very tempted to just keep going and take this awesome little load carrier home."
Now you should take a look. Take a test drive at your nearest Renault dealer.

renault.com.au

BUILDING A LOCAL CUSTOMER BASE

It is well known that most clientele for almost any small business, particularly those in the building and trades industry, will come from within a 10km radius of its location. Oneflare head of technology **James Martin** shares some tips on how to attract more local customers.

It used to be enough for tradies to have a classified ad in the local newspaper, be listed in a business phone directory and maybe even do a leaflet drop to find new clients. However, these tactics are no longer as effective as they once were.

This is because people now get most of their information online, including doing their research for trades, services and products. Thanks to search engines, social media, news sites, blogs and email, there are now many more effective options for attracting customers from your local area.

Here are a few digital techniques that can help you attract local clientele.

OPTIMISE YOUR WEBSITE

With so many people doing their research online, in order to make decisions about their home or building project, it's imperative to have a website that showcases who you are, what you do and how to get in contact with you.

When targeting potential customers in your local area, ensure your website is optimised for people researching local tradespeople using search engines, i.e. Google. At the very least you should include the names of the nearby suburbs you service on all pages of your website and in the page titles too.

You can also consider including localised terms, such as region names. For example, many people may use 'best plumber in the hills district' as their search phrase.

Tip: don't add a whole heap of suburb names to your website thinking this will help you rank higher. Google favours websites that are relevant. Focusing on the two to three suburbs nearest your business will likely get you a better outcome.

My four tips for a great website for your trades business:

1. Ensure your website is mobile responsive and looks great on a variety of screen sizes (think tablet, iPhone, and laptop).
2. Ensure there are clear call-to-action buttons, such as 'Call Now' or 'Get a Free Quote'.
3. Ensure that the website contains everything the customer needs to know in order to get them to click your call-to-action button, whether this is a gallery and samples of your work or a list of trade qualifications. Your aim is to instil trust and win them over and laying out this information in an easy to read manner is key.

> "Social media can be used for more than just keeping in contact with friends."

HAVE A GOOGLE PLACES LISTING PROFILE

Have you ever searched for a business, say hardware stores, online using Google and in the results you see a map highlighting hardware stores in your local area? These hardware stores listed all have a Google Places listing. These listings can be very powerful in helping customers to find and connect with your business, plus they are free to set up.

Google Places listings show information like address, phone number, opening hours, photos, website and even directions. It is also a place where customers can leave a review of your business.

Get started by searching 'Google My Business' in Google. Google has a step-by-step process to help you easily setup your Google Pages listing.

BUILD YOUR BUSINESS PROFILE ON LOCAL SERVICE MARKETPLACES

Local service marketplaces are online tools that help customers list their job needs and do all the hard work matching them with quality local service professionals. A local service marketplace can provide a great source of quality local customer leads, at a fraction of the price of traditional online advertising methods.

Local service marketplaces provide trades professionals with a place to build a business profile, configure their service area and lead notification settings and start connecting with clients – in real time.

When building your business profile on local service marketplaces, do your research and consider aspects like:

- Will this target people in my geographical area?
- How will I be notified about possible leads, via email, SMS or push notifications?
- What profile information can I share on the site?
- How many visitors does the site get?
- How credible is the site?
- Is the site easy to use and easy for customers to search?
- Does the site rank well for common Google searches specific to your industry?
- Does the site also allow customers to leave reviews?
- If the site has a membership fee, what other benefits does it offer?

SOCIAL MEDIA

Social media can be used for more than just keeping in contact with friends and family and sharing funny cat videos. It can also be a great way to showcase your business and stay top of mind with prospective customers.

Consider having a Facebook business page where you can post pictures on your latest projects, maybe it's a complete bathroom renovation, a new deck or a new modern lighting setup – it's a great place to highlight your work. Get support from family and friends to share examples of your work as you never know who's around the corner looking to get a job done.

HAVE A DATABASE OF LOCAL CONTACTS

Having useful data about your customers can lead to an incredibly powerful sales pipeline. For instance, Oneflare records over two million data events per week which helps us segment, analyse and uncover different and unique ways we can add value for our customers.

Having a database makes it easier to keep in contact with previous customers, keeping you top of mind for when they may need to engage you again or recommend you to a friend.

For example, a few years ago I used a local handyman. To this day he still sends me promotions via text messages every spring as a reminder to get jobs around the home (gutters, weeding, etc.) – usually with some sort of promotion. And the great thing is, he knows my house and yard already so the quote is super accurate.

There are many free tools you can use to record customer information, like Google Sheets. However, more advanced customer relationship management tools, such as InfusionSoft, allow you to do so much more. For instance, you can segment your customers and perform automated tasks, like send timely text messages after a job has been completed asking the customer to leave a review on popular review sites such as wordofmouth.com.au.

To get ahead of your competitors and stand out in your local area think about using a range of digital tactics, like those listed above. Consumers are searching for tradespeople online and it's up to you to leverage this activity so you can build a sustainable and lucrative pipeline of jobs for your business. ▲

Oneflare
www.oneflare.com.au

MULTI-TOOL RANGE

Bosch
www.bosch-pt.com.au

Bosch is expanding its range of professional Multi-Tools to include 5 new versatile models: the GOP 55-36 Professional, GOP 40-30 Professional and GOP 30-28 Professional corded tools; the GOP 18V-28 Professional and GOP 10.8V-28 Professional cordless multi-tools.

Trade professionals can now make safe, quick and efficient accessory changes (within 3 seconds) while also improving work progress. The innovative Starlock system is a cutting edge 3D interface design which enables snap-in accessory changes without the need for a tool, or having to touch a hot blade. The system also delivers 100% power transmission for better results.

ROTARY LASER & DETECTOR

Lufkin
www.lufkin.com.au

Lufkin's LR600 Dual Beam Auto Levelling Rotary Laser & Detector is the heavy hitting measuring tool with the capability to handle the biggest jobs. The LR600 projects rotary laser horizontal plane, as well as laser plumb beam. The gradient feature allows slope scanning at selected grade angles. It also incorporates an innovative electronic auto leveller.

Lufkin's big daddy of the Laser Range can help achieve unparalleled accuracy on all manner of professional jobs. A rainproof and dustproof casing make it suitable for all conditions, while a detector and a remote control enable long range operation. The LR600 is a sophisticated piece of equipment designed specifically for trade professionals, and will deliver accurate results no matter the job.

WORK LIGHT

Worx
www.worx.com

Worx Tools have included a much needed member to the Powershare range that will maximise your workspace. For completing home renovations, working onsite or simply adding more light to ensure the perfect result, the Worx 20v Work Light is the answer to all workspace lighting problems.

Tradies can now enjoy the freedom of this 20v Work Light's 360° rotatable function. To continue making your workspace better by helping you get the job done faster, you can easily transfer your light from the ground, handheld, hanging on the wall or tree, or even install onto a tripod.

METAL CUT-OFF WHEEL

Lenox
www.lenoxtools.com.au

Lenox Metalmax diamond abrasive, is a new alternative to abrasive cut-off wheels for increased durability and smooth, clean and even cuts. Made with metal cutting diamonds bonded to the wheel's surface, Lenox Metalmax is manufactured with a proprietary technology allowing the diamonds to endure high cutting speeds and temperatures while maintaining superior cutting properties.

Lenox Metalmax diamond abrasives deliver 1,000 or more cuts with no need for wheel changes, providing 30 times longer wheel life than thin bonded abrasive cut-off wheels.

The solid steel body design reduces the risk of breakage and its diamond cutting edge does not wear away, allowing it to hold its original wheel diameter until the very last cut. Because Lenox Metalmax doesn't wear away, there is substantial reduction of odour and airborne particles for less dust residue in the workspace.

CORDLESS TABLE SAW

Dewalt
www.dewalt.com

The DCS7485T1 60V MAX 8 1/4" table saw is maximized for accuracy, capacity and runtime. The brushless motor delivers the power to cut all common materials, the rack & pinion fence allows for fast, easy adjustments and provides the capacity to rip 4x8 sheet goods. The DCS7485T1 comes with one 20V/60V MAX Flexvolt battery and fast charger.

FEATURES:

- Rack and pinion telescoping fence rails make fence adjustments smooth and accurate
- 24" of rip capacity for ripping 4x8 plywood or OSB sheets
- Run off of 20V/60V Flexvolt battery system for maximum portability
- Site-Pro Modular Guarding System allows for tool free adjustment of the guarding
- Power-Loss Reset prevents accidental re-starts following a power disruption when the switch is left in the 'on' position
- Metal roll cage base offers greater durability than plastic bases
- On board storage for Guard, Fence, wrenches and mitre gauge
- Table coating reduces friction for smoother cutting

TABLET

Panasonic
www.panasonic.com.au

The Toughpad FZ-A2 combines Intel and Android productivity with full ruggedisation and is suited to a range of mobile users, including servicing, repair and technical support teams; local, state and federal governments; utility and infrastructure providers; logistics and transport operators; healthcare providers and retailers.

It is ideal for highly mobile outdoor workers in challenging conditions. With its sunlight-viewable 10-finger multi-touch IPS display, flexible configurable ports and business expansion capability, plus enterprise class security, the FZ-A2 is perfect for use in the field. In addition, it has the ability to work below zero or above 50°C and to use the touch screen in the rain or while wearing gloves.

CIRCULAR SAW BLADE

Irwin
www.irwin.com.au

Irwin Tools' WeldTec circular saw blade range features exclusive welded carbide teeth for outstanding strength. The new blades are designed for construction, demolition and specialty applications.

WeldTec circular saw blades last longer with Irwin's innovative WeldTec process, featuring carbide teeth welded onto the blades, not brazed; creating a tooth bond that is stronger than other blades. Additional components reinforce blade strength and make for a long lasting blade delivering true, clean cuts:

- A PTFE (polytetrafluorethylene) non-stick coating reduces binding and gumming, increases cutting speed while dissipating heat damage
- Perimeter vents strengthen the core of the blade and enable fast chip ejection
- The laser cut plate with expansion control slots provides superior flatness over a broad temperature range with reduced warping and increased blade stability

PRESSING JAWS

Rigid
www.rigid.com.au

Jaws for pressing PEX are now available to suit the Rigid RP210-B pressing tool. Available sizes are 16/18, 20, 22, 25, 32 & 40mm.

Jaws for copper pressing are also available in 15, 20, 25 & 32mm.

Rigid pressing tools are unsurpassed in making quick and reliable connections on copper, stainless steel, PEX and multi-layer tubing.

The Ridge Tool Company is a world leading manufacturer of professional quality pipe and tube working tools serving the plumbing, mechanical, construction, HVAC, location and facility maintenance industries, and now the electrical industry. The Rigid trademark is recognised by professional tradespersons and engineers for uncompromising product quality, performance, durability and service.

TOYOTA LANDCRUISER 70 SERIES

Toyota has overhauled the LandCruiser 70 Series to bring the workhorse utility range up to date and keep it on the shortlist of buyers who value the unique combination of V8 diesel engine muscle, outstanding off-road capability, 3500kg towing capacity and solid payload in both the single cab chassis (up to 1235kg) and the double cab (up to 1125kg) – both of which can be easily fitted out to suit various trades.

Far more than a tweak here and there, the new 70 Series has benefited from a five-year full-scale re-engineering program that was undertaken in Australia by local and Japanese engineers and was designed to keep the range viable in the marketplace for years to come. The alternative was to drop the vehicle altogether from Toyota's range.

The single cab benefits most as it lifts its crash-test rating under the independent ANCAP regime from three stars to the maximum five, thanks to sweeping changes that include a bigger, stronger and more rigid ladder frame (including thicker side rails and now seven cross-members), revised body panels, redesigned front seats, front seatbelt pre-tensioners, three additional airbags (side curtains and protection for the driver's knee adding to the dual front airbags), under-dash padding and a host of new electronic safety systems.

On the latter, which also extends to other 70 Series variants, Toyota has finally introduced electronic stability and traction control, along with hill-start assist, brake assist and electronic brake-force distribution (in addition to the existing ABS brakes).

The suspension has been recalibrated to match the new frame, with the combination said to have improved handing and refinement as well as safety. The steering linkage has also been moved behind the front axle for extra protection for the occupants, forcing the adoption of a single 130L fuel tank, although Toyota emphasises that improved fuel economy has helped offset the reduced tank capacity.

To that end, the 4.5L turbo-diesel V8 – good for 151kW of power at 3400rpm and 430Nm of torque from 1200-3200rpm – picks up a particulate filter (part of the move to Euro 5 emissions compliance in Australia) and piezo-electric injectors, while the five-speed manual gearbox's gearing is taller in second and fifth.

Toyota says the combined effect is reduced consumption – down by 10.1% to 10.7L/100km – and lower emissions, as well as improved responsiveness at low engine speeds and more relaxed driving on the highway. The addition of cruise control to the standard equipment list will also make things more comfortable on the open road.

Among other changes, the split-rim steel wheels on the entry WorkMate model grade have gone, replaced by a wider single-piece 16" design – matched for the first time to tubeless tyres (225/95 16C). Auto-locking front hubs (with a manual 'lock' function) now feature across the range, and a new bank of 10 fuses allows for safer and easier connection of accessories – an important consideration for tradespeople.

Pricing has risen $5000 for the single cab and $3000 for dual cab variants, which looks modest considering the engineering overhaul. The single cab starts at $62,490 for the WorkMate, with GX adding $2000 and GXL positioned a further $2000 upstream at $66,490 plus on-road costs.

The double cab is available in WorkMate and GXL grades, priced from $64,990 and $68,990 respectively.

Air-conditioning is a $2761 option, premium paint adds $500, diff locks are $1500 for single cab GX and double cab WorkMate and a broad range of accessories are available to suit specific industries, trades and applications. New steel and alloy tray options are also now available on single and dual cab chassis variants. ▲

Toyota
www.toyota.com.au

VOLKSWAGEN AMAROK V6 TDI

Volkswagen has pumped up its position in the one-tonne ute segment with the launch of a powerful new V6 turbo-diesel engine for the Amarok.

The V6 TDI is currently unique in the market, with Nissan not offering such a powertrain with the new-generation NP300 Navara – the previous D40 series had a Renault-sourced 170kW/550Nm six-shooter for the flagship ST-X 550 but this was retired due to its inability to meet Euro 6 emissions standards – and Mercedes is still about a year away from launching its all-new X-Class, which will include V6 diesel power.

Already in service in various Volkswagen Group passenger vehicles like the VW Touareg, Porsche Cayenne and Audi Q7 SUVs, the Amarok's diesel is a Euro 6-compliant 3.0L unit that delivers 165kW of power from 2500-4500rpm and 550Nm of torque from 2500-4500rpm – figures that can be increased to 180kW/580Nm for short periods of time with an overboost function.

Overboost kicks in when the accelerator is at least 70% of the way to the floor and is only delivered in third or fourth gear (from a minimum 50km/h), hanging in for 10 seconds. It also requires a five-second 'off time' before becoming available again.

Volkswagen Group Australia has left the manual gearbox in Europe for now, specifying the V6 diesel with an eight-speed automatic transmission only that can send the circa-2200kg dual cab from 0-100km/h in a claimed 7.9sec and from 80-120km/h in 5.5sec in 'controlled conditions'. Top speed is limited to 193km/h.

Despite the extra performance, the oil-burning six-pot engine can also return impressive fuel economy of 7.8L/100km on the official combined test cycle.

The V6 is not available on any other body variants, and only a single driveline is available in Australia – permanent 4WD with a Torsen differential. Rear-drive and selectable 4WD options are not part of the local package.

The engine combines with two high-series model grades: the TDI550 Highline priced from $59,990 and the TDI550 Ultimate starting at $67,990, both excluding on-road costs.

Both come packed with creature comforts and safety equipment, and usher in some unique features other than the powertrain including styling revisions, a new instrument panel, upgraded infotainment system (now equipped with features such as App Connect and DAB+ digital radio) and an advanced multi-collision braking system which automatically applies the brakes after a collision to limit the severity of the impact and potentially avoid a multi-car pile-up.

For the extra money, the Ultimate has new 14-way electrically adjustable 'ergoComfort' seats for the front occupants, Nappa leather seat upholstery, a colour screen for the multi-function digital display, 3D navigation, steering-mounted gearshift paddles, additional aluminium cabin trim, illuminated side steps, extended sports bar, matt-black 'Durabed' tub-liner coating and 19" 'Milford' alloy wheels (up from 18" rims on Highline).

Payload is 911kg on Highline and 864kg on Ultimate, while both retain a 3000kg braked towing capacity.

VW CADDY SAFETY MOVE

Billed as an Australian first for vehicles in the compact van class, Volkswagen has added two advanced driver-assist safety systems – forward collision warning and city emergency braking – as standard across its Caddy range.

Previously available as an option, both are radar-based systems designed to alert the driver of an impending accident and, if required, automatically prime and apply the brakes to prevent a collision.

Pricing increases $400 with the move, but Volkswagen Group Australia says the extra step up should be ameliorated over the period of ownership via reduced insurance premiums.

The Caddy Van (with seven-speed DSG auto only) is now priced from $29,390, while the long-wheelbase Maxi Van starts at $28,590 for the six-speed manual or $31,590 for the DSG. Five-seat Crewvan versions start from $30,909 for the manual, with DSG likewise adding $3000.

All models use a 1.4L TSI220 four-cylinder petrol engine that produces 92kW of power at 4800rpm and 220Nm of torque from 1500-3500rpm.

MERCEDES-BENZ X-CLASS

Mercedes-Benz has presented its inaugural X-Class mid-size one-tonne utility in near-production concept form as the prestige German manufacturer tools-up in partnership with the Renault-Nissan Alliance ahead of an Australian launch in 2018.

Australia is specified as a key market for the Spanish-built X-Class, along with Europe, Latin America and South Africa, and the concept unveiled recently in Sweden – presented in two different variants/themes – came with plenty of preliminary detail on the highly anticipated production version.

Based on the current NP300 Nissan Navara, the X-Class will be a dual cab model only – no single or extended cabs are planned – but will be offered with a broad range of powertrains, manual and automatic transmission, and 4x2 and 4x4 drivelines that will ensure it not only caters for its traditional luxury vehicle clientele but remains competitive against high-end versions of volume-selling mainstream utes such as the Navara, Toyota's market-leading HiLux, the Australian-developed Ford Ranger and the Volkswagen Amarok.

Indeed, Ranger, HiLux and Amarok were the three utes cited as benchmarks for Mercedes in developing the X-Class, which will be offered with two Renault-Nissan four-cylinder engines – one diesel and one petrol, with details still under wraps – while at the top end a Daimler-sourced V6 turbo-diesel paired with the 4Matic permanent four-wheel-drive system will be offered.

The 4WD system will combine with electronic traction control, a transfer case with low-range reduction, and centre and rear differential locks.

Mercedes senior management have confirmed the X-Class concepts unveiled in Stockholm are not too far from the final version, although the more conservatively styled example – dubbed 'Stylish Explorer' – is expected to be more representative of the production model than the more aggressive 'Powerful Adventurer'.

The latter stands 1.9m tall, has a huge ground clearance, Silverstone Xtreme all-terrain tyres, front electric winch, rear metal hook and extra undercarriage protection to name a few talking points and potential options once the X-Class reaches production.

As the white metallic 'Stylish Explorer' version demonstrates, Mercedes' designers have clearly borrowed from SUVs such as the GLA and GLC in sculpting the front end of the X-Class, rather than drawing on traditional commercial vehicle themes.

Both concepts have a striking continuous LED light strip in a slim chrome surround on the tailgate, which Mercedes says "points to the unique character of the future pick-up" – so expect this to be carried over to production.

According to the manufacturer, the interior is also close to what we will see in the production version, notwithstanding the different trim levels and model grades to be offered.

Count on high-quality details, advanced connectivity and infotainment technology, and a strong emphasis on safety features including driver assistance systems based on cameras, radar and ultrasound sensors.

These are all hallmarks of the broader Mercedes range that the company promises have not been watered down with its reliance on the Nissan Navara as the donor vehicle.

That said, the tough ladder-frame chassis in conjunction with the powertrains on offer will make for a payload of more than 1.1t and a towing capacity of up to 3500kg possible.

One of the key customer groups identified by Mercedes in the Australian market comprises "business owners such as building contractors, architects and service providers who want to use their pick-up for commercial and private purposes".

As such, it describes the X-Class as "a comfortable company car for customer meetings, which is equally perfect for transporting customers and employees as well as tools and building materials, as an 'everyday vehicle' and as a vehicle for weekend activities". ▲

Mercedes-Benz
www.mercedes-benz.com.au

NISSAN NAVARA SERIES II

Nissan has introduced a Series II upgrade for its Navara one-tonne utility, introducing a host of detail changes in the first major update since the NP300 series was launched in June 2015.

Headlining the overhaul is an improved suspension for all dual cab versions, which is a direct response to customer and dealer feedback on the Navara's suspension set-up – in particular, its unique five-link coil-sprung rear set-up.

The Japanese manufacturer undertook specific testing in Australia and has subsequently included new front and rear shock absorbers, new rear coil springs and rear rebound dampers. The company claims the dual cabs now offer more refined ride and handling characteristics, with improved lateral stability as well as enhanced handling when carrying loads – all good news for tradies.

With Series II, Nissan Australia has also added a new 'SL' model grade that is specifically targeted at tradespeople. It sits below the mid-series ST grade in 4x4 dual cab guise but still features the 2.3L twin-turbo diesel engine producing 140kW of power and 450Nm of torque, combining with either a six-speed manual (with which it offers a class-leading 6.5L/100km economy) or seven-speed automatic transmission.

Priced from $43,990 plus on-road costs for the manual or $46,490 for the auto – $3000 cheaper than the ST – the SL 4x4 twin-cab diesel has 16" steel wheels (with 255/70R16 tyres), flared wheel arches (giving it a 'wide body' look), vinyl flooring, a reversing camera and NissanConnect smartphone app functionality.

Other specification changes for the wider Navara Series II include satellite navigation added to all ST dual cab grades (adding $1000 to the bottom line), vinyl flooring replacing carpet in RX twin and single cab lines, and removal of the fold-out floor-level cup holder for rear seat passengers in the dual cabs – all actions that have stemmed from customer and dealer feedback, Nissan says.

The total Navara line-up – spanning single, king and dual cab body styles – now stretches to more than 30 variants with the addition of the SL grade, plus an auto option being added to the RX 4x4 dual cab chassis. A sunroof is also now offered as an optional feature (for $1000) on ST-X dual cabs, whereas previously it was standard.

Nissan
www.nissan.com.au

METAL PECKER

Cuts metal penetrations in a flash

It's New!

THE METAL PECKER® is specifically designed to cut penetrations in profiled metal roofing for in-situ vent pipe and skylight installation ...as well as air-conditioning duct, furring channel and other straight or formed metal sheet. The tool's precisely engineered slot-shear cutting action eats up folded sheets, seams and joints, like no other hand or power tool, you've ever used. The more you use the tool, the more uses you will find for it onsite.

HOW IT WORKS

The Metal Pecker's bolt-cutter sized handles provide far greater cutting leverage than other metal cutting hand tools.

Its precision cutter blade shears the metal between the anvils and pushes out a 1.7" (43mm) x 0.24" (6mm) slug with each cutting stroke. There is no blade face to blunt.

To cut, you simply punch a pilot opening in the metal sheet, poke the beak of the Metal Pecker's cutting jaw into the opening and commence cutting.

A MULTITUDE OF USES

The Metal Pecker compliments other tools that do their best work on single thickness profile cutting at ground level, or on flat sheet.

However, when the going gets tough with in-situ penetrations and other tools pass up under-folds or have difficulty cutting through a profile, reach for the Metal Pecker.

Its extended handles keep you away from the sheet's sharp edges and provide greater reach and leverage in hard to access places - reducing your work time.

ORDER TODAY AT
www.metalpecker.com

- ***Saves time and gives a clean cut every time***
- ***Doesn't deform the metal, leaves no swarf to rust***
- ***Keeps hands away from those nasty metal edges!***
- ***No need for power cords on roofs anymore***
- ***Cuts both hi-tensile and soft metal sheet***




Every Tool Kit Needs A Metal Pecker, The Tool With 1001 Deconstruction Uses

Non-slip serrated cutting jaw

Slot-shear design

Heavy duty construction

Precision honed cutting blade

Cuts Clean – no swarf

Comfort-grip PVC moulded handles

Manufactured from hardened tool steel

Cutter blade shears the metal between the anvils

Full length handles provide greater leverage

www.metalpecker.com

RENAULT KANGOO, TRAFIC

Renault Australia has made two key moves in relation to safety and the environment, fitting side-protecting airbags and rear parking sensors as standard across its Kangoo compact van range, and partnering with climate action organisation Greenfleet to offset the expected carbon emissions of select versions of its mid-size Trafic van.

The French brand made a variety of running changes across its various light commercial vehicle lines early in 2016, which included safety equipment upgrades on select Kangoo variants, but the latest action brings the entire range – which spans short-wheelbase petrol, long-wheelbase Maxi diesel and five-seat Crew diesel variants – up to date.

The new features add to a comprehensive list that already includes dual front airbags, electronic stability and traction control systems, and ABS brakes with emergency brake assist.

For Trafic, the carbon offset move – dubbed the Green Van Plan – only applies to those vans that are specified in the distinctive 'bamboo green' exterior colour.

Under the incentive, Greenfleet will plant enough native trees to absorb the carbon emissions of all new green-painted Trafics over the first seven years of their working lives, based on an average of 30,000km a year and the official combined-cycle fuel economy figure of 6.2L/100km.

Renault says this will equate to six tonnes of CO^2 per green-coloured Trafic per year, which includes an in-built over-allowance of 20% to reflect real-world fuel consumption.

The company has also vowed to ensure that "Bamboo Green Trafic vans will be the most affordable models in the Trafic range to drive away" from showrooms, giving buyers "both a financial and ethical incentive to go green" – so good deals should be available from dealers. ▲

Renault
www.renault.com.au

LDV T60

China's biggest motor company, Shanghai Automotive Industry Corporation (SAIC), unveiled the all-new T60 one-tonne utility for its burgeoning LDV brand at the recent Guangzhou auto show in China, ahead of an Australian launch in the second half of 2017.

The T60 will be distributed in Australia by Ateco Automotive and sold through a growing national dealership network that at the time of writing had reached almost 50 retail outlets – and which is expected to rise to at least 80 by the time the pick-up is launched here.

Both SAIC and Ateco have high hopes for the new utility, which will be pitched at tradies as a value-for-money proposition that provides a cut-price but nonetheless competent alternative for the major Thai-built Japanese and American players including the market-leading Toyota HiLux and Australian-developed Ford Ranger.

It will also go head-to-head with rival Chinese brand, Great Wall, and its new-generation Steed, which at this stage is only available as a petrol or diesel dual cab with a manual gearbox, priced from $25,990 plus on-road costs for the 4x2 petrol.

The Australian launch line-up is still to be confirmed, but SAIC management have confirmed a broad range of T60 model variants will be offered in Australia, covering various body styles (including single and dual cab, the latter with an extended tray option), petrol and diesel powertrains, manual and automatic transmissions, 4x2 and 4x4 drivelines, and two suspension heights.

The Chinese manufacturer says that its "comprehensive global range will enable LDV to tailor a local market range to cover all sectors of the Australian ute market".

The model shown in Guangzhou was a dual cab with four-wheel drive and a 2.8L VGT engine, details of which were still under wraps but this is expected to be a diesel (with variable geometry turbo technology) powering much of the T60 range.

LDV says the utility is built on an all-new platform with a high-tensile steel chassis protected by galvanisation, advanced wax injection and new paint processes to minimise chip damage. This has also prompted the company offer a 10-year warranty against corrosion.

Ateco is working with the factory to ensure entry level pricing starts below $30,000, while ensuring a high level of safety engineering and equipment goes into the utility in a bid to secure a maximum five-star crash test rating from the independent Australasian New Car Assessment Program (ANCAP) – a level which is now the target for virtually all light commercial brands.

Up to six airbags will be fitted to the T60, along with 'double pre-tensioning seatbelts' and a variety of electronic safety systems. Parking sensors, 360° cameras, a separate reversing camera and a driver fatigue alert system have also been developed for the ute. ▲

LDV
www.ldvautomotive.com.au

LDV G10 DIESEL

SAIC has ramped up its presence in Australia with the release of long-awaited diesel engine variants for the LDV G10 mid-size van – and the promise of more models in future including the all-new one-tonne T60 ute due later in 2017 and a range of smaller light-commercials in both van and cab-chassis guise.

Up until now, the G10 was restricted to four-cylinder petrol power only – an old-school Mitsubishi-sourced 105kW/200Nm 2.4L engine paired with a five-speed manual gearbox, and a more advanced and powerful 165kW/330Nm 2.0L 'NLE' turbo-petrol unit that combines with a ZF-sourced six-speed automatic transmission.

The new '19D4N' diesel engine is an 1850cc inline turbo four that produces 107kW of power at 4000rpm and 350Nm of torque from 1800-2600rpm. It is mated to either a six-speed manual or six-speed automatic gearbox, with the stick shift offering a combined-cycle fuel consumption figure of 8.3L/100km – well down on the 11.5L/100km manual petrol.

No mileage figures for the auto were available at the time of writing, but a similar difference between the petrol auto (offering 11.7L/100km) is anticipated.

All G10 vans have a 3000kg GVM, with tare weight on the diesel variants just under 2000kg and payloads 1030kg/1010kg for the manual/auto respectively. Braked towing capacity is 1750kg, which is up from 1500kg on the petrol versions, while the maximum cargo volume is 5.2m^3.

The cargo space measures 2365mm long, 1590mm wide (1278mm between the rear wheel arches), and 1270mm high.

LDV and its Australian distributor Ateco Automotive claim the diesel engine puts the G10 almost at the top of the performance league in its class, against vehicles costing more and often with less equipment.

The manual diesel is priced from $28,990 and the automatic from $31,490 – drive-away prices for ABN holders – while the petrol versions start at $25,990 for the manual and $29,990 for the turbo-petrol auto.

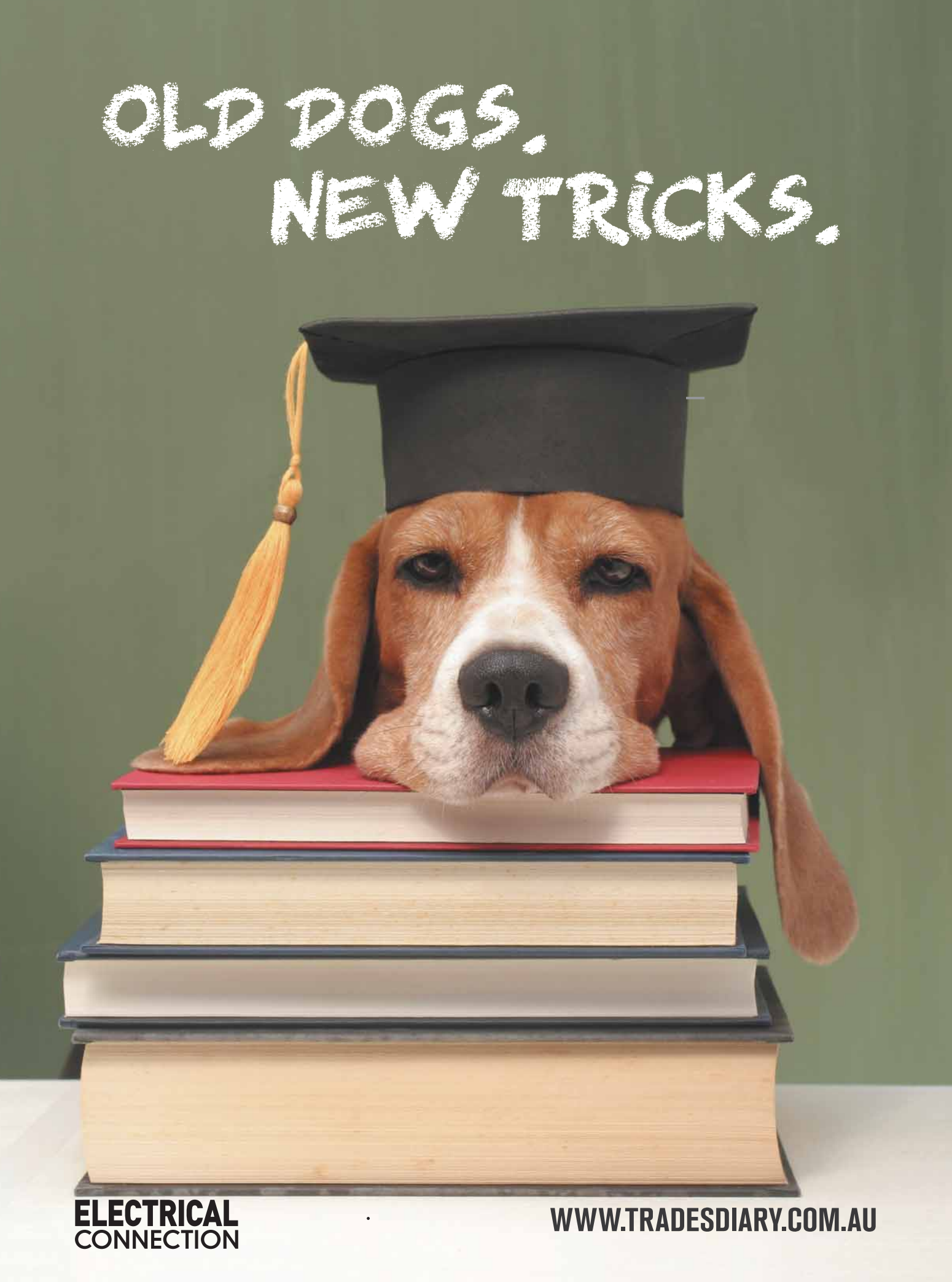
Standard features include twin side sliding doors, a rear tailgate (barn doors are optional), 16" alloy wheels (with full-size steel spare), rear fog lamps, air-conditioning, remote central locking, electric windows/mirrors and a twin-speaker radio/MP3 audio system that includes a 7.0" LCD touchscreen and Bluetooth connectivity.

Cruise control is optional on manual versions, but fitted standard to the autos.

A relatively high level of safety equipment is also found on the G10, including dual front airbags, electronic stability control, four-wheel disc brakes, an ABS braking system (with electronic brake-force distribution and brake assist), a 'roll movement intervention system', reversing camera, parking sensors and a tyre pressure monitoring system.

All LDV vans are covered by a 3-year/100,000km warranty and roadside assistance, and accessories designed for trade applications are available including roof rack systems, heavy duty steps, load area lining kits and cargo barriers. ▲

LDV
www.ldvautomotive.com.au


OLD DOGS.
NEW TRICKS.
ELECTRICAL
CONNECTION
WWW.TRADESDIARY.COM.AU

HPM LEGRAND
WWW.LEGRAND.COM.AU

MYHOME KIT TRAINING

During this hands-on one-day course, attendees will learn the capabilites of a MyHOME system, how to program a MyHOME Kit and how to sell a MyHOME kit to their customers. Note: You will need to purchase and bring along a MyHOME Kit.

Start date	End date	Location
03/04/2017	03/04/2017	Prestons

MYHOME FULL SOLUTION TRAINING

During this hands-on two-day course, attendees will learn the capabilites of a MyHOME system, how to program a MyHOME system, and how to sell a MyHOME system to your customers. You will walk away with the ability and confidence to program a basic MyHOME installation.

Start date	End date	Location
04/04/2017	05/04/2017	Prestons

INTERCOM 2-WIRE AND D45 SYSTEM TRAINING

During this hands-on two-course, attendees will learn how to program BTicino 2-wire and D45 systems, how to design systems using YouDiagram pre-sale software and how to use the tools available to sell BTicino Intercoms to your customers.

Start date	End date	Location
06/04/2017	07/04/2017	Prestons

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

UEENEEF102A INSTALL AND MAINTAIN CABLING FOR MULTIPLE ACCESS TO TELECOMMUNICATION SERVICES (OPEN CABLER REGISTRATION)

This nationally endorsed course provides applicants with the training, skills and knowledge required to meet the Australian Communications Media Authority (ACMA) Open Cabler Registration.

Start date	End date	Location
28/01/2017	02/02/2017	Joondalup
18/03/2017	23/03/2017	Joondalup
25/03/2017	30/03/2017	Jandakot

80970ACT COURSE IN ELECTRICIAN- MINIMUM AUSTRALIAN CONTEXT GAP TRAINING

This course provides the Minimum Australian Context Gap training to holders of an Offshore Technical Skills Record (OTSR) for the UEE308011 Certificate III in Electrotechnology Electrician qualification.

Start date	End date	Location
06/02/2016	17/02/2016	Jandakot
20/02/2016	24/02/2016	Joondalup
13/03/2017	24/03/2017	Joondalup
13/03/2017	17/03/2017	Jandakot
27/03/2017	07/04/2017	Jandakot
03/04/2017	07/04/2017	Joondalup

DESIGN AND INSTALL GRID CONNECTED PHOTOVOLTAIC SYSTEMS

This course delivers the requisite training to licensed electricians for the design and installation of grid connected photovoltaic systems and associated equipment required for Clean Energy Council Accreditation. It provides detailed knowledge and practical skills in the design and installation, set-up, test, fault find, repair and maintenance of grid-connected photovoltaic systems.

Start date	End date	Location
16/01/2017	20/01/2017	Jandakot
20/02/2017	24/02/2017	Jandakot
20/03/2017	24/03/2017	Jandakot
03/04/2017	07/04/2017	Jandakot

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

BATTERY STORAGE FOR GRID-CONNECTED PV SYSTEM

This course delivers the requisite training in the design and installation of battery storage for grid-connected PV systems. It provides detailed knowledge and practical skills for the design, installation, fault-finding and repair of batterey storage systems for grid-connected photovoltaic systems. Completion of this course meets the requirements for Clean Energy Council Battery Storage endorsement that will be applied to existing CEC Design and Installation of Grid-Connected PV Systems Accreditation.

Start date	End date	Location
23/01/2017	25/01/2017	Jandakot
29/03/2017	31/03/2017	Jandakot

CHECKING AND TESTING AN ELECTRICAL INSTALLATION

This non-endorsed course provides licensed electricians and final year apprentice electrical mechanics and fitters with the training, skills and knowledge to visually inspect and test a low voltage electrical installation in compliance with the requirements of AS/NZS 3000.

Start date	End date	Location
27/01/2017	27/01/2017	Joondalup
08/02/2017	08/02/2017	Joondalup
22/02/2017	22/02/2017	Joondalup
22/03/2017	22/03/2017	Joondalup

ELECTRICAL CONTRACTOR TRAINING PROGRAM (ECTP) - ELECTRICAL CONTRACTORS NOMINEES/IN-HOUSE LICENCE, ELECTRICAL CONTRACTORS BUSINESS LICENCE

In Western Australia, the Electricity (Licensing) Regulations 1991 provide that electrical contracting work may only be carried out by persons holding the appropriate electrical licence as issued by the Electrical Licensing Board. This EnergySafety WA approved course satisfies the Electrical Contractor Training Program (ECTP) and provides licensed electricians with the training, skills and knowledge rquired to identify, investigate and apply statutory and legislative requirements, manager jobs and operate a business and inspect and test electrical installation work according to regulatory requirements. This course can be delivered fulltime on campus or through distance learning (correspondence).

Start date	End date	Location
16/01/2017	20/01/2017	Jandakot
30/01/2017	03/02/2017	Joondalup
06/02/2017	10/02/2017	Joondalup
11/02/2017	23/02/2017	Joondalup
13/02/2017	17/02/2017	Jandakot
18/02/2017	02/03/2017	Jandakot
13/03/2018	17/03/2017	Joondalup
27/03/2017	31/03/2017	Jandakot
01/04/2017	13/04/2017	Jandakot
03/04/2017	07/04/2017	Joondalup

RESTRICTED ELECTRICAL LICENCE (REL) COURSE (DISCONNECT & RECONNECT TO 1000 VOLTS)

The Restricted Electrical Licence course provides eligible persons with the training, skills and knowledge required to apply for a Restricted Electrical Licence. The full time course is structured to include both theoretical and practical training.

Start date	End date	Location
27/02/2017	03/03/2017	Joondalup
27/03/2017	31/03/2017	Joondalup

STAND-ALONE POWER SYSTEMS - DESIGN AND INSTALLATION CLEAN ENERGY COUNCIL ACCREDITATION

This course delivers the requisite training in the design and installation of stand-alone power stystems required for Clean Energy Council Accreditation. The course provides knowledge and practical skills in design, installation, fault-finding and repair of stand-alone power systems.

Start date	End date	Location
13/02/2017	22/02/2017	Jandakot

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

HIGH VOLTAGE SWITCHING SYSTEMS OPERATIONS COURSE

This industry endorsed course, derived from the UEP12 Electricity Supply Industry-Generator Sector Training Package and the UET12 Transmission, Distribution and Rail Sector Training Package, is intended for electrical workers and electrical engineers working with HV switchgear in industrial facilities and networks.

Start date	End date	Location
16/01/2017	19/01/2017	Jandakot
30/01/2017	02/02/2017	Jandakot
06/02/2017	09/02/2017	Jandakot
13/02/2017	16/02/2017	Jandakot
27/02/2017	02/03/2017	Jandakot
07/03/2017	10/03/2017	Jandakot
13/03/2017	16/03/2017	Jandakot
20/03/2017	23/03/2017	Jandakot
27/03/2017	30/03/2017	Jandakot
03/04/2017	06/04/2017	Jandakot
10/04/2017	13/04/2017	Jandakot
18/04/2017	21/04/2017	Jandakot

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

UEENEEF105A INSTALL AND MODIFY OPTICAL FIBRE PERFORMANCE DATA COMMUNICATION (OPTICAL FIBRE CABLING COURSE)

This nationally endorsed course is an extension of the ACMA Open Cabler Registration Training Requirements Course, and provides applicants with the training, skills and knowledge to correctly install and terminate optical fibre cabling.

Start date	End date	Location
10/03/2017	11/03/2017	Jandakot
07/04/2017	08/04/2017	Jandakot

UEENEEF104A INSTALL AND MODIFY PERFORMANCE DATA COMMUNICATION COPPER CABLING (CATEGORY 5/6/7 STRUCTURED AND COAXIAL CABLING)

This nationally endorsed course is an extension of the ACMA Open Cabler Registration Training Requirements Course, and provides open cablers with the training, skills and knowledge required to correctly install terminate category 5/6/7 structured and coaxial cabling.

Start date	End date	Location
03/02/2017	04/02/2017	Joondalup
24/03/2017	25/03/2017	Joondalup
31/03/2017	01/04/2017	Jandakot

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

UEE20111 CERTIFICATE II IN SPLIT AIR-CONDITIONING AND HEAT PUMP SYSTEMS

This nationally endorsed qualification provides participants with the training and knowledge to install, commission and de-commission single head split air conditioning and heat pump systems to a prescribed routine, where the maximum plant capacity for each system does not exceed 18kWr. It includes wall hung, floor, and ceiling suspended, cassette and ducted fan coil split and water heating heat pump systems.

Start date	End date	Location
04/02/2017	04/03/2017	Jandakot
27/03/2017	31/03/2017	Jandakot

UEENEEP026A CONDUCT IN-SERVICE SAFETY TESTING OF ELECTRICAL CORD CONNECTED EQUIPMENT AND CORD ASSEMBLIES (PORTABLE APPLIANCE TESTING)

This course provides information regarding the safe and accurate operation of the Portable Appliance Tester (PAT) and testing of RCDs for persons required to operate this type of equipment. Essentially, the course is aimed at persons who have little or no understanding of electrical theory and are required to endorse equipment as safe to use.

Start date	End date	Location
23/03/2017	24/03/2017	Jandakot

NECA EDUCATION & CAREERS
HTTP://NECAEDUCATION.COM.AU

CONSTRUCTION WIRING

Construction wiring is a specialised area providing regulatory, industrial relations and cost challenges for contractors. Successfully managing these challenges requires comprehensive skills and knowledge of the relevant Australian and industry standards to ensure compliance and eliminate risks.

Start date	End date	Location
22/02/2017	24/02/2017	Carlton North

CONSTRUCTION WIRING REFRESHER

This two-day refresher course willl update your knowledge and understanding of changes to standards and legislation impacting on installation practices. Acknowledged by Worksafe Victoria and endorsed by Energy Safe Victoria.

Start date	End date	Location
23/03/2017	24/03/2017	Carlton North

ELECTRICAL INSTALLATION TESTING

Electricians and RECs have a legal obligation to test and certify that their electrical work complies with relevant standards. It is essential thay you or your employess have the essential testing skills so that you can test and sign of on COES with confidence.

Start date	End date	Location
24/02/2017	24/02/2017	Carlton North
24/03/2017	24/03/2017	Carlton North
28/04/2017	28/04/2017	Carlton North
09/06/2017	09/06/2017	Carlton North

ESSENTIAL BUSINESS 4 ELECTRICAL CONTRACTORS

Improve your business' performance, profits and productivity by hearing from industry expert Max Rowe on developing various aspects of your electrical contracting business.

Start date	End date	Location
28/03/2017	30/03/2017	Carlton North

NECA EDUCATION & CAREERS
HTTP://NECAEDUCATION.COM.AU

ESTIMATING ELECTROTECHNOLOGY PROJECTS - FUNDAMENTALS STAGE 1

Estimating is a key component in establishing a successful contracting business. Knowing what to charge is only part of the equation. Knowing how long a job will take and what is involved in developing a quotation for a job is critical. This course reviews the methods and procedures comminly used in estimating plus more.

Start date	End date	Location
20/02/2017	20/02/2017	Carlton North
27/03/2017	27/03/2017	Carlton North

ESTIMATING ELECTROTECHNOLOGY PROJECTS - ADVANCED STAGE 2

This two-day refresher course willl update your knowledge and understanding of changes to standards and legislation impacting on installation practices. Acknowledged by Worksafe Victoria and endorsed by Energy Safe Victoria.

Start date	End date	Location
03/04/2017	10/04/2017	Carlton North

GRID CONNECT

This course provides licensed electricans with the skills to design, install, set-up, test, fault find, repair and maintain grid connected photovoltaic systems and the associated equipment.

Start date	End date	Location
27/02/2017	03/03/2017	Carlton North
03/04/2017	07/04/2017	Carlton North

LICENSED ELECTRICAL INSPECTORS PRACTICAL (LEIP)

Increase your skillset and your service offerings by becoming an electrical inspector. NECA Education and Careers is the only RTO to offer tutorials to prepare you for the licensing assessment. This component prepares you for the practical component.

Start date	End date	Location
27/02/2017	01/03/2017	Carlton North

LICENSED ELECTRICAL INSPECTORS SAFE APPROACH (LEISA)

Increase your skillset an your service offerings by becoming an electrical inspector. NECA Education and Careers is the only RTO to offer tutorials to prepare you for the licensing assessment. This component prepares you for the safe approach component.

Start date	End date	Location
16/03/2017	17/03/2017	Carlton North

LICENSED ELECTRICAL INSPECTORS THEORY (LEIT)

Increase your skillset an your service offerings by becoming an electrical inspector. NECA Education and Careers is the only RTO to offer tutorials to prepare you for the licensing assessment. This component prepares you for the theory component.

Start date	End date	Location
30/01/2017	02/02/2017	Carlton North

LICENSED ELECTRICAN THEORY (LET)

Brush up on your knowledge before you go for your electrical licence. This component prepares you for the LET component plus you can book your assessment at the same time.

Start date	End date	Location
17/01/2017	20/01/2017	Carlton North
13/02/2017	16/02/2017	Carlton North
20/03/2017	23/03/2017	Carlton North
03/04/2017	06/04/2017	Carlton North

NECA EDUCATION & CAREERS
HTTP://NECAEDUCATION.COM.AU

LICENSED ELECTRICIAN PRACTICE (LEP)			
Brush up on your knowledge before you go for your electrical licence. This component prepares you for the LEP component plus you can book your assessment at the same time.	**Start date**	**End date**	**Location**
	23/01/2017	25/01/2017	Carlton North
	06/02/2017	08/02/2017	Carlton North
	20/02/2017	22/02/2017	Carlton North
	06/03/2017	08/03/2017	Carlton North
	29/03/2017	31/03/2017	Carlton North
	10/04/2017	12/04/2017	Carlton North

OHS MANAGEMENT FOR MANAGERS & SUPERVISORS			
Are you and your team dealing with OHS? Then you need to understand the role you play in keeping safe at work. This course is specifically designed to provide contractors and their management with a clear understanding of the role of Occupational Health and Safety in today's work environment and specifically in the electrotechnology industry.	**Start date**	**End date**	**Location**
	20/03/2017	27/03/2017	Carlton North

NECA EDUCATION & CAREERS
HTTP://NECAEDUCATION.COM.AU

SAFE WORK PRACTICE (SWP)			
Brush up on your knowledge before you go for your electrical licence. This component prepares you for the SWP component plus you can book your assessment at the same time.	**Start date**	**End date**	**Location**
	27/01/02017	27/01/02017	Carlton North
	10/02/2017	10/02/2017	Carlton North
	24/02/2017	24/02/2017	Carlton North
	03/03/2017	03/03/2017	Carlton North
	10/03/2017	10/03/2017	Carlton North
	27/03/2017	27/03/2017	Carlton North

REGISTERED ELECTRICAL CONTRACTOR (BUSINESS)			
If you want to start your own electrical contractor business then this course is for you. The course sets out the knowledge and skills required to ensure regulatory, technical, occupational and workplace relation requirements are met in conducting a contracting business.	**Start date**	**End date**	**Location**
	13/02/2017	16/02/2017	Carlton North
	06/03/2017	09/03/2017	Carlton North
	25/03/2017	02/04/2017	Carlton North
	10/04/2017	13/04/2017	Carlton North

TRADESTUFF

THE ONLINE STORE FOR TRADIES

AS/NZS 3000:2007 The Wiring Rules (includes Amendment 1:2009 and Amendment 2:2012)

For electricians, the Wiring Rules are probably your most valuable tool, designed to protect you, your customers and their property – and every electrician in Australia and New Zealand is urged to familiarise themselves with the this Standard and its associated Amendments. Part 1 of this document provides uniform essential elements that constitute the minimum regulatory requirements for a safe electrical installation. Part 2 provides installation practices that achieve certainty of compliance with the essential safety requirements of Part 1. Recognised as the benchmark for safe and efficient electrical installations, this is one of the most widely used Standards in Australia and has played an important role in reducing the incidences of electrical mishaps and injuries.

$229.00 Spiral bound.....CODE 431s

Electrical Principles for the Electrical Trades

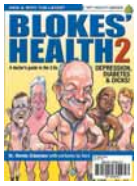
Volume 1 & 2

Volume 1:
Ideal for electrical apprentices, the 6th edition of *Electrical Principles for the Electrical Trades* is the first volume of a two-volume set. Written by two TAFE/VET teachers, the book looks at the fundamental knowledge required to become a successful electrician. A portion of the proceeds from this book will go to WorldSkills Australia.

Volume 2:
Volume 2 of *Electrical Principles for the Electrical Trades* explores the electrical applications of the principles learned in Volume 1. This is an excellent learning resource for electrical apprentices and teachers, as well as being a suitable long-term reference for tradespeople. A portion of the proceeds from this book will go to WorldSkills Australia.

$136.00.....CODE 085

Blokes' Health 2 – Depression, Diabetes and Dicks!



Following in the footsteps of Dr Bernie Crimmins original best-seller, Blokes' Health: comes Blokes Health 2. We all want to live as long and as healthy as we can, with good quality of life. In this book Dr Bernie Crimmins outlines the main health problems that affect males and gives some simple advice on how to prevent, or detect early, those particular diseases which may lead to an early demise.

$19.95.....CODE 671

Electrical Wiring Practice

Volume 1

Volume 1 of *Electrical Wiring Practice* has been updated to provide guidance in the use of the Australian and New Zealand Wiring Rules, AS/NZS 3000:2007, including the 2009 Amendments. Taking a practical approach, this book employs clear visual tools to illustrate the knowledge and practices required by specified products and the Standards.

$89.95.....CODE 086

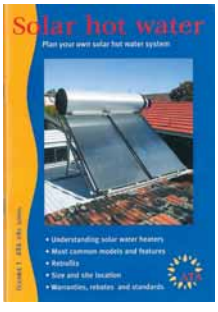
Electrical Wiring Practice

Volume 2

Volume 2 of *Electrical Wiring Practice* has been updated to provide guidance in the use of the Australian and New Zealand Wiring Rules, AS/NZS 3000:2007, including the 2009 Amendments. Taking a practical approach, this book employs clear visual tools to illustrate the knowledge and practices required by specified products and the Standards.

$95.95.....CODE 364

Solar Hot Water



This booklet gives you an understanding of solar hot water heaters and the most common models and their features. It also covers retrofits, size and site locations, including mains pressure versus low pressure, collectors, tanks, boosting and freeze protection, warranties, rebates and Standards.

$16.95.....CODE 589

DELIVERED DIRECT TO YOUR DOOR

TRADESTUFF
THE ONLINE STORE FOR TRADIES

ORDER FORM

Name:

Company:

Postal address:

City:

State: Postcode:

Phone:

Mobile:

Fax:

Email:

◯ CHEQUE ◯ MASTERCARD

◯ VISA ◯ AMEX ◯ DINERS

Expiry: _____ / _____

Cardholder's name:

Signature:

CODE	QTY	UNIT COST	TOTAL $
		$	$
		$	$
		$	$
		$	$
		TOTAL PAYABLE	$

POST FORM TO:

CONNECTION MAGAZINES, UNIT 2/18-22 LEXIA PLACE, MULGRAVE VIC 3170

* PRICES ARE IN $AUD AND INCLUDE GST & POSTAGE. ALL PRICES CORRECT AT TIME OF PRINTING. PRICES SUBJECT TO CHANGE WITHOUT NOTICE. LIMITED STOCK AVAILABLE, SPECIAL ORDERS CAN TAKE 3-4 WEEKS FOR DELIVERY.

PHONE 1800 623 214
FAX (03) 9542 9090

Electrical Estimator's Labour Unit Manual

14th edition

This labour unit manual has been produced to assist contractors to allow a realistic labour allocation to their jobs. These units have been developed over a number of years using actual time studies. This publication also includes a CD estimating spreadsheet and templates for calculating hourly charge out rates and minor installation quotations.

$120.00 ..... **CODE 583**

Electrical Installation Standards

AS/NZS 3008.1.2:2010
Selection of cables for alternating voltages up to and including 0.6/1kV

Plus Amendment 1

This Standard specifies current-carrying capacity, voltage drop and short-circuit temperature rise of cables, to provide a method of selection for those types of electric cables and methods of installation that are in common use at working voltages up to and including 0.6/1kV at 50Hz AC. It is applicable to typical Australian installation conditions where the ambient air temperature is 40°C and ambient soil temperature is 25°C.

$200.00 ..... **CODE 347**

AS/NZS 3001:2008
Transportable structures and vehicles including their site supplies

Plus Amendment 1

This Standard sets out requirements for electrical installations associated with transportable structures and vehicles intended for connection to low-voltage AC supply systems (i.e. exceeding 50 V AC but not exceeding 1,000 V AC). For the purposes of this Standard the term transportable structure includes vehicles and structures with or without wheels that are capable of being readily moved from one site to another either under their own motive power or otherwise.

$110.25 ..... **CODE 196**

AS/NZS 3080:2013:
Generic cabling for customer premises

The Standard provides building owners, managers, architects, designers, manufacturers, installers, maintainers and users with the necessary requirements to ensure compatibility with equipment and services, and to ensure performance of infrastructure to meet present and foreseeable future requirements.

$269.00 ..... **CODE 179**

AS/NZS 3012:2010 +Amdt 1/2015-10-20
Construction and demolition sites

This Standard sets out requirements for electrical installations that supply electricity to equipment on construction and demolition sites. It includes requirements for the inspection and testing of electrical equipment used on building construction sites.

$186.00 ..... **CODE 345**

AS/NZS 4836:2011
Safe working on or near low-voltage electrical installations and equipment

This Standard outlines the principles and procedures of safe work, organisation and performance on or near low-voltage electrical installations and equipment. It provides a minimum set of procedures, safety requirements and recommendations to manage the hazards associated with electricity, specifically arc blast, arc flash, electric shock and electrocution.

$150.00 ..... **CODE 574**

AS/NZS 3017:2007
Verification guidelines

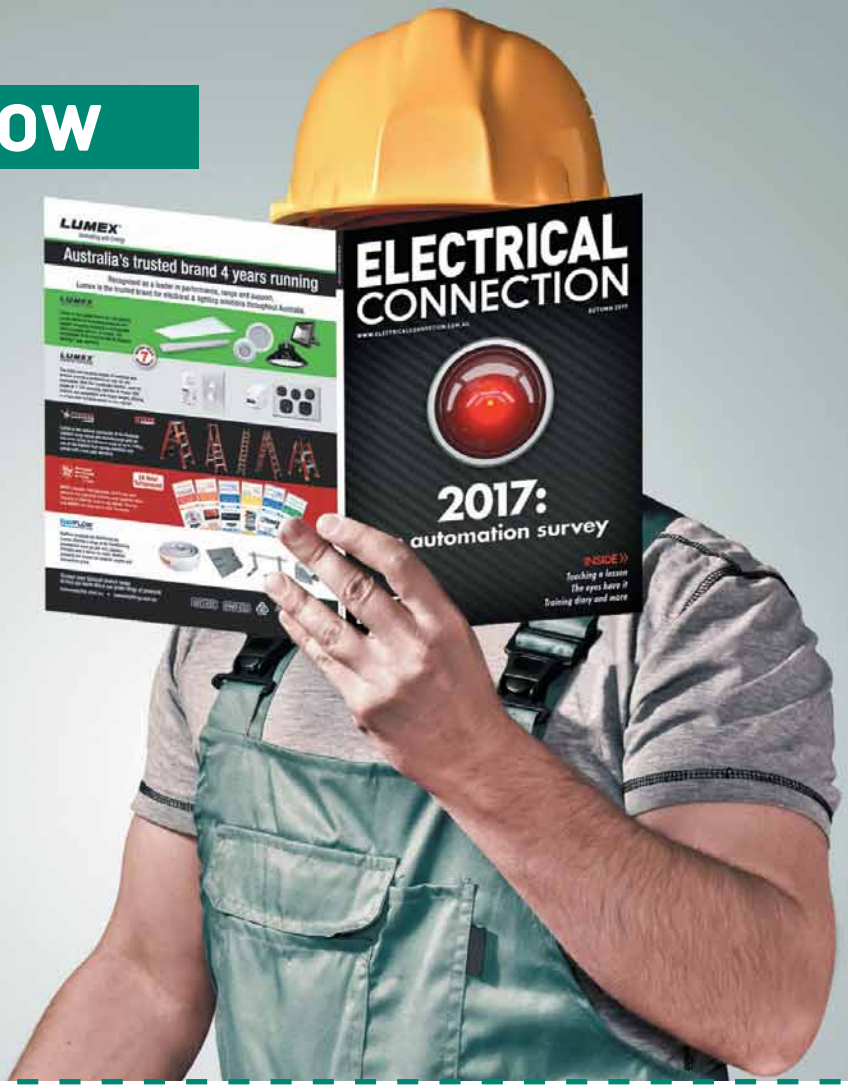
This Standard provides testing procedures and inspection guidelines to ensure that an electrical installation complies with the requirements of AS/NZS 3000 with regard to the prevention of a fire or preventing a person from receiving an electric shock. It includes tests for earth continuity, insulation resistance, polarity and incorrect circuit connections, fault-loop impedance and operation of residual current devices.

$155.95 ..... **CODE 127**

TRADESTUFF.COM.AU

SUBSCRIBE NOW

NEVER MISS A SINGLE ISSUE!



○ 2 Year (8 issues) $79.00
○ 1 Year (4 issues) $45.00

○ 2 Year (8 issues) $79.00
○ 1 Year (4 issues) $45.00

○ 2 Year (8 issues) $79.00
○ 1 Year (4 issues) $45.00

○ 2 Year (12 issues) $99.00
○ 1 Year (6 issues) $59.95

PRICES INCLUDE DELIVERY WITHIN AUSTRALIA ONLY. FOR INTERNATIONAL DELIVERY FEES, PLEASE CALL 1800 623 214

Name: ..... Company: .....

Postal address: ..... City: ..... State:..... Postcode: .....

Phone: ..... Mobile:.....

Fax: ..... Email:.....

Total payment: $..... ○ CHEQUE ○ MASTERCARD ○ VISA ○ AMEX ○ DINERS

____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ Expiry: _____ / _____

Cardholder's name: ..... Signature:.....

MAIL TO: CONNECTION MAGAZINES, UNIT 2/18-22 LEXIA PLACE, MULGRAVE VIC 3170

FREECALL 1800 623 214 • FAX 03 9542 9090 • WWW.TRADESTUFF.COM.AU

LUMEX®
Innovating with Energy

Australia's trusted brand 4 years running

Recognised as a leader in performance, range and support,
Lumex is the trusted brand for electrical & lighting solutions throughout Australia.

LUMEX LED LIGHTING

Lumex is the trusted brand for LED lighting. Lumex backs its innovative products with support programs including a professional lighting design service, EnerSpec, full certification of its products and an industry leading 7 year warranty.

SEVEN YEAR 7 WARRANTY

LUMEX ELECTRICAL ACCESSORIES

The Silica and Alumina ranges of switches and sockets provide a professional look for any application. Both the LoadSmart dimmer, used for phase or 1-10V dimming, and the Hi-Power USB module, are compatible with these ranges, offering a unique and versatile choice in the market.

REDBACK LADDERS by LUMEX

2 YEAR WARRANTY

Lumex is the national distributor of the Redback Ladders range which are manufactured with an industrial rating to withstand loads of up to 150kg, one of the highest load ratings available and comes with a two year warranty.

Managed Marketing & Sales by LUMEX

24 Hour Turnaround

MM&S designs, manufactures, distributes and services the Electrical Industry with superior value. Capable of offering custom tag design, find out how MM&S can help you in your business.

RAYFLOW climate

Rayflow products are distributed by Lumex offering a range of Air Conditioning accessories such as pair coil, plastics, brackets and a whole lot more. Rayflow products are known for superior quality and competitive price.

Contact your Gemcell branch today
to find out more about our great range of products

lumexelectric.com.au • lumexlighting.com.au

VEET-ESC IPART-ESS N 5522 100% Australian

CONNECTED HOME MOST POPULAR LED LIGHTING 2016 2015 | 2014 | 2013 VOTED #1 AUSTRALIAN OWNED