

# ELECTRICAL CONNECTION

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AUTUMN 2018

Shining a  
light on LEDs

IS IT TIME FOR NEPS?





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COVER STORY

**16 PROPOSING WITH A GEM(S)**

Draft Minimum Energy Performance Standards [MEPS] for LED lighting has sparked debate across the lighting industry. Simeon Barut delves into the potential ramifications passing the proposed legislation could have on LED suppliers and light designers.



16



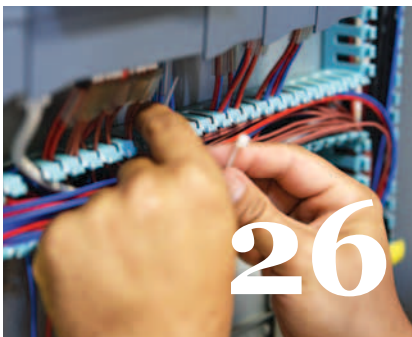
FEATURES

**20 I'LL SEE YOU IN COURT**

Accusations levelled at the electrical cable and distribution sectors have been dismissed by the Federal Court. Paul Skelton reports on a court case that left a trail of destruction across the industry.

**56 EMBRACE CHANGE**

Varying job conditions will affect total labour hours on projects. Understanding this is the key to successful estimating.



**26 ALL TIED UP**

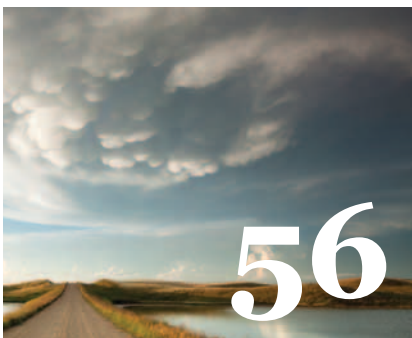
Cable ties are everywhere but don't have a great environmental record. Adelle King looks at how the industry can cut down on wastage and even recycle nylon ties.

**50 IT'S ALL PART OF THE PROCESS**

Proportional, integral and derivative are simple terms that can have complex ramifications in process control.

REGULARS

- 06 Editorial
- 08 Contributors
- 10 Industry News
- 12 New Products
- 74 NECA News
- 105 Training Diary
- 112 Trade Stuff



**52 THE STORAGE FRONT**

Grid support and domestic use are the two main applications for battery energy storage systems. Phil Kreveld outlines available technologies as well as their pros and cons.



**86 MARKETING**



**88 LEGAL MATTERS**



**100 TRANSPORT**



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# A LEECH ON THE SYSTEM



**T**raining... it really is one of life's little mysteries.

Every tradie you ask will tell you that they are actively involved in training and yet, the numbers don't seem to stack up.

It's almost as if everyone wants to be seen as doing the 'right' thing but, when it comes down to it, doesn't actually follow through and put their money where their mouths are.

That couldn't possibly be the case, right?

After all, is the electrical industry really one in which you can pay lip service to ensuring the skills of your staff remain up-to-date?

Look at the medical industry as an example. In order for a general practitioner [GP] to remain registered, they have to complete a certain amount of recognised training each year. You wouldn't want to see one otherwise, would you?

Of course not.

Think about it this way, if GPs never undertook training, we'd all be covered in leeches and riddled with syphilis. Or dead.

No, we all want drugs that make everything better and we want GPs who know what the hell they are talking about. And the only way that will ever happen is training.

Given the nature of work that electricians perform, working with potentially lethal live cables, wouldn't you want to make sure you know what you're doing – especially as the number of new technologies skyrocket?

Why would you shy away from that? I realise that cashflow and time are always a consideration when running a small business, but training is not just a cost – it's an investment. And if it's done well, it's something that you should be able to market to your potential customer base.

As this edition of *Electrical Connection* comes out, the new year is just beginning, so now is the best time to take a moment to develop a training plan for yourself as well as your staff.

To start, why not check out the training diary at the back of this magazine? In every edition, we run a comprehensive guide to what training is occurring in the market. If you want to do something a bit later in the year, check out [www.trainingdiary.com.au](http://www.trainingdiary.com.au). Last year, we published the details of around 1,500 courses happening in Australia.

The alternative, I guess, would be to stock up on some leeches and hope for the best.

I hope you enjoy this edition of *Electrical Connection* and wish you all the best of luck for 2018.

Until next time,

Paul Skelton



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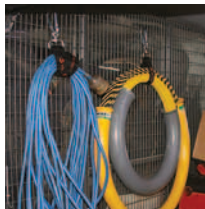
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**PHIL KREVELD**

**Let's Get Technical**

Phil Kreveld is an energetic energy writer and electrical engineer. He has worked in electrical, electronic and scientific instrumentation, including relay testing power and power quality analysis, in Australia and the US. Phil is also quite an adept artist, regularly showing his paintings in galleries around Victoria.

**See pages 42, 52 and 68**



**STEVE KEIL**

**Laser Focus**

Steve Keil has spent his career in trade-related businesses. His first decade in the workforce was as an electrical contractor before a career with one of Australia's leading electrical wholesalers. In 2004, Steve founded Laser Plumbing & Electrical in Australia. Laser's membership now includes 140 electrical and plumbing contracting companies in A/NZ.

**See page 58**



**WES MCKNIGHT**

**McKnight on the Town**

Third generation electrical contractor Wes McKnight has 32 years' experience on the tools in the Victorian town of Ballarat. From 2008 to 2013 he served as the president of the National Electrical and Communications Association (NECA). He is also the director of Motorwise Australia, which sells an AC motor controller used to optimise the power delivered to electric motors.

**See page 30**



**GLEN MCMURTRIE**

**Instrumentation**

NECA Trade Teacher of the Year 2016 Glen McMurtrie is a process instrumentation and control teacher at SkillsTech TAFE in Brisbane. He has extensive experience in mining and mineral processing. When he's not teaching students he's travelling the world as a member of the Australian disabled shooting team.

**See page 50**



**BRIAN SEYMOUR**

**Estimating**

Brian Seymour MBE is an industry consultant and author of four books, including *Electrical Estimator's Labour Unit Manual*; *Starting Out*; *Electrical Contracting in Australia*; and, *100 Years Electrical Contracting in Australia*. He conducts regular industry training programs throughout Australia on behalf of the electrical and air conditioning industries, focusing on estimating.

**See page 56**



**JAMES TINSLAY**

**Apprentices**

James Tinslay is a consultant and engineer with some 40 years of experience dealing with the electrical contracting industry. He is an ex-CEO of NECA - an organisation he has worked with since 1988 - and is a current director of NECA Electrical Apprenticeships and Standards Australia. He also runs his own consultancy firm, JCT Advisory.

**See page 80**



# TIDY UP WITH SMART CABLE MANAGEMENT SOLUTIONS

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**CONNECTION MAGAZINES ANNOUNCES DISTRIBUTION PROGRAM WITH TAFE NSW**

Connection Magazines, the publisher of *Plumbing Connection*, *Electrical Connection* and *Building Connection* magazines, has announced a new magazine distribution program with TAFE NSW.

The distribution program will see 50 colleges that teach building, plumbing or electrical services receive substantial bulk copies of the three trade magazines, delivered direct to their doorstep on a quarterly basis.

TAFE NSW construction and property services industry liaison manager Greg Cheetham says these publications provide value that goes beyond the general curricula that is taught.

“It is important that our teachers have access to the latest industry thinking, as well as products and services that are new to the market. And that’s what these unique publications provide. You can’t put a price on the knowledge and value that such technical magazines bring to our industry,” says Greg.

Each quarter, Connection Magazines is expected to send TAFE NSW an estimated \$50,000 worth of publications across the three sectors.

**AMENDMENTS TO THE ELECTRICAL SAFETY ACT 2002**

There have been two important amendments to the *Electrical Safety Act 2002* that affect Queensland licence holders, says the Electrical Safety Office. These amendments target unsafe electrical work and practices, and are in addition to existing penalties and disciplinary actions available under the Act.

Under section 64C of the Act, the Electrical Licensing Committee (ELC) may now direct an electrical work licence holder to undertake a competency reassessment where there

are reasonable grounds to believe the licence holder may not be competent.

Under section 121AA of the Act, a person’s electrical work licence may be immediately suspended if the regulator forms a reasonable belief that:

- the person may be responsible for electrical work that has caused a death or grievous bodily harm; or,
- has otherwise carried out electrical work that poses an imminent serious risk to the health or safety of any person.

In these circumstances, the regulator will then refer the person to the ELC for a disciplinary hearing.

**GLOBAL LIGHTING ASSOCIATION APPOINTS NEW PRESIDENT**

During a Global Lighting Association board meeting in November 2017, Australian Russell Loane was elected president of the Global Lighting Association. He takes over from retiring president Jan Denneman, who led the team since 2007.

Russel has a plethora of experience in the lighting industry and will be bringing that to the table during his new role. Russell has been active in the lighting industry for 40 years, most recently as chair of Lighting Council

Australia from 2007 until this year.

The Australian Government recognised Russell’s contribution to the lighting industry by granting an Order of Australia award in the field of illuminating engineering in 2013.

Russell says that overseeing implementation of the Global Lighting Association’s strategic roadmap for the lighting industry was his highest priority. The roadmap sets goals for the industry based on acceptance by stakeholders and the benefits modern lighting gives beyond energy efficiency.

**SCHOLZ INDUSTRIES ANNOUNCES MAJOR RESTRUCTURE**

Scholz Industries has announced it is instigating a major restructure in order to streamline its operations and present an integrated offering to the market.

As part of this restructure, Scholz has sold its HVAC (Air Additions and Ray-flow), test tag (MM & S) and Redback Ladders divisions to Auralec. These divisions will continue to be overseen by chief executive Andrew Hartley.

Scholz Industries chairman Erik Scholz says the restructure will enable Scholz Industries to concentrate its focus on driving its foundation business of energy efficiency and exploiting its significant presence in the lighting and projects sectors.



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### MIDDY'S AWARDS 13 SCHOLARSHIPS FOR TRAINING AND EDUCATION

Electrical wholesaler Middy's has awarded 13 of its customers with scholarships to attend further training in the hopes it will help build their businesses.

Of the entrants, the judges said: "The standard was again very high and the finalists reflected that. Our judging process saw each of the applicants reviewed resulting in an initial final pool of just over 60 applications.

This was then reviewed again by all judges scoring individually on each of those which resulted in a final pool of 20. The winners were then taken in order of rating from this final score."

The winners were as follows:

#### **GOLD \$10,000**

- Brendan Stoyles, DICE Industries
- Graham Baker, Grounded Electrical
- Luke Eggins, Eggins Electrical
- Matthew Campbell, Eascom Electrical
- Michael Van Heerden, Scadaelectric Automation

- Philip Collins, MidWest Refrigeration and Electrical
- Trent McCarthy, TSM Electrical
- SILVER \$5,000**
- Alistair Bowers, Ballarat Electrical Company
- Cameron Wilding, SAW Electrics
- Chris Vitartas, Caddy Electrical
- Fiona Papworth, Fi's Electrical Contracting
- Joel Fallon, Teys Australia Naracoorte
- Woody Conboy, Woody Conboy Electrical Services



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**WIRE AND CABLE STAPLE GUN**

The Arrow T72 heavy duty wire and cable staple gun is a reliable tacker that shoots large insulated staples for the professional installation of twin and earth wire, communications and data cabling.

With a wire guide included, the all-steel T72 takes 5mm or 9mm staples [insulator clearance height] and features a jam-resistant mechanism and short-span, easy compression handle.

The grooved wire guide lets the staple gun glide across the cable making it easier to finish the fastening process. The T72's genuine Arrow insulated staples are made in the United States from quality steel material with a clear plastic insulator, suitable for a range of typical electrical cable installations.

The staples are available in 5mm insulator height with 12mm flat crown width, 9mm insulator height with 15mm grooved crown width, or 22mm staple leg length [19mm for hard wood applications].



**Master Distributors**  
[www.masterdistributors.com.au](http://www.masterdistributors.com.au)

**CONSUMER SWITCHBOARDS**

Clipsal by Schneider Electric has extended its Resi MAX range of consumer switchboards, now offering a complete solution with 8-, 12-, 18-, 24- and 36-module wide plastic enclosures in flush and surface mounted options.



Resi MAX range provides a comprehensive range of consumer switchboards, surge arrestors and residential circuit protection.

With products to protect Australian homes from top to bottom, the latest introduction to the Resi MAX range includes 24- and 36-module wide enclosures. Compact and light in design, the range of Resi MAX enclosures provides a cost effective solution for home owners without compromising on quality and style.

**Clipsal by Schneider Electric**  
[www.clipsal.com](http://www.clipsal.com)

**HIGH, LOW BAY FLOODLIGHT**



Lumex Lighting has released the SkyBay3 high and low bay floodlight.

SkyBay3, with its distinctive green ring, is more than a model change. It is a major leap forward in design and performance.

The SkyBay3 is brighter and more versatile than ever. The light output is boosted and the compact size works just as easily as a high-bay, a low-bay and even as a floodlight.

Backed by a seven year warranty, the Lumex SkyBay3 Range is impressive and provides a significant saving.

**Lumex Lighting**  
[www.lumexlighting.com.au](http://www.lumexlighting.com.au)

**LED SATELLITES**

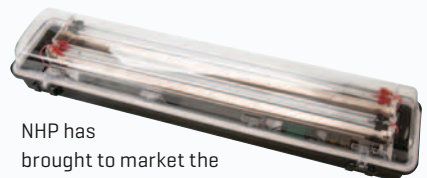
From carparks to industrial premises, it's important to have all your emergency areas illuminated effectively and efficiently. Legrand's new Super LED Satellite is specifically designed to illuminate from high ceilings large areas in emergency situations.

Legrand's key aim was to develop a product that could illuminate a large area using a single Chip On Board (COB) LED. To achieve this, a unique double refractive lens was developed. The lens provides an ultra-wide optical distribution and is ideal for applications such as: parking lots, exhibition centres, industrial manufacturing, warehousing and most general installations with high ceilings.



**Legrand Australia**  
[www.legrand.com.au](http://www.legrand.com.au)

**HIGH BAY LEDS**



NHP has brought to market the EXEL-L and the EVL high bay LED lighting ranges from Cortem, which are suited to all applications within hazardous environments.

Running at low operating temperatures, NHP's EXEL-L series is IECEx Certified enabling installation in hazardous areas where a high degree of protection and resistance against corrosion is required. This range is equipped with long-life LED tubes sealed in a transparent resin, and thanks to the new reclining frame on which the LED tubes are housed, easy access to the inside part of the lighting fixture is possible. This system simplifies the maintenance and any interventions on the electrical part required by the operator, ensuring greater safety and quick service.

**NHP Electrical Engineering Products**  
[www.nhp.com.au](http://www.nhp.com.au)

## RUGGEDISED CABINETS

Eaton has expanded its current industrial portfolio to include ruggedised cabinets to support the growing trend towards digitalisation of process and communications and provide a safe, secure and available environment for IoT technology, automation and big data, and which is moving traditional UPS products outdoors.

Eaton's ruggedised portfolio will ensure continuous critical back-up power to critical applications in telecommunications, transport, utilities, public services and agriculture whose data collection and processing is located in harsh environments subject to extreme weather, dust, vermin and vandals.

The new range of solutions cater for most applications through customisable designs and offer an Ingress Protection [IP] of 42 to 55, guaranteeing vital electronics remain protected at all times.



**Eaton**  
[www.eaton.com](http://www.eaton.com)

## AIRCHECK G2

Netscout Systems has announced new features in the AirCheck G2 that let WiFi professionals better address performance problems on wireless networks.

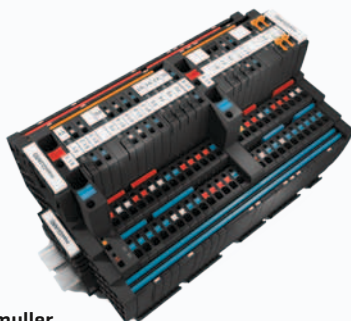
The newest version of AirCheck G2 addresses a major challenge in WiFi network testing – how to determine actual network performance. By offering the ability to quickly and easily verify throughput and performance, and detect non-802.11 interferers on the WiFi network, AirCheck G2 lets wireless network professionals determine how various impairments may impact the end-user experience. Using an easy to deploy test accessory as a performance endpoint, network performance degradations can be identified, pinpointing to the WiFi access, the LAN or even wide area connections. This release also provides increased efficiencies with captive portal support.



**Netscout Systems**  
[www.netscout.com](http://www.netscout.com)

## MAXGUARD

Fail-safe and maintenance-friendly control voltage distribution that can be installed in a time- and space-saving manner is a must for efficient machine and facility operation. With the new maxGUARD system from Weidmuller, the terminal blocks (previously installed separately) for distributing potential to the outputs of the electronic load monitors become an integral part of a 24V DC control voltage distribution solution. The new combination of load monitoring and potential distribution saves time during installation, increases safety against failure and reduces the amount of space required on the terminal rail by 50%.



**Weidmuller**  
[www.weidmuller.com.au](http://www.weidmuller.com.au)

## UNDERFLOOR HEATING THERMOSTAT



The Thermotouch 4.3dC is Thermogroup Australia's first dual control electric underfloor heating thermostat that can control underfloor heating and an additional appliance.

The dual control Thermotouch thermostat includes two relays that can be independently controlled providing the ideal solution for underfloor heating and an additional appliance such as a towel rail or demister.

The Thermotouch 4.3dC is available in two colours; ice white and satin black and has eight display colour options. It can be used in landscape or portrait made allowing you to personalise your thermostat to suit your home.

**Thermogroup**  
[www.thermogroup.com.au](http://www.thermogroup.com.au)

## LED FLOODLIGHT

The Crompton Hornet is a low-profile LED floodlight that has a slimline body that can hide unobtrusively when mounted under eaves. The adjustable head [300° horizontal and 200° vertical] allows the user to direct light anywhere. A separate mounting base also allows for retrofitting onto existing floodlight mounting points – it is engineered to deliver performance output and robustness.

As one of the most compact LED floodlights on the market, the Hornet produces high lumen output from lower power consumption.



**Gerard Lighting**  
[www.gerardlighting.com.au](http://www.gerardlighting.com.au)

## HUE WHITE AMBIANCE

Philips Lighting has announced the launch of the next category in the Philips Hue range, the Philips Hue white ambiance.

Philips Hue white ambiance is a wellbeing-focused light that helps to ensure the perfect light for every moment of the day. From warm gradual light that wakes you up naturally in the morning to energising light for increased productivity and relaxing reading light at the end of the day, Philips Hue white ambiance lets users tailor light to suit their lifestyle.

It features a Hue dimmer, which allows users to control all the lights in a singular room and set individual routines from their phone or wearables, including Fitbit, Apple Watch and Android Wear.



**Philips Lighting**  
[www.lighting.philips.com.au](http://www.lighting.philips.com.au)

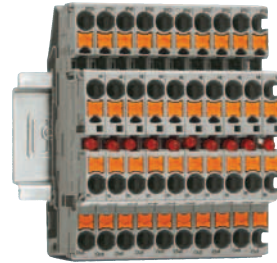
## CURRENT INDICATOR TERMINAL BLOCK

Phoenix Contact has released a new current indicator terminal block with push-in connection technology for hassle-free use.

The Phoenix Contact PTTB 2,5-ILA 100 current indicator terminal block simplifies the connection process thanks to its 'push-in connection technology' which allows direct plug-in capability. Whether working with solid conductors or conductors with ferrules, technicians can connect directly to the terminal point without any fuss.

The technician simply aligns and inserts the wire into the marked terminal points.

The low insertion forces of the push-in connection terminal block enables the conductors to be inserted easily and directly and tool-free.



**Phoenix Contact**  
[www.phoenixcontact.com.au](http://www.phoenixcontact.com.au)

## ELECTRICAL TESTER



Fluke has developed FieldSense technology that takes the open fork functionality of the T5 electrical tester and adds, for the first time, AC voltage measurements. Now electricians can take simultaneous voltage and current measurements, not just detection, without test leads.

Contacting electrical conductors with test leads or alligator clips requires metal-to-metal contact, which carries the potential for arc flash. FieldSense technology eliminates that step.

The new T6 electrical testers, the first tools to use FieldSense technology, are now available at local distributors and retailers.

**Fluke**  
[www.fluke.com.au](http://www.fluke.com.au)

## FLAT PIN PLUG AND SOCKET

NHP has introduced the ISO 20A flat pin plug and socket.

Within this range extension, three series are being released including the 20A flat pin plugs, 20A flat pin socket outlets and 20A flat pin switched socket outlet.

This addition to the flat pin range incorporates a range of new features, including a 20mm male cable gland entry that can be changed out to suit various gland types such as corrugated conduit, anaconda, rigid conduit and standard cable glands.

Ideal for commercial to industrial applications of any category, the 20A flat pin plug and socket also features a swing away internal cord grip allowing faster installation times and fewer components.



**NHP Electrical Engineering Products**  
[www.nhp.com.au](http://www.nhp.com.au)

## STRING INVERTER

ABB has showcased new solar solutions, including 100kW and 120kW string inverters.

The inverter will feature an extended input voltage range up to 1,500V DC. It has been designed for large scale commercial and industrial PV installations, as well as for ground-mounted projects. It requires minimal onsite interventions, reducing operating costs, as it has access to the Internet of Things via IP based communication, scalable cloud architecture and easy wireless commissioning via tablet/mobile device. Overall, it optimises the total cost of ownership.

Joining the new string inverter will be ABB's latest addition to the TRIO family, the TRIO-TM. This 3 MPPT version features power ratings up to 60kW, and has been designed with enhanced flexibility in mind to maximise the ROI in large systems.



**ABB**  
[www.abbaustralia.com.au](http://www.abbaustralia.com.au)

## New Emergency Range

Energetic Lighting Australia is proud to release a range of high quality, cost effective emergency lighting solutions.

Designed to meet harsh Australian conditions, these products will provide a simple and flexible installation solution for all new or refurbishment projects.



### EMG Downlight

Recessed Non Maintained LED  
Emergency Light



### Stellar Plus EMG Batten

LED Strip On Board Batten With Emergency

### Tempest Nova EMG Batten

Weatherproof LED Strip On Board Batten  
With Emergency



### EMG Exit Sign

LED Emergency Exit Sign





## REJECTING A PROPOSAL

Draft Minimum Energy Performance Standards (MEPS) for LED lighting has sparked debate across the lighting industry. **Simeon Barut** delves into the potential ramifications passing the proposed legislation could have on LED suppliers and light designers.



In July 2016, an amendment to the *Greenhouse and Energy Minimum Standards [GEMS] Act 2012* was proposed, looking at the potential introduction of Minimum Energy Performance Standards [MEPS] for LED lighting.

The draft MEPS Standard was developed to address LED efficiency and performance concerns in the Australian and New Zealand markets. Included were a series of performance restrictions that ensured LEDs remained an effective alternative to other lighting technologies that were less efficient.

Of course, implementing MEPS for LEDs has the potential to improve overall performance of lighting installations as well as spark greater consumer confidence in the diode-based technology. Further, the proposed MEPS presents a chance to increase energy (and therefore cost) savings by removing less effective LED lighting from the market entirely.

One large multi-national lighting supplier, which asked not to be named in this article, has come out in favour of the introduction of MEPS for basic and traditional LED luminaires, but only if there are modifications to the draft Standard.

In particular, it does not support the introduction of new or additional labelling for basic or traditional luminaires.

The biggest hurdle for this well-respected supplier, however, is that under the proposed amendment, 40% of its products would fail the proposed minimum lm/W requirement (i.e. >85lm/W by 2020 and >100lm/W by 2023 for non-directional lamps and >110lm/W by 2020 and >120lm/W by 2023 for linear LED tubes), which would result in the withdrawal of an estimated 1,900 products from the company's offering - products that would not be uncommon in the back of an electrician's van today.

Given the lighting market is already highly competitive, any proposed legislation that results in a large

reduction of its luminaire portfolio will of course have a detrimental effect on the business, which will ultimately make it more difficult for Australian contractors to source application-specific product, which in turn will kick-off a long period of expensive trial and error while electricians hunt for viable alternatives.

Interestingly, the proposed European Directive 2009/125/EC in its current form calls for minimum efficiency requirements of around 66lm/W with further reduction factors being considered to allow for high colour rendering LEDs along with luminaires that feature glare control, resulting in minimum requirements of around 50lm/W. In addition, the US Department of Energy [DOE] is currently considering implementing a minimum efficiency standard for LEDs of 45lm/W [to be effective from 1 January 2020] for all general service lamps, according to *Energy Conservation Program: General Service Lamps Notice of Proposed Rulemaking [NOPR]*.

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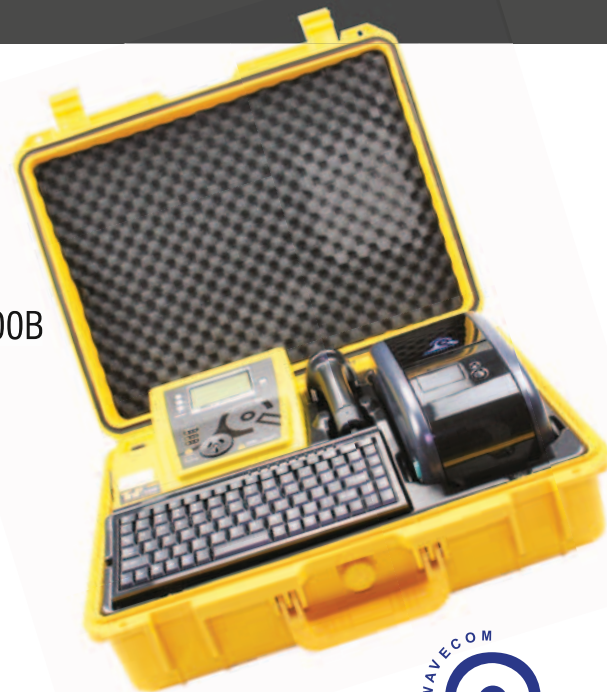
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In addition, the most recent version of *Green Star USA for Residential Luminaires* has documented a minimum requirement of 50lm/W to 70lm/W for some of the most energy efficient LEDs in the country.

This raises a very serious question for suppliers: why are the proposed Australian MEPS for run-of-the-mill residential LEDs higher than what the DOE is proposing for 'premium' energy efficient LEDs used in American homes?

A leading industry group, which also asked not to be named, has analysed the draft Standard and found that the proposal would have an overwhelming compliance burden on suppliers and for this reason could not support the introduction of MEPS, in its current form.

"The transition to LED products is accelerating. The LED lighting market is growing quickly and the sales of non-LED lamps are decreasing. Industry's research and development efforts are focused wholly on LED developments," the group wrote in a response to the draft.

"The installed base of traditional lamps and luminaires is large and diverse. With good and affordable LED alternatives available, customers are switching to LED.

"We support MEPS as a vehicle for improving the energy efficiency of lighting equipment placed onto the Australian market, but only where this is the most appropriate and cost-effective means of addressing market failure.

"As a group, we also support the proposed phase-out of incandescent and halogen lamps. This will achieve 70% of the forecast energy savings; however, we doubt the proposed MEPS for LEDs will save the other 30% of forecast energy savings."

Further, the group says there are no issues with the current state of the LED lamp market, especially nothing that would require a large regulatory burden.

The industry group explains the draft Standard assumes that compliance information required under the proposed changes is readily available to Australian suppliers. This isn't the case. For a number of suppliers, the added testing burden will drastically increase industry compliance costs.

"The regulatory analysis that has been done seems unfair as it assumes the

availability of test report information, industry compliance costs, the market share of poorer quality LED lamp products and the effectiveness of any regulatory monitoring, verification and enforcement efforts," the group wrote.

"The proposed changes could also lead to a massive reduction in Australian consumer choice, costly and time consuming qualification efforts and unaffordable and unachievable monitoring, verification and enforcement; just to name a few.

"We've seen time and time again that regulations like these are difficult to adequately enforce and this is becoming widely recognised, not only by government and industry representatives, but also by non-government organisations (NGOs) that share our environmental goals."

Some recommendations from suppliers have included revisiting the minimum lm/W efficiency requirements so that they apply to all traditional non-LED lights. This is to ensure that lm/W MEPS for traditional lights are not more onerous than the new lm/W MEPS for LED luminaires. Suppliers do not want a situation where LED luminaires revert to less efficient and lower cost lights.

#### DESIGN OF THE TIMES

It is also suggested that labelling for lighting products should stay the same, which is in accordance with Australian Standard AS/NZS 60598.1:2017 *Luminaires - General requirements and tests - Section 3 Marking*. The general consensus is that adding any additional labels to packaging will have little influence on what lighting designers choose as many make their decision based on technical data sheets.

However, there is concern that the MEPS implementation as a blanket formula across all classes of LED lighting could be impractical, especially for lighting designers. According to International Association of Lighting Designers (IALD) regional coordinator

Steven Brown, MEPS is practical for simple LED downlights but it poses huge cost ramifications for technical application-specific equipment.

"The driving force behind MEPS seems to be aimed at addressing the bottom end of the market only and lift the quality of cheap, poorly performing LED products," says Steve.

"As lighting designers, we have no issue with that basic principle since these cheaper, underperforming alternatives are often used as

substitutes for better quality products that often spoil the outcomes of our design intent.

"However, professional and commercial grade LED downlights have a far higher level of diversity and sophistication – both at a product level

and at an application level – than a very basic LED sold by hardware stores. For this reason, the associated red tape to comply with MEPS for the professional market, where some product types are sold in small numbers, is prohibitively burdensome and expensive."

As it stands, regulation costs will reportedly increase by than \$80m over 10 years and these price increases will be predominately felt by consumers. Steve says further consideration of the LED market should take place before regulation starts and due to Australia not being a major market, it should follow in the footsteps of Europe and the US insofar as timing, product requirements and compliance costs are concerned.

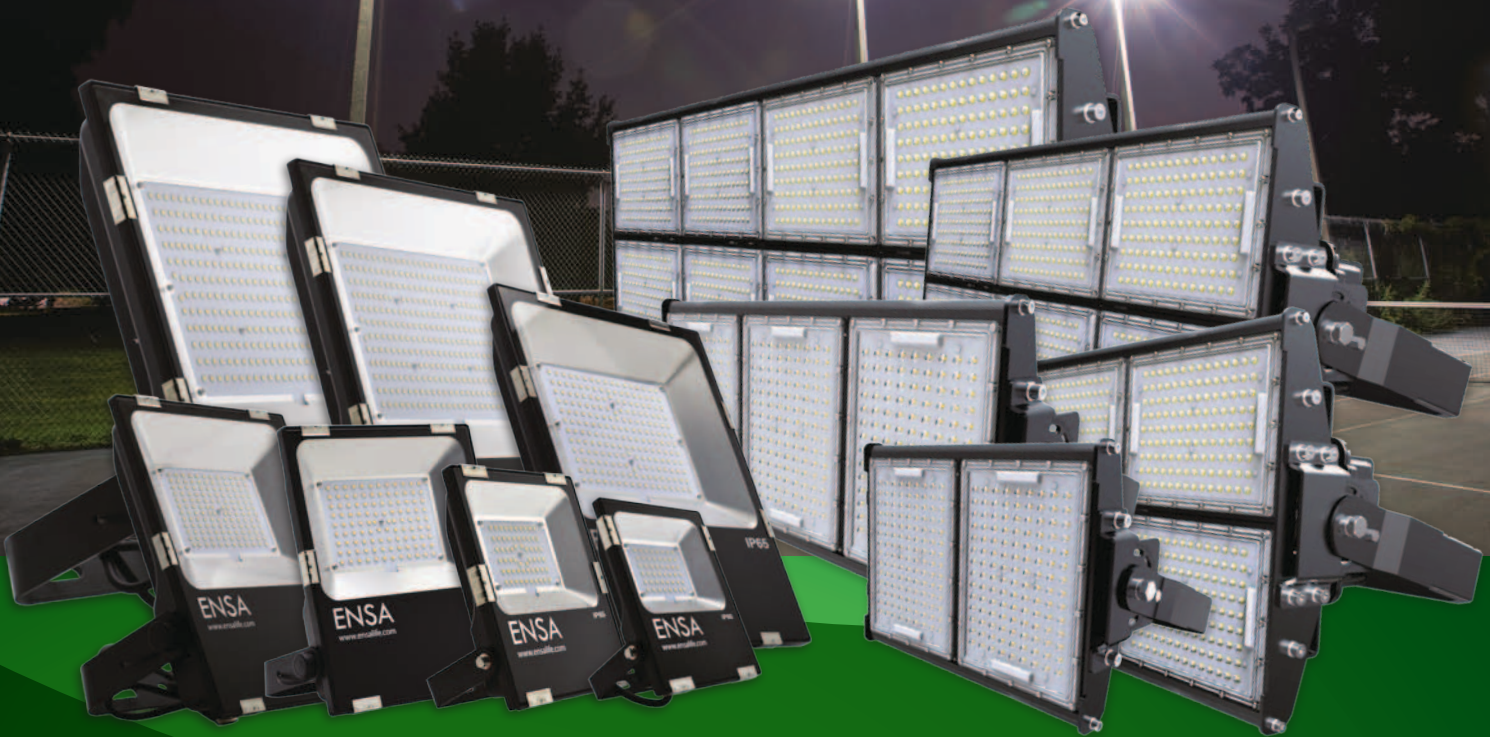
"Hopefully the application of base-line MEPS to the most basic luminaires or to LED lamps will rule out the poorest performing products," says Steve.

"Beyond this we believe MEPS For LED luminaires should be left to lighting professionals in the various Australian Standard committees who have in-depth knowledge of the diverse aspects of lighting applications and equipment, rather than it being applied as a 'one-size-fits-all' big stick." ■

## Why are the proposed Australian MEPS for residential LEDs higher than what the DOE is proposing?

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## HELD TO **ACCC**OUNT

Accusations levelled at the electrical cabling sector have been dismissed by the Federal Court. **Paul Skelton** reports on a court case that left a trail of destruction in the industry.

**O**n 10 March 2017, the Federal Court dismissed proceedings brought by the Australian Competition and Consumer Commission (ACCC) against electrical cable manufacturers and wholesalers, and their executives for alleged cartel conduct.

The ACCC alleged that in 2011, at a meeting of the Electrical Wholesalers Association of Australia (EWAA), the respondents made an arrangement which had the purpose of fixing prices, preventing, restricting or limiting the supply and acquisition of electrical cable, and allocating customers.

In particular, the ACCC alleged this arrangement included the following provisions:

- The manufacturers would increase their cutting services fee to \$85 per length cut for electrical cable and

the wholesalers would not object to those fees.

- The manufacturers would introduce a minimum order value (MOV) fee of \$250 for orders of electrical cable less than \$2,500, and the wholesalers would not object to those fees.
- The wholesalers would not reduce the volume and/or value of electrical cable that they acquired from the manufacturers.

The ACCC also alleged two respondents engaged in bid rigging in response to a request for proposals from Caltex for the supply of electrical cable for an upgrade of the Kurnell Refinery in Botany Bay, NSW.

Justice Beach dismissed all allegations against:

- Australia's two largest electrical cable manufacturers, Olex and Prysmian.

- Electrical cable wholesalers, Rexel and Lawrence & Hanson.
  - An industry association, the Electrical Wholesalers Association of Australia (EWAA).
  - A senior executive from each of Olex, Prysmian, Rexel and Lawrence & Hanson.
  - Two senior industry executives who attended meetings representing the wholesale buying group, Gemcell.
- Justice Beach also awarded costs in favour of the respondents.

In an open letter addressed to ACCC chairman Rod Sims, which was shared with *Electrical Connection*, L&H former executive general manager Stephen Hanlon criticised the ACCC for its multi-million dollar 'witch hunt' against the electrical cabling sector.

"I write to you following the

comprehensive defeat of the case bought by the ACCC against various members of the Australian electrical wholesale industry and a number of individuals of those industry players," it reads.

"You were very public in your press release, alleging cartel behaviour, which has now been repudiated by the Federal Court.

"When can we expect your press release indicating how wrong you were?"

"I have no doubt, should it appear, you will make statements like, "we will continue to prosecute such cases where we believe there has been inappropriate and potentially illegal conduct", "we want to ensure all companies in Australia understand and abide by their legal obligations", and "we need to work with the Parliament to ensure the laws protect Australian consumers".

"All are noble, just and essential obligations for our country; but, they are hollow words unless you resolve to fix your own organisation's failings. You oversee and direct an organisation which is ignorant of market reality, establishes its own version of the truth and then seeks evidence to support it, and is prepared to waste huge amounts of money in the pursuit of fantasy."

[In a press release dated 10 March, Rod Sims is in fact quoted as saying: "Pursuing cartel conduct, which is so detrimental to the competitive process, will always be an enforcement priority for the ACCC."]

"At a rough estimate, between \$20 million and \$30 million in legal costs has been expended through the process of this case," Stephen writes.

Despite not being named as an individual respondent to the case, Stephen describes himself as "a participant whose reputation is damaged, career has been affected and whose personal wellbeing has been jeopardised."

"When a supplier comes to me and says "I'm putting your prices up", you and your colleagues at the ACCC seem to believe I have acted illegally. That is the essence of what happened, and resulted in over six years of pain," Stephen writes.

"In late 2013, I received a Section 155 notice compelling me to give sworn

evidence, without legal representation, and without any of the normal legal protections our system provides. In fact, I was not allowed to tell anyone that I had received the notice, nor could I tell anyone anything of what was said.

"I am exposed in December 2013 to over six-and-a-half hours of 'interrogation' resulting in over 200 pages of transcript. The majority of questions would be inadmissible in court due to their hectoring nature, their hearsay and more importantly their hypothetical nature. I still laugh when I recall the combination of four hypothetical questions in one.

"Your team clearly had an agenda and were determined to generate facts to support their conclusions. Rather than a realistic exploration of the industry, its dynamics and the potential application and execution of the assumed cartel behaviour, I was confronted with fairy tales."

Stephen writes that what makes the situation even more laughable was the timing of the case.

"During this whole saga, defective cable of the type covered by your action was exposed and recalled. It had been supplied by a new market entrant with no industry experience. It was the very respondents to your action who could have helped resolve this and the industry organisation, EWAA, which could have ensured the maximum impact of this recall. More importantly, it would have been that organisation which could ensure that such a failure would not happen again. This case ensured none of that could occur," he writes.

"Also running in parallel was a finding of alleged dumping against a number of Chinese manufacturers of product the subject your action. This resulted in penalties being applied.

"So we had the body established by the industry to avoid such circumstances, EWAA, disbanded as a result of your action. And all the major players whose interest had been to work to ensure only compliant product was sold to installers, wasting money on defending spurious allegations from the very same organisation, yours, which is responsible for ensuring only safe products are sold in Australia. At the

same time, another arm of government was taking action on illegally dumped product which again was one of the key agenda items of the industry body.

"It would make a great episode of *Yes, Minister*, if it weren't so serious."

Guy Picken, the former chief executive of Rexel Holdings, was named as a respondent in the case.

He says after enduring this process, he will never join another trade association, even if it is founded on the best of intentions.

"We got our first notices of investigation in 2011 and judgement in 2017. Six years to sort this out is ridiculous," Guy says.

"Further, the law is so convoluted that it is impossible for a businessman to navigate it without a lawyer."

The process was made increasingly difficult as the ACCC reportedly kept changing the allegations.

Originally, the group was investigated for alleged or suspected breached of section 45 of the Act, which looks at anticompetitive contracts. When the case actually commenced, the allegation was that the cable companies and the wholesalers entered into a cartel arrangement whereby the cable companies fixed the price of cable and the wholesalers aided this by accepting a price rise.

The allegation was then changed to the wholesalers colluding to fix prices with Olex and possibly Prysmian.

Finally, virtually on the last day, during closing arguments, the ACCC again changed the allegation to an arrangement whereby the manufacturers would increase cutting fees and would agree to impose minimum order quantities on the wholesalers, which would have been of no benefit to wholesalers.

Bizarrely, even though he was named in the lawsuit, Guy says he was never interviewed by the ACCC.

[A number of other wholesalers who were active members of the EWAA were also interviewed but the ACCC seemed to selectively charge organisations and individuals while remaining indifferent to others.]

"The first time I spoke to anyone from the ACCC was in court. Had they thought I had contravened the Act, why wouldn't

they have made an effort to discuss the allegation with me and give me a chance to disprove it before spending millions to prove my innocence? I would have thought this especially logical as we had a lawyer present, minuted the meetings and were obviously not trying to be covert," Guy says.

But what appears to stick in the craw of most, if not all, of the people involved in the case was that the alleged price fixing was so minor as to be illogical.

"For us, the alleged price fixing represented less than 0.5% of the cost of cable. It would be like Holden and Ford getting together and fixing the price of floor mats but not the car. It wouldn't make any commercial sense," Guy says.

"In reality, while there were increased fees it was like budget airlines charging for meals and baggage. It wasn't to increase costs – it was to allow them to reduce the airfare and let the consumers choose if they want a meal or not."

BGW Group chief executive Laurie Murphy was another respondent to the case, named as a representative of the wholesale buying group Gemcell.

BGW Group is the parent company of CNW electrical wholesalers.

"[BGW Group owner] Brian [Webb]

and I were alleged to have knowingly aided, abetted, counselled, procured and induced our competitors to make more money. Have you ever heard of anything so ludicrous?" Laurie asks.

"The resulting action has cost our industry millions of dollars.

"The Section 155 process alone is very emotionally straining and costly – you require legal representation at these proceedings, but when you are proven innocent you are not able to claim back those costs. It's an ordeal with heavy emotional strain and significant legal fees with no recompense."

As to the effect on the wider industry, Laurie says it's not positive.

"Recently, the Queensland Government Electrical Safety Commissioner was seeking industry input into the current Electrical Safety Legislation and the Electrical Contractor's Licence. He asked me to get an industry group together to have their input. Unsurprisingly, no wholesaler is willing to be in a room

together again," he says.

"We have also seen senior executives who have dedicated their lives to the industry leave their employment under the cloud of this investigation. It is a disgrace for someone like Robin Norris, after all those years of commitment, to leave under such circumstances. Graeme Moncrieff and Llyr Roberts suffered the same fate. The knowledge and professionalism that has been lost to the industry is very sad."

Despite the negatives, Laurie remains an optimistic force in the industry.

"The ACCC has recalled a number of products that rely on the distributor to

take action to recall the product. Look at the Infinity Cable debacle, where significant metres of that cable are still installed, with little to no action or consequence being taken. Imagine if we had the millions we spent on lawyers to use for regulatory activity on non-compliant product?" he says.

"I do hope that out of the insanity that was the ACCC investigation, some maturity and a genuine want for the betterment of our industry will shine through." ■

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**"It would make a great episode of *Yes, Minister*, if it weren't so serious."**

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## HOW DO YOU REBUILD AN INDUSTRY?

*Publisher Jeff Patchell has followed this disappointing time in the history of the electrical sector. Below are his thoughts.*

In the war that was raged by the ACCC, the electrical industry lost a number of good men.

Unfortunately, when the global-owners of the major electrical wholesale and cable manufacturing businesses became aware of the notices being served on their Australian management teams by the ACCC, relationships were tested.

Some were supportive of their management teams, others less so. It is believed that one even encouraged its staff to do practically anything to side with the ACCC and move on. In the end, it meant early retirement for some and

encouragement to 'move-on' for others.

The one private Australian company who had two executives in the gun sights of the ACCC had to fund their own multi-million dollar defences, a significant strain on such a business.

But put aside the financial issues, the greatest strain was the mental anguish everyone was put through over such a lengthy period, while holding down their day jobs, eking out a new living or twiddling thumbs in early retirement, waiting for a result.

As an outsider with some knowledge of what was going on, I was particularly disappointed by the lack of open support shown to these men by the electrical contracting sector in general.

Most of these executives had grown up through the ranks of their companies

and along the way engaged with the majority of Australian electrical contractors, large and small – they fought for you when your trading account was delinquent, made special arrangements to help you get that next big job, hosted you and your staff at many a function locally and overseas and were there to answer that phone call asking for advice. All in all, genuinely good blokes. Some had more than 45-years service, but after being cleared, nobody offered to acknowledge their service as might normally have been expected. The EWAA has disappeared; it was an important foundation for this industry. Partnerships between suppliers, wholesalers and contractors will never be the same again.

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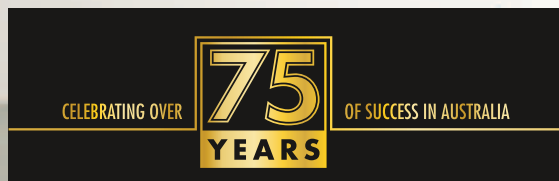
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# SCHOOL OF LOCK

Education has changed radically over the past 50 years – but perhaps nowhere more than in ensuring the safety of pupils, as **Ian McMurray** finds out.



**Q**uestion: what do Palm Beach Currumbin State High School and Brisbane's Boondall Primary School in Australia, and St. Edmunds School in Birmingham and Wolsey Junior Academy in Croydon, England have in common? Answer: all were recently subject to lockdown in response to real or perceived threats. And: there have been many, many more...

If you're of a certain age, you're probably thinking 'lockdown?' Back in those heady days when use of the cane or spending your lunch break writing out 500 times 'I must pay attention at all times in maths lessons' were considered appropriate punishments for a misdemeanour, lockdowns were unheard of.

If, on the other hand, you have children of school age, then lockdown is something with which you're probably very familiar. Today, schools do lockdown drills as often as we once used to do fire drills.

The history of school lockdowns can probably be traced back to the notorious Columbine High School massacre in April 1999, when 12 students and a teacher were murdered by Eric Harris and Dylan Klebold. Inevitably, as well as sparking renewed debate over America's gun control laws, it also focused increased attention on ensuring the security of schools – an attention which is now worldwide. That attention only increased in 2012, following the killing of 20 children and six adults at Sandy Hook Elementary in Connecticut.

## **BORROWED FROM PRISONS**

But what, exactly, is a lockdown? It's a term said to have been borrowed from the prisons regime in which prisoners are confined to their cells, typically to regain control in a riot. In education, it means securing the establishment with staff and pupils locked in the building – and potential intruders locked out. It's not, though, just applicable to schools: lockdown policies are also in place in many businesses. It's akin to the old

practice in the wild west of drawing the wagons in a circle to ward off an attack by those pesky Indians...

It's not just about potential shootings, though. A lockdown may be in response to a threat to the school of any kind – or to another school in the area. It can be in response to suspicious activity, or a civil disturbance, nearby. It can be in response to, for example, fire or severe weather, or reports of highly polluted air – or for something as apparently minor as a dangerous dog on the loose. It is an unfortunate, if inevitable, fact that hoax threats to schools have become commonplace – but schools need to react no less completely.

Because of the range of threats, their perceived likelihood and perceived severity, various types of lockdown have evolved. A 'soft' lockdown may be a school where external doors remain locked throughout the school day, and visitors are vetted before entry. A 'partial' lockdown places the school on high alert and prepared to implement a 'hard' or 'full' lockdown, which brings





In May, Palm Beach Currumbin High School on the Gold Coast was subject to lockdown following a bomb threat - which turned out to be a hoax.

all pupils and staff into the building, and windows and doors (possibly including classroom doors) locked - and can often only be lifted by the police.

#### EXTENSIVE MARKET

Unsurprisingly, there is now an extensive market for lockdown systems, not least because it is now mandatory for schools in Australia to have protocols in place to respond to threats. In many cases, these can be thought of as application-specific implementations of, for example, a PA system or emergency evacuation system (although a lockdown is, of course, usually the reverse of an evacuation) - or even the bell system that often signifies class changeover time. A range of solutions is available - from simple broadcast messages to the ability to lock all external doors at the push of a button, from basic point solutions to what can be thought of as enterprise-grade integrated systems that leverage the existing IP network and encompass PA, fire alarms, panic buttons, CCTV and so on. The kind of access systems - via badge or fob, for example - widely deployed in business are also finding favour in schools.

Locking external doors is, of course, appropriate when the threat is outside the school buildings - but if the threat is already on the premises, then systems are available that immediately lock all doors within the facility, confining pupils and staff to the space they are currently in. Some systems allow for the creation of zones, such that only a subset of doors is locked: much depends on the

layout and flow of the establishment. It is also, of course, important to pay attention to security on the school perimeter to provide security for pupils during break times.

Many systems provide for three stages of alert. Stage one is 'stand by' - some form of warning that a lockdown may be about to be implemented: this can be in the form of a 'secret signal', which may be a specific piece of music. The second stage is to implement the lockdown itself (and a distinction may be made between lock in and lock out) - and the third, to sound the all clear.

#### RELIABILITY, SPEED

Some vendors stress that their systems are wired, rather than wireless - allegedly providing superior reliability in an emergency situation. For similar reasons, some include battery back-up in the event of mains failure. Inevitably, some solutions are app-based, allowing control via a mobile device, while others can be activated from any PC on the campus. In choosing or specifying a system, an overriding concern will always be the speed with which a lockdown can be implemented: as many commentators note, in an emergency, seconds count.

Activation of the necessary alarms can be from a single point, or multiple locations throughout the facility. This will depend on the school's policy of whether only one person is authorised to make a lockdown decision, or whether that responsibility is devolved to individual teachers. In the case of distributed authority, some kind of

central control panel is necessary to ensure that the classroom that has initiated a lockdown can be rapidly identified. Provision - perhaps in the form of walkie-talkies - needs to be made for staff to be able to communicate with each other.

As with any AV application, understanding the problem is key. Lockdown systems can be thought of as a highly specialist niche market - a subset, perhaps, of the overall security market - and subject knowledge is vital. Just because a school thinks it knows what it wants, it doesn't necessarily follow that that's what it needs. There is no 'one size fits all' lockdown solution. Research has shown that too many schools focus exclusively on the 'active shooter' scenario, without considering the multiple other circumstances that create the need for lockdown.

#### COMPLEX, LENGTHY

And, yes, the sales process can be complex and lengthy, given the number of potential stakeholders - from the education authority and emergency services through teaching and IT staff to parent associations. All of them may have different - and potentially conflicting - requirements. Just as with school network security, a lockdown system will be the outcome of the establishment's broader policies concerning student welfare, and the balance between protection on the one hand and individual freedom on the other. As always in education, budget is also often an issue.

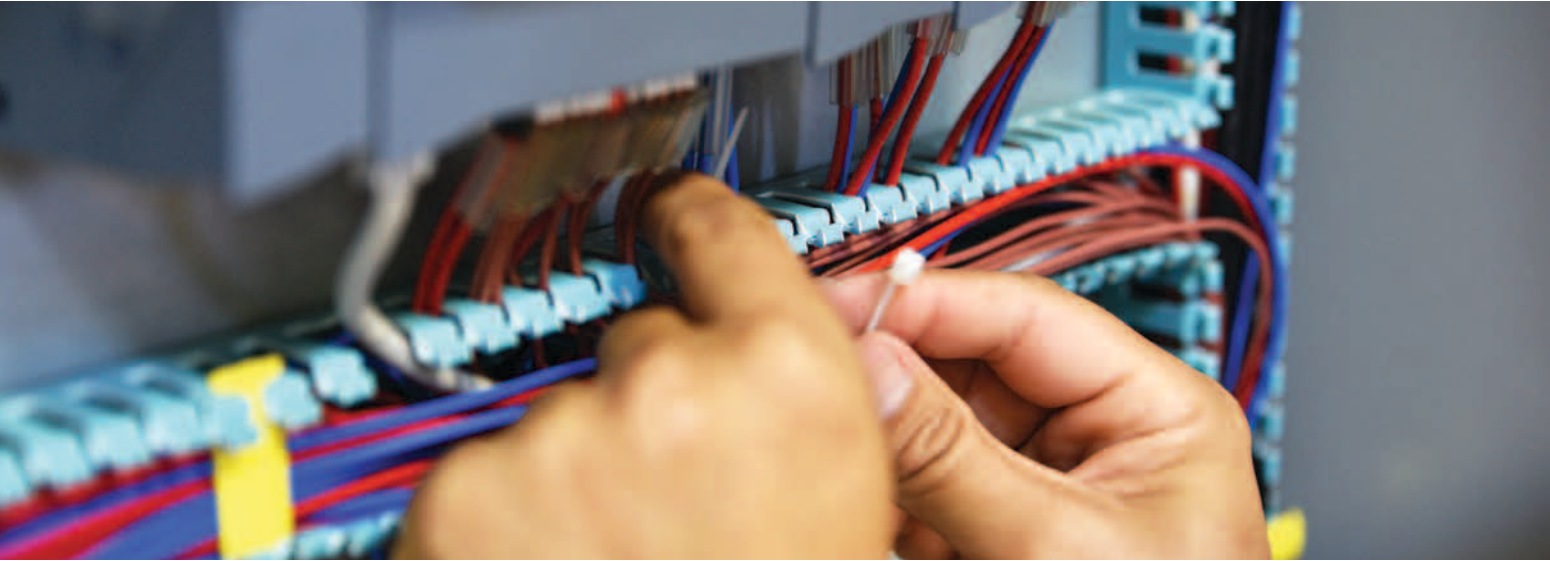
For contractors already providing AV systems to education installations, however - especially internal audio systems and security systems - lockdown systems represent more than an opportunity: it could be said that they represent an obligation. Schools unquestionably need and value the expert advice that a knowledgeable electrician can bring. ■

For the past 10 years, Ian McMurray has worked as a freelance journalist in the global AV industry.



# CUTTING TIES WITH WASTE

Cable ties are everywhere but don't have a great environmental record. **Adelle King** looks at how the industry can cut down on wastage and even recycle nylon ties.



Cable ties were invented in 1958 by electrical company Thomas & Betts as aeroplane wire harnesses and have since been widely adopted in the electrical industry to hold together electrical cables or wires.

According to market research company Orion Market Research (OMR), the global cable tie industry is expected to grow 8.6% annually between 2016 and 2021, with the electronics and automobile industries driving this growth. OMR says there has been rising demand for cable tie products around the world and because the manufacturing process is simple, requires a comparatively small investment to start up and has limited entry barriers, there are plenty of opportunities for small companies and new entrants.

One new entrant into the cable tie industry in Australia is Zippy Tie Man, which was founded in 2014. The company manufactures and imports cable ties but what sets it apart is that it operates a franchise business model.

"It started with me and my van but I couldn't keep up with the demand for cable ties," says Zippy Tie Man owner David Bancroft.

The company now has five vans

operating around Australia and David says the business is continuing to grow.

There is one thing that could slow down this growth though and that's the environmental impact of cable ties. Although useful, cable ties, which are generally made from nylon, are mostly a single-use product and considered non-recyclable by most people. As a result, they are a big cause of waste in the electrical industry.

Approximately 80% of cable ties used in Australia end up in landfill, according to Evo Building Products.

However, David says the perception of cable ties being wasteful is based on a misconception that nylon is not recyclable.

"Not many people realise that nylon cable ties actually are recyclable because they're thinking about recycling in terms of household recycling. You can only put certain plastics into household recycling bins and since nylon isn't one of these, people assume nylon isn't recyclable," says David.

"As they are, cable ties can't be recycled but if you take them down to a local recycling centre, they can generally be melted down for use in other products."

David says another issue that is compounding the problem of cable tie waste is incorrect storage. Ageing has

no effect on cable ties but brittleness can become an issue if the cable ties are not stored somewhere cool.

"When cable ties are stored in sunlight or places where the temperature is extremely hot, it dries out the nylon, causing it to feel brittle. People then assume the cable tie is no good and throw it out," says David.

Nylon is a hydroscopic material, which means it's affected by changes in moisture levels and has the ability to absorb moisture. To give cable ties their flexibility and toughness, moisture is added after the manufacturing process by storing them in a sealed bag with water.

"Storage is really important because heat will cause this water to evaporate and the cable ties will become brittle. If this happens, soaking the cable ties in water will return them to a useable condition, which most people don't realise," says David.

It is estimated that hundreds of billions of cable ties are used each year globally and whether they can be recycled or not, the majority of these simply get cut off and thrown away as part of the installation process.

Releasable ties have been offered as an alternative but the protruding tail portions are still often cut-off and



Unlike traditional nylon cable ties, Rapstrap won't pinch or crimp and provides several ties per strap instead of just one.

discarded. Leaving the tail portion intact, particularly for temporary fastenings, or using removable hook-and-loop ties are better solutions but these are not appropriate for all applications.

The idea that there had to be a better alternative available prompted UK research and development company Kosine to begin exploring the concept of a waste-free cable tie. By 2008, Kosine

had developed Rapstrap, a softer and more efficient option to traditional cable ties, as well as a company of the same name. Rapstrap cable ties, which are distributed in Australia by Evo Building Products, can be removed and reused if required, greatly reducing waste and lowering cost.

"With traditional cable ties, any unused portion is simply cut off and discarded as waste. However, with Rapstrap, unused portions can be used again, an inherently more efficient design that can provide several ties per strip instead of just one," says Rapstrap inventor and technical director Andy Harsley.

Rapstraps feature a cellular tie strip that can loop and weave into a number of different configurations, as well as a self-terminating system. This means the Rapstrap gets progressively used up from the back while the front end, with the tongue still attached, is kept and used again.

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Rapstrap cable ties can be removed and reused as required.

“The Rapstrap is manufactured from elastomeric materials, which makes them much softer than their nylon counterparts. Unlike cable ties, Rapstraps stretch and can be fitted with a controlled amount of tension – either loosely or tightly as required. This makes them more suitable for challenging applications, such as high performance cabling or on equipment with moving parts,” says Andy.

Rapstraps are made from polyurethane and feature a patented design that allows the cells to fold along their spine during use so that one portion of the tie strip can pass through another. When pulled backwards, this folding process occurs in the opposite direction, which snares the outer cell and locks the tie in place.

As with nylon, polyurethane is a recycle type seven ‘other’ material so while it can be recycled in principle, in practice this doesn’t often happen.

“One of the big recycling challenges is separation. Engineering polymers like nylon or polyurethane only achieve their specification if pure. Just a few percent of contamination with other materials will degrade their performance and can even render them useless,” says Andy.

“An ideal solution would be cable ties made from an easier-to-recycle material and we have been working on it. Alternatively, if an end user has a viable quantity of end-of-life Rapstraps then we’re happy to take them back for reprocessing.”

While electrical contractors often use cable ties and see them inside electrical wiring rooms or behind the scenes in a building’s infrastructure, it’s easy to overlook the true scope of the environmental issue.

“In the UK, in excess of one billion cable ties are used annually and approximately 100 million of these are just on mail sacks. Very few of those ties currently get reused or recycled so there’s a very compelling case for finding waste-free alternatives for tying things up,” says Andy. ■

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[www.evobuild.com.au](http://www.evobuild.com.au)

**THE CABLE TIE GUN SHOW**

Cable tie guns, or cable tensioning tools, can help electrical contractors improve efficiency and minimise cable tie waste. Available in manual and automatic versions, cable tie guns ensure the ties are flush and have the correct amount of tension, minimising the wastage of cable tie. Some cable tie guns also come with a waste container that collects cable tie waste so that none can fall onto the ground.

**KLEIN NYLON TIE TENSIONING TOOL**

Klein Tools’ nylon tie tensioning tools are designed to work with ties rated at 54-113kg and tensions of force up to 30kg. There is a manual and automatic version that both feature handle grips for comfort and have a maximum tie width of 12mm. [www.kleintools.com](http://www.kleintools.com)



**WATTMASTER NYLON AND STAINLESS STEEL CABLE TIE GUNS**

Wattmaster has both nylon and stainless steel cable tie guns to help eliminate sharp edges on cut cable ties. The cable tie guns feature tension adjustment and a durable metal construction, while the stainless steel version also has a self-locking mechanism. [www.wattmaster.com.au](http://www.wattmaster.com.au)

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Altronics’ Professional series of cable tie guns automatically tighten and cut cable ties with the simple pull of a trigger. Both the T2346 nylon cable tie gun and T2347 steel cable tie gun feature a steel construction and automatically snip the tail once the correct tension is achieved. [www.altronics.com.au](http://www.altronics.com.au)



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## WHAT WERE THEY THINKING?

The roll out of the NBN has proved that outsourcing complex infrastructure projects to a wholly owned government entity is never a good idea. **Wes McKnight** lets us know his thoughts.

**T**he Australian Government has in the past been able to design, build and implement a 'nation building' piece of infrastructure. Just look at the Snowy Hydro scheme. Towns, roads, and civil and electrical infrastructure were built to deliver the project and workers were imported to help build it.

Yet today the Federal Government is struggling to deliver its national telecommunications infrastructure project, the National Broadband Network (NBN).

While it's enjoyable to watch government ministers struggle when asked about the NBN, it has caused me to wonder why a government would

want to be the ultimate custodian of such a venture. The whole process has been a fraught experience.

A government a few years ago had an epiphany that every house in Australia should have optical fibre running into it, which would be the envy of every country in the world.

However, many countries already had the option to bring fibre into their house. I've been to many of these countries and trust me their citizens are no happier with their lives because their kids can download the latest episode of a show faster than before fibre.

Nevertheless the idea became reality and a group of bureaucrats in Canberra had to sit around and

'workshop' [probably at an offsite] for a few days about how the project was going to be implemented.

No doubt a couple of the big consulting firms won million dollar contracts to write reports on how it should or shouldn't be delivered just so the bureaucrats could rely on someone else if the idea failed.

Workshops were completed, reports delivered, recommendations were drawn up and ministers and advisers met until the penny dropped. It was decided that a new entity would be created from the ground up and taxpayer funds were committed to kickstart the project. Additionally, it was decided that the government

would select the people to run this entity, which would deliver an incredibly complex infrastructure project to one of the most sparsely populated countries in the world.

So began the journey we are all now on.

It takes years to get an operation going to the extent that enough bulk connections are being made to be able to claim real progress, nevermind the geographical issues and lack of population density [i.e. paying customers].

A short cut deal was therefore done with Telstra to 'speed up' the process.

Management teams were employed and were mostly poached from existing companies, which is never a cheap exercise.

A lack of trained installers around Australia and available labour to carry out all civil and technical works in a timeframe that satisfies the stakeholder meant parts of the work were broken down into separate components. Small businesses around the country were then able to bid for the work.

Let me tell you about my contacts and friends who were part of the small businesses bidding for NBN work.

### CASE STUDY ONE

A small specialist financing company in the 'yellow machine' industry [excavators, diggers, borers etc.] was getting deals and finance placed for 14 hours a day within three months. The company was flying and couldn't keep up.

Ten months later, 50% of the customers couldn't keep up their payments and lost their machines and their businesses. The 50% of customers who did manage to hang on did so because they stopped bidding for NBN work.

### CASE STUDY TWO

An electrical contracting company in Tasmania attended an information session run by the major construction/project management firm who was

delivering the NBN for the state. This electrical contractor was encouraged to bid for parts of the work that needed cable and conduiting from the street into the premises. The catch was there was a set price so it was less like bidding and more like accepting.

The set price didn't account for each individual premise or environmental difficulty, it was unit or piece rate work.

The electrical contracting company struggled and struggled, having to use cheaper labour from labour hire

companies and purchasing all of the safety equipment needed. The company left the normal work it had been doing for years to hop on the bandwagon and within three years was broke.

At various times during the three years the company went to the intermediary, which sat between the company and the head contractor, to plead its case and ask for more money for each premise. The company was given a small increase but only within two minutes of threatening to stop doing the work, which suggests to me that there was plenty to give away. More work was promised and the company was assured more valuable work was just around the corner.

### CASE STUDY THREE

I renovated a 100-year old house a couple of years ago and while doing the front garden landscaping I decided to put the conduit in then. I assumed I would get the NBN one day and didn't want my new garden dug up.

Fortunately someone from my office applied for me to get fibre to my house. I checked what type and size of conduit I would need, including depth, bend and radius, and waited for a small contractor to turn up. A few months later, after two other contractors couldn't do the job, a third contractor turned up with five men. Luckily my wife was home and was able to let them know there was a conduit installed.

Three house later when she came back out, the garden was dug up, the sprinkler system was broken and the contractors were gone. However, the fibre was installed.

The story doesn't end there though and two months later another contractor turned up in a 15-year old red Barina with a ladder hanging out the window. There was also a 16mm solid conduit bent in and around the inside of his car and he was able to get us connected after an hour.

Now, when the media ask the Government about how the roll-out of the NBN is going, I reflect on my own experiences and wonder why an educated politician would decide that a government is the best organisation to deliver this project.

Who thought it would be a good idea to outsource this to a wholly-owned government entity with no assets, systems or people?

I haven't been to an 'off-site' or workshoped the idea with 20 other government paid people so I don't have the answer but I do know that how the NBN rollout has been handled to date has been expensive.

I have always disliked people who just point out the problems without an alternative solution so this is difficult for me to do. However, I do know there would have been better ways and I feel that it is not too late to change the approach.

As the roll out of the NBN continues, technology also continues to develop. Perhaps microwave or satellite technology [effectively wireless] will be as cost effective and as fast as fibre soon.

I will keep you posted on my search for a better way but in the meantime I hope next time politicians remember what government is and isn't good at before they make a decision. ■

## Who thought it would be a good idea to outsource this to a wholly-owned government entity with no assets, systems or people?

Third generation electrical contractor Wes McKnight has 32 years' experience 'on the tools' and is the former president of NECA.



# JETTING OVER THE HURDLES

Canberra has a number of iconic landmarks, including the Captain Cook Memorial Jet in Lake Burley Griffin. After nearly two years, the Jet is back to its former glory. **Deborah Andrich** reports.



Opened in 1970 by Her Majesty, Queen Elizabeth II, the Captain Cook Memorial Jet fountain in Lake Burley Griffin, Canberra has long been an icon for residents of and an attraction for tourists to the nation's capital.

Capable of pumping water to a height of 152m, via two pumps, in 2014 the Jet's pump room suffered severe flooding from a burst irrigation pipe causing a complete shutdown of the system. The subsequent repair

work was the first major upgrade the Memorial Jet had undergone for more than 20 years.

The scope of the works included the upgrade to the electrical and hydraulic systems.

The electrical contractor, Shepherd Electrical performed the upgrades on the earthing, HV and LV installation and collaborated on the lighting upgrade, earning the company a 2017 NECA ACT Excellence Award in the Industrial – Medium Project category.

Operation of the Jet is via a 50m intake tunnel to the underground pump house. Two 3.3kV pumps can be operated simultaneously or independently through the Jet 'donut'. The scope of works included replacement of the 3.3kV motor starter panels, an upgrade to the internal pump room lighting to meet current emergency lighting standards, the installation of earthing to comply with high voltage standards and the replacement of the submarine steel wire armour cables.





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Shepherd Electrical installed new cable tray as well as new high voltage cabling.

Specifically the scope of works encompassed both high and low voltage aspects, including the following:

- a) Replacement of the high voltage switchgear.
- b) Replacement of the low voltage main switch board.
- c) Replacement of the high voltage mains cables from the transformer room to the new high voltage switchgear and onto the existing high voltage pump motors.
- d) Replacement of the low voltage mains from the transformer room to the new low voltage switchboard.
- e) Replacement of the existing transformer with full testing and commissioning.
- f) Upgrade of earthing within the pump and transformer room.
- g) Upgrade pump room emergency lighting.
- h) Replacement of the existing submarine cable into the lake.
- i) Control cabling modifications to suit new switchboard and panels.
- j) Supply, installation and commissioning/program of 12 new

IP67 RGBW fittings on the jet donut to illuminate the Jet at night. The lighting is controlled remotely via wireless DMX transmitters from the Jet to shore.

“The original HV cable that provided 3.3kV high voltage supply to the pumps was installed in the late 1960s, and was found to be wrapped in hessian and sealed with tar and asbestos,” says project manager Aaron Vincent.

“A fully licensed asbestos removal team removed the section of pipe on our behalf. To replace it, we under-bored from the pump room to the substations under a nearby carpark. The flow on effect of the cable removal was that one of the original transformers could no longer be terminated correctly and needed full replacement.”

Replacing the submersible cable with three 24-core cables from the pump room to the Jet donut in the lake presented its own challenges. Shepherd Electrical contracted the services of Gray’s Diving, specialists in underwater construction. The cable was too heavy for divers to drag it across the lake to the Jet donut, so a system of floats and buoys was employed to ‘float’ the cable above the lake floor to prevent it from becoming caught on underwater obstacles. The end of the cable was attached to the dive vessel and towed out to the jet nozzle, while staff onshore spooled the cable off and fed it through the lake wall.

Boring through the lake wall presented its own unique set of circumstances.

“As part of the contract we needed to work with the EPA to ensure that we met the waterways requirements for the lake,” says Aaron.

“The lake wall is constructed from concrete and rock, so to get from the Jet to the pump room, we needed to undertake concrete coring, which creates a lot of slurry, mud and debris. To minimise contamination to the lake we constructed a coffer dam from sandbags and lined with plastics, plus we used a hydrovac truck to pump out any contaminated water.”

The challenges didn’t end there.

The neighbouring visitor’s centre on Regatta Point had also been recently refurbished and during those works,

the copper phone line to the Jet pump room was severed, leaving the PLC and SCADA systems without remote login capabilities. To overcome the problem, Shepherd Electrical provided mobile 4G data capabilities as an interim measure while a new NBN fibre was arranged.

The final piece in the puzzle was the lighting on

the Jet donut.

“The lights on the Jet donut were a very basic high wattage halogen flood lights, with no colour changing ability. To change the colour you needed to

## In 2014 the Jet’s pump room suffered severe flooding, causing a complete shutdown of the system.

go out to the donut and change the lens. As part of our scope of works, we replaced it with a DMX lighting control system that can be controlled from either the pump room or remotely from a mobile device. The lamps are now 120W LED that run much cooler and use far less power.”

Despite the complexity of the project, which included asbestos HV cable contamination, copper wire breakage and earthing compliance rectification the project was finally completed. To celebrate the commissioning of the Captain Cook Memorial Jet, the client, the National Capital Authority [NCA], turned on the Memorial Jet for the Canberra Day holiday in March 2017 to its full height of 152m.

In a press release, the then Chief Executive of the NCA, Malcolm Snow, said that, “the Memorial Jet is such an intricate part of the lives of the people of Canberra and I think we’ve all been missing it as this necessary work was undertaken”.

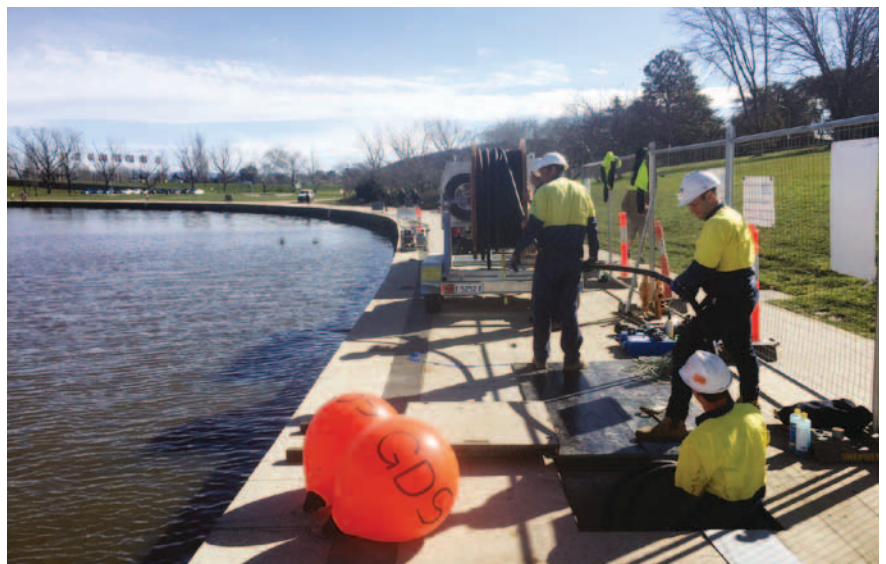
“I’m pleased to announce that the Memorial Jet will begin operating from 11am to 2pm daily, using one pump and at a height at 114 metres, and it will be boosted to two pumps for significant events, special visits and state occasions.”

In the NECA awards submission, Shepherd Electrical stated: “It has been an honour for Shepherd Electrical to be involved in such a prestigious capital works project which had many hidden hurdles to overcome along the way. All parties involved and Shepherd Electrical staff members under the direction of Aaron Vincent and site manager Stuart Gorrell, worked together to overcome them.

“Shepherd Electrical must also acknowledge the contribution to the project by Ecowise Services whose advice and collaboration on the hydraulic systems aided our cause immensely. John Anderson from Rudd’s Consulting Engineers was heavily involved with the certification and compliance of the installation to AS2067. John also completed the protection relay programming and settings in conjunction with David Conlin from Shepherd Electrical.” ■



New HV SWB and SCADA panels were installed for the Capation Cook Memorial Jet.



Due to its weight, submersible cable was ‘floated’ into position.



The Captain Cook Memorial Jet saw a number of new lights installed.



## FOR WHOM THE BELL TOLLS

Door entry systems are an integral part of what makes MDUs safe for its residents. **Simeon Barut** looks at new developments in the market and why electricians will play a major role moving forward.

**T**raditionally, multi-dwelling units (MDUs) featured an entry level intercom system with a half decent lock on the door that, for obvious reasons, provided minimal security.

Thankfully for apartment residents and building owners alike, technology has advanced to a point where video intercom systems are now readily available. And with the technological improvement come enhanced security features and robust designs.

Not only do these new systems give peace of mind to the building owner, but apartment residents are able to keep a close eye on the front of the building in case of an intruder.

According to ABB Australia channel head of building automation Christian Schiemann, electricians who decide to expand their knowledge to suit the

toolset of the developing door entry system market will reap the benefits.

“A great example is when the first home automation system came out 25 years ago; electricians were hesitant to go down that path. Now, like the door entry system market, they’ve put themselves into that market – which is very competitive – and they’ve reaped the benefits. Their services can cater to a wider audience which translates to more business,” says Christian.

“Another thing to look out for with new video intercoms is the fact that they can be integrated into different systems. This is a major aspect of the technology that electricians should be developing their skillset in because there are just so many business opportunities.

“It’s great to have a standalone system but it’s infinitely more beneficial

for the tenants and building operators if it can be integrated into other home automation features.”

Legrand national systems and solutions manager Luca Frigerio says while electricians do need to be more aware of the developing market, manufacturers are making it easier to adapt to the change.

“What we are trying to do as a company is incorporate an easy-to-use user interface for not only the customer, but also the contractor. We understand that it takes a lot of time for an electrician to stay up-to-date on all the new market trends so we’re simplifying it as much as possible,” says Luca.

“As a result, we’ve made sure that our new intercoms are accessible for all contractors and are easy to install and setup.”

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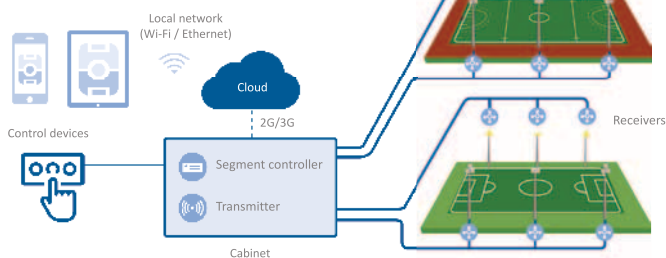
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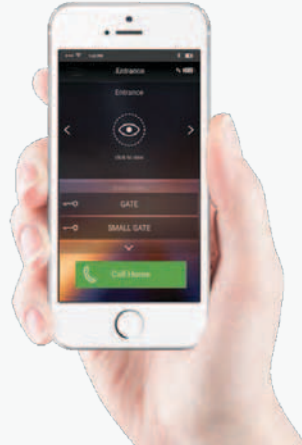
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**PHILIPS**



The Classe 300X13E is the new internal unit which combines communication between smart phones and video internal units. The integrated WiFi connectivity allows connection to the user's smart phone and via an app, is able to monitor video door entry calls in an easy-to-use way.

The new unit features an 18cm touch screen and functionality that means users can manage calls both inside and outside of their residency.

For the electrician, the installation requires no IT skills and the configuration of the classic two wires system parameters. The installation process remains exactly the same due to the WiFi connectivity which is integrated into the video unit and allows any existing units – audio or video – to be instantly replaced with the Classe 300X13E without the need for extra wiring.

The curved and metal finish round out a stylistic look which is available in light and dark, and can be installed via wall mount or table-top.

are currently two types of systems; wired and IP. Wired systems are ideal for retrofitting because there's no need to replace the cabling infrastructure while IP versions are great for new builds.

In a world that's transitioning to IP, video intercom manufacturers such as ABB and Legrand strongly recommend electricians learn the infrastructure around wired intercom systems. This way, if a power outage does occur a redundancy is in place.

According to Lite Automation chief executive Adrian van der Heijden, safety is one of the top reasons for the development of door entry system technology.

Lite Automation is one of the distributors of Doorbird in Australia.

reason for such a big focus on updating these systems," says Adrian.

"A lot of home automation products are derived around security based marketing trends because people want to be more secure at home and doorbells are absolutely a part of the solution.

"They give the tenant the ability to monitor the front of the building without having to actually be there. This also serves as a great deterrent for intruders that might be trying to gain access to the building."

Adrian says that the security element branches off into more aspects than just being able to keep an eye on the entrance to their building as WiFi encryption and a robust unit is also a must.

"It's incredibly important that the security elements of these systems include a robust design and are WiFi encrypted," Adrian says.

"It's fine if the tenant is able to look at who's out the front and even better if they're able to deter any intruder that might be there, but choosing a good quality system – both on the technology side and manufacturing side – is a must."

Due to a lot of new intercom systems incorporating a data or networking component, it becomes quite technical and out of range of the expertise a standard electrician has been trained in. As a result, sparkies will need to expand their knowledge when it comes to configuration, and what systems are appropriate for each customer.

"Moving forward, electricians will have to develop their skills in order to keep up with the complexity of the installations," says Christian.

Ultimately, electricians should expand on their knowledge and skill-set in order to offer their customers an entirely new range of intercoms that improve on MDU security. This will result in a neat solution for the building manager that gives peace of mind to their tenants. ■



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# THE HUMAN TOUCH

Electrical contractors don't tend to offer interior design advice but Human Electrical and Design is thinking outside the box. **Adelle King** reports.

It's rare to find an electrical contractor that works closely with interior designers, which is why it's interesting that Human Electrical and Design has an interior designer on staff who can consult across projects.

Yarra Valley-based Human Electrical and Design is a family-owned business run by Cameron and Clarissa Betts. Cameron is an A-grade electrician, while

Clarissa is a qualified interior designer.

Clarissa says she and Cameron always knew they wanted to combine the two industries and developed Human Electrical and Design around this idea.

"Launching an electrical and design business meant that we could focus on both practical and aesthetic electrical needs. It gives us the ability to make decisions that are well thought out and planned from the beginning, with the whole picture in mind."

Combining electrical and interior design means electricians are able to remain focused on executing the scope of work without getting wrapped up in details, yet the customer still receives an aesthetically

pleasing solution.

"Cameron focuses on electrical efficiencies and technical aspects, while I design spaces that meet our clients' needs. Together, we are able to offer our clients exciting designs that meet both form and function," says Clarissa.

"At times we support design teams and architects, contracted to give professional advice on the planning prior to final design submissions. At other times we work with the end user directly, creating reflected ceiling plans (RCPs), light fitting specifications and switching layouts to maximise design and fulfil function requirements."

Lighting is the most obvious example of where this collaboration can occur as it's the area of the electrical industry that overlaps the most with the interior design profession.

"Where electrical is concerned, I design and submit RCPs, including exit and emergency lighting sensor plans



Lighting is the most obvious example of where this collaboration can occur between designer and sparkies.



and Section J6 energy efficient lighting designs, as well as customised lighting layouts and specifications for the residential market,” says Clarissa.

Whereas most electrical contractors work on projects on a task-based contract, the combination of electrical and interior design has enabled Human Electrical and Design to position itself as a one-stop shop. The company is able to market itself to customers as providing a full service, from concept development and design through to implementation and installation.

According to Clarissa, the key to creating a full electrical solution that is both practical and aesthetic is to give importance to all aspects. Since Clarissa and Cameron can consult

on projects together, they are able to do this, giving equal weight to the technical, safety and design features.

“Overall, room designs work because every detail is thought through and

selected correctly. From the start of the project we’re able to balance technical expertise with aesthetics to create rooms that achieve the best results to suit our customers’ needs,” says Clarissa.

Not all projects are worked on by both Cameron and Clarissa though, and Human Electrical and Design does still take on jobs that are either purely electrical or interior design and colour specifications only.

Yet, there is definitely a shift occurring in the electrical industry

“Launching an electrical and design business meant that we could focus on both practical and aesthetic electrical needs.”

and selected correctly. From the start of the project we’re able to balance technical expertise with aesthetics to create rooms that achieve the best results to suit our customers’ needs,” says Clarissa.

Not all projects are worked on by both Cameron and Clarissa though, and Human Electrical and Design does still take on jobs that are either purely electrical or interior design and colour specifications only.

towards more design-focused solutions that pay careful attention to detail.

Clarissa says this is clearly reflected in the developments being seen in the manufacture, design and colours of available switches and power point faceplates, which are no longer considered ugly or requiring hiding.

As for the other design trends currently dominating the electrical industry, Clarissa says there is a growing trend among customers towards viewing lighting as a design statement rather than just a functional element. Pendants and fixed wall lights have been gaining momentum and remain popular in lighting design.

“No matter the customers’ style, there are now different lighting, switch and faceplate ranges to suit them and this has really encouraged both electricians and customers to start focusing more on the design element of electrical installations,” says Clarissa. ■

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# SOUNDS OK?

Unfortunately, power quality in low-voltage distribution systems isn't going to get better. **Phil Kreveld** outlines the issues this creates for sensitive AV systems.



**Y**ounger teenagers who, by some miracle, have not subjected themselves to headphones blasting at 100dB for long periods can generally hear sounds up to 20kHz.

For the rest of us, the upper frequency limit has steadily decreased over time, just like visual acuity.

When we consider the influence of the 24/7 electromagnetic 'soup' we are immersed in – and its effects on hi-fi equipment or TV image and colour clarity – it is a highly subjective area.

As for the radiated and conducted electromagnetic soup, a price must be paid for removing its unwanted effects on AV equipment, and therefore in judging the value of screening measures.

In the end that judgment is also subjective.

However, the effects of filters, chokes, capacitors, transformers, ferrites and grounding techniques in our entertainment systems can be judged via physical measurements.

Any changes in dynamic range, frequency and phase response – and the human ability to perceive them – will determine customer satisfaction with those devices and components.

## **CLEAN AC POWER**

Quality sound and image reproduction should start with mains power that is free of everything except the basic 50Hz perfect sinewave constant AC voltage.

Thereafter there are earthing features and internal power supplies that might interfere.

External factors also come into play. These include switch-mode power supplies for high-efficiency lighting, electronic ballasts, phase-controlled dimmers and even those ubiquitous 'wall warts' charging our portable devices.

Without ensuring at least minimal interference to reproduction quality from external devices we could be tying one hand behind our backs.

However, clean AC power as defined above is a myth. If it ever existed it would have been in the time of Charles Proteus Steinmetz, the

father of AC engineering, at the turn of the 19th century.

Modern power distribution has to contend with automatic tap changers at substations, switched capacitor var compensators, flicker due to high inrush current loads, harmonics from rooftop solar power inverters and, at times, from switching transients due to reclosers.

Many bits of apparatus connected to the low-voltage distribution network can put up with these practicalities, but for quality AV equipment it is sensible to clean up our act AC-wise.

### TOROIDAL ISOLATION TRANSFORMERS

The obvious place to start is with an isolation transformer to feed our amps, etc.

Unsurprisingly, there are great differences in the real-life embodiment of these devices.

We focus here on toroidal transformers. As the name implies, they have an annular core around which the primary and secondary windings are placed. By contrast, the other forms of isolation transformers employ U-I, E-I and other rectangular shapes.

The big deal about the toroidal transformer core is the absence of core lamination junctions. In 'run of the mill' cores, heat and acoustic noise are produced at these junctions.

The principal source of acoustic noise for many transformers is the magnetostriction effect, whereby the individual magnetic domains of the core material are elongated and relaxed alternately by the alternating magnetic flux, producing that irritating 100Hz hum.

In the rolling operations of magnetic core material, the individual magnetic domains [the tiny proto-magnets] are aligned.

When the magnetic flux induced by the coils is in the same direction [zero degrees, as shown in Figure 1], magnetostriction effects are minimised. When the flux is at 90°, as happens in lapped transformer joints, the effects are at a maximum.

It is now readily grasped that the beauty of the toroidal transformer core is the virtually complete alignment

throughout the core. It is basically a joint-less continuous strip of core material that's insulated and wound upon itself.

Diminishing magnetostriction noise is a big advantage, as generally the AV equipment will be close to the isolation transformer.

For pedants, there is still another noise source – the so called Lorentz force effect due to eddy current – but the usual measures taken for sound containment can render this inaudible.

### TOROIDAL TRANSFORMERS AS 'NOISE' FILTERS

But there's more to toroidal transformers – controllable leakage inductance.

Leakage inductance is caused by the interaction of magnetic flux outside the core 'cutting' some primary coil winding turns. It can also be a nuisance because it adds impedance to the primary circuit, thereby causing voltage regulation under changing power requirements.

This is generally the case for power transformers.

For an isolation transformer supplying a constant load, leakage inductance can act a low-pass filter, letting through the 50Hz fundamental voltage and basically stopping everything else.

As mentioned, distribution voltage contains a good portion of 'rubbish'.

Harmonics are generally odd, as evens imply the presence of DC. [Some DC can be present near photovoltaic solar installations.]

There are also inter-harmonics with higher frequencies into the 25kHz region, as well as flicker. The latter, due to switching transients, exhibits very fast rise times, and therefore a very wide frequency spectrum towards 100kHz and higher.

This stuff, if not stopped, is readily conducted and has a long near-field induction effect.

In the toroidal transformer, leakage inductance is controlled by the winding aperture angle [Figure 2] thereby allowing the control of low-pass filter properties.

For power harmonics, a 5% leakage inductance [based on the kVA rating of the transformer] will stop the third and everything above it very nicely.

**Quality sound reproduction starts with mains power free of everything except 50Hz perfect sinewave constant AC voltage.**

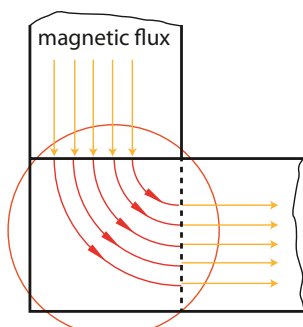


Figure 1.

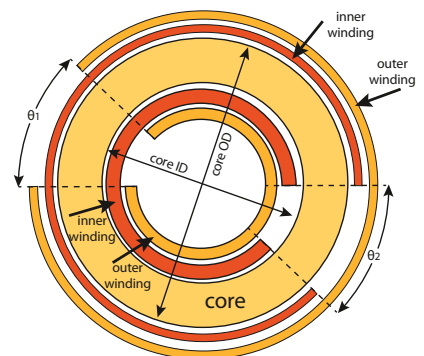
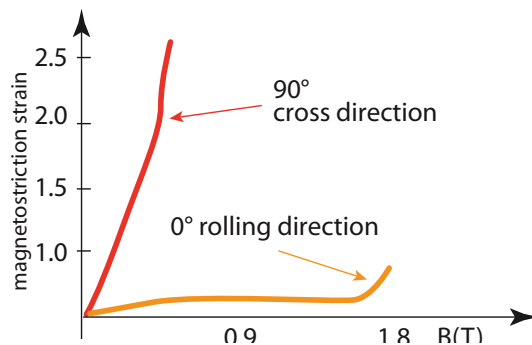


Figure 2.

Unlike flicker and harmonics, which are transverse [differential] voltages, the electromagnetic compatibility stuff is common mode and special filtering is needed (Figure 3).

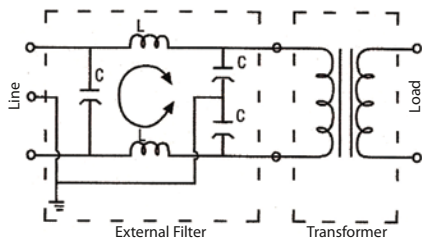


Figure 3.

Basically the small toroidal filter provides inductive impedance only to stop common mode noise. The differential signal is passed unimpeded by virtue of the two windings being in opposite phase so that there's net zero flux contribution in the core. Usually this sort of device is employed in pi filter topology in combination with capacitors.

The Canadian company Torus Power Inc was interviewed for this article. Although not unique in its adoption of toroidal transformers, the company has earned an important market position with its range of AC power supplies.

Torus Power is distributed locally by Network Audio Visual.

Ross Whitney and Kevin Main of Torus Power have confirmed some important construction details. Particularly noteworthy is the performance of the transformer as a filter, in important ways mimicking the performance of the above-mentioned EMC filter.

Using what is termed 'narrow band technology', the toroidal transformer offers impressive performance, having a -3dB point at 2kHz, with a roll-off of -30 dB per decade to 20kHz and -60 dB attenuation at 1MHz.

In outline, the tightly controlled equivalent capacitance [reflected from the secondary winding] in combination with the controlled leakage inductance and resistance at the input of the transformer, forms an R-L-C filter with frequency performance as mentioned.

An important aspect of the Torus Power transformer is a very generous core cross-section relative to kVA ratings. The result is low flux density,

meaning smaller core losses and linear operation [ie: no third harmonics introduced - this normally occurring because magnetising force H approaches the knee of the hysteresis curve].

Another advantage of the toroidal transformer not immediately recognised is the reduction of parasitic capacitance, and reduced voltage stress on turns with the exception of end turns of the windings.

Note the electric field pictures relevant to rectangular core and a toroidal transformer, as in Figure 4.

Torus Power equipment has a voltage regulator feature, providing 10V taps selected by relays that are controlled from the secondary voltage measurement.

### GOOD GROUNDS

A crucial consideration when installing an isolation transformer is the earth loop impedance - the lower the better.

In Australia all low-voltage distribution is based on multiple earth neutrals [MEN]. The ground stake or metallic water pipe connection to the neutral bar is therefore critically important.

An earth loop test needs to be carried out by a licensed electrician. This is a bit tricky, as we're not talking earth loop impedance for the internal installation [to ensure that earth leakage breakers will trip in the event of earth faults] but the earth loop impedance from the service fuse out.

One alternative [putting faith in the low impedance of the neutral wire] is to do an earth resistance check at the

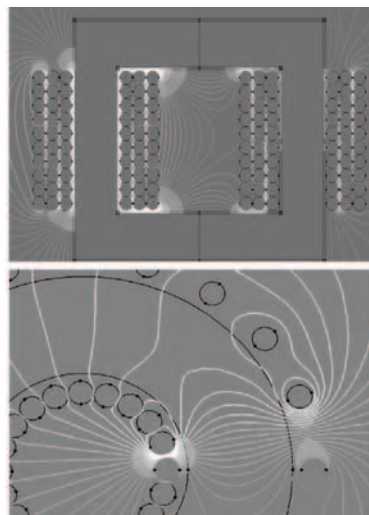


Figure 4.

installation ground stake.

As is the practice here, the installation earth in Canada and the United States is at the service entry point.

From there the safety earth wire is pulled through to the metal chassis of connected equipment, and to the metallic cover of the toroidal transformer, as well as to the core and electrostatic shield separating the primary and secondary windings.

The latter is a feature of isolation transformers in general, and basically removes inter-winding capacitance as a feed-through path.

To get the best out of the toroidal core technology, attention to performance-spoiling factors is needed.

Earth loops, although unrelated to transformer hum, can show as hum and therefore star-point equipment signal grounding should be used. The signal grounds for the connected equipment should be located and brought out separately to an insulated 'grounding' point, connecting only at one point to the MEN bar.

To end where we began: will we hear the sound of good power quality?

Starting with clean AC is important, but environmental issues such as induction fields from neighbouring equipment and radio frequency interference from other electronic apparatus is equally important.

That said, and in defence of good isolation transformers, power quality in low-voltage distribution isn't going to get better, particularly because of the increasing penetration of distributed generation - not only solar, but also tri-state generators and other auxiliary and ancillary generators.

One way of avoiding the whole issue is to insert an inline uninterruptible power supply. However, that's a pricey solution, appropriate perhaps for a server room but not for our AV equipment. ■

Phil Kreveld is an energy writer. He is an electrical engineer. He has worked in electrical, electronic and scientific instrumentation in Australia and the US.





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**ABB**

# OOOH! LIAPOOTAH

Following the 2016 Tasmanian energy crisis, RBD Electrical & Implementation replaced high voltage cables at the Liapootah Power Station as part of Hydro Tasmania's Asset Management Plan for the state's hydro power network. **Adelle King** explains.

**A**t the start of 2016, Tasmania suffered a six-month long energy crisis after a fault in the Basslink high voltage [HV] direct current cable, combined with low rainfall, led to record-low storage levels in the state's hydro-electric system. According to Hydro Tasmania, the crisis cost taxpayers approximately \$180m and a parliamentary Public Accounts Committee recommended that significant changes to energy security management and Hydro Tasmania's storage management policy be made.

In the aftermath of the crisis Hydro Tasmania released its Asset Management Plan to address the risks identified by the crisis and secure the future of Tasmania's hydro power capacity. As part of this, Hydro Tasmania commissioned electrical contractor RBD Electrical & Instrumentation to replace the Liapootah Power Station's generator power cables.

The Liapootah Power Station was commissioned in 1960 and is one of 11 hydro-electric power stations that make up the Derwent scheme. It houses three units that consist of English Electric francis turbines coupled to English Electric generators, with each generator connected to the transmission system in the Liapootah switchyard. The station output passes through three banks of three 11/220kV single-phase transformers and 220kV outdoor switchgear.

The Liapootah generator replacement project involved RBD replacing the three hydro 31MVA generator set 11kV power cables from each generator termination to each switchyard power transformer termination.

Each power transformer consisted of three single phase transformers and there were nine single phase transformers in total. Each generator



The Liapootah Power Station was commissioned in 1960 and is one of 11 hydro-electric power stations that make up the Derwent scheme.

connection consisted of six 630mm single core cables, which were laid in a trefoil configuration along an 'S' shaped tunnel connecting the machine hall to the transformer switchyard.

The route length of each was approximately 150m through the HV cable tunnel and each cable group was mounted on metal supports along the length of the tunnel.

"The project involved pulling and laying 18 large, heavy cables through restricted spaces, which we had to do in an organised fashion to minimise downtime," says RBD Electrical & Instrumentation managing director Mark Richardson.

"We had to change all of the cable supports, as well as build new trays and cable connection points, which was complicated to achieve while still keeping other machines running and the down time to a minimum."

The 18 cables each weighed 1.2 tonnes and were pulled and laid through a narrow tunnel that was only 1.6m wide and easily congested by the work crew and haulage gear. This required an innovative roller

system design and the use of multiple motorised cable pulling traction devices that had to be negotiated around the tunnel. A system of radio communication was used to start and 'pull together' each cable into place.

"RBD showed innovative solutions to the installation of the HV cables within the HV tunnel during a series of short outages, which maximised our production and prevented spill. RBD's care and attention to the customer's needs throughout the project meant that limited supervision was required and a quality product resulted," says Hydro Tasmania delivery manager Kennedy Clarke.

The roller system used a combination of methods, including fixed rollers, portable rollers, edge protection, two cable haulage machines, side pulling equipment swivels, and dynameter and head winch. While the design is not unique to the industry, RBD had eight bends and three floor levels to negotiate with expensive cables weighing 8kg per metre.

"Being a HV cable, cuts and scrapes were not permissible as they could then



The narrow high voltage cable tunnel was only 1.6m wide.



RBD replaced the three hydro 31MVA generator set 11kV power cables from each generator termination to each switchyard power transformer termination.



Transformer cable connections.

fail the cable upon test. The roller system, powered haulage gear and the manning of the cable run required experience and skill from our senior staff," says Mark.

The old lead sheath cables were safely disposed of by cutting and removing the cables in sections using trolleys.

RBD also helped to create efficiencies through design stage involvement, assisting designers in the selection of suitable cable clamps and the trefoil clamping arrangement over the length of the cable run. The company conducted an internal due diligence design review and found the client free issue termination palms and heartshrink kits were incorrect and would not interface correctly with the generator terminals.

"The ones that were supplied were too wide to give us the appropriate clearance to meet Australian Standard AS2067. The connection points were fixed so when the palm was wired on them, the gap in between didn't meet the Standard, which meant we had to source a different design palm that was thicker but not as wide," says Mark.

"We undertook extensive research and worked with multiple suppliers in Australia to source palm lugs that were certified for the voltage required and would give us the necessary clearance."

Another issue that RBD had to overcome during installation was the fact that 16m of cable had to be managed and secured outside the tunnel in preparation for the replacement of three phase transformers in five years time.

Temporary HV cables were laid outside the cable tunnel to keep one machine in operation during the replacement of the other generator cables, which involved RBD cutting through the station wall and into the switchyard. An extended rolling and traction system over 300m was designed to pull and place each of the six cables into position.

"We used an alternate route to feed one generator so the surface-mounted temporary cables cut a path through the station wall, through the control wing basement and into the switchyard, with final connection to the power transformer. This route was shorter than the cable tunnel so to ensure we would have sufficient length, we had to loop the cable in a live switchyard and support it at multiple locations on timber sleepers," says Mark.

"It was also the middle of summer and we noticed the cable was getting too hot so we developed a system to completely cover a large area with shade cloth to protect the cable from the heat."

Despite part of the original supply of HV cabling being damaged during transit and an urgent order needing to be placed to secure additional cable, the Liapootah generator replacement project was completed 15 days ahead of schedule. Hydro Tasmania says this allowed full production of electricity from the station.

"Hydro Tasmania was particularly pleased with the OHS, quality and careful liaison during the preliminary and implementation stages with our staff," says Kennedy. ■

**RBD Electrical & Instrumentation**  
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# SCHOOL NETWORK SECURITY: KEEPING THE BAD GUYS AT BAY

Schools are becoming no less network-centric – and network-reliant – than any other organisation. Keeping the network available is mostly about ensuring its security, says **Ian McMurray**.

**T**he subject of network security has been very much top of mind recently in the UK. It may not have been reported widely beyond the shores of Britain, but 16 ‘trusts’ within the National Health Service (NHS) were, to all intents and purposes, shut down by a ransomware – ‘WannaCry’ – attack that demanded \$US300 [in bitcoin] from each affected user.

Doctors in affected locations had no access to patient data, appointment systems were unavailable and ambulances had to be diverted to unaffected hospitals. It took several days for the hospitals to get back online.

What’s remarkable, of course, is that the NHS is one of the UK’s biggest spenders on IT with budgets running to billions of pounds each year. What chance, then, of a school – with its far more meagre resources – being able to guard itself against a similar attack?

If anything, the situation in schools is exacerbated by BYOD.

Back in my school days, BYOD meant

ensuring you brought your pen to class, and security meant the teacher locking the stationery cupboard door to prevent the ‘borrowing’ of new exercise books for non-educational purposes...

## BYOD PHENOMENON

Today, BYOD is as much of a phenomenon in schools and universities as it is in business. It’s a concept introduced to its employees by Intel in 2009, and over the past eight years, adoption of the principle has proliferated rapidly. Research by MarketsandMarkets indicated that, by 2021, the total worldwide BYOD market will be worth over \$US73 billion.

What’s the attraction of BYOD? Simply: productivity, cost savings and engagement. Those are three attributes valued no less highly by educationalists than by their counterparts in business.

But, just as in the world of work, BYOD brings significant security challenges. First, there are those that are common to both environments. Trojans and viruses. Ransomware. Key

loggers. Network snooping. Identity theft. DDOS. Access to inappropriate sites. Outbound malicious activity that appears to originate from the establishment. Beyond these, there are security risks to which schools, in particular, need to be sensitive – risks such as the compromise of examinations, cyber-bullying, grooming and exposure to extremism. Schools are also perhaps more protective than many organisations when it comes to protecting their reputation. And, perhaps most significantly: younger people tend to be far less guarded when it comes to Internet access.

The first dilemma this provides to schools is whether their policy should be to provide portable devices to pupils – in effect, a corruption of the BYOD principle.

Schools have the ability to control the designated devices they purchase – implementing on the device policies for acceptable usage, ensuring up-to-date antivirus protection and so on – compared to BYOD which is out of their control.



BYOD offers the potential for malware acquired outside the school gates to be disseminated across a school's network.

The downside, of course, is cost – and possibly some degree of engagement, as there becomes a clear separation between pupils' personal interests and their educational interests. Many educators feel it is vital to establish an appropriate balance between control and freedom.

### NETWORK CONTROL

Industry security experts believe that, while the security of the device is important, the optimum approach is to ensure appropriate provision of the necessary controls on the network itself. These might include a network access control (NAC) appliance, Cisco's Identity Services Engine (ISE) control, and DNS protection such as OpenDNS.

NAC enables academic institutions to recognise, audit and report those accessing the network and on

which device while evaluating whether devices comply with the organisation's security policies. Then, if not, it allows them to enforce security policies by blocking, isolating and repairing those that are non-compliant.

Moreover, with NAC, organisations can provide easy and secure guest access to the network, which is a vital step in the balancing act between freedom and control. Role-based security – sometimes known as an active directory database – is an approach taken by many educational institutions, assigning different capabilities to, for example, teachers on the one hand and students on the other.

There's also widespread agreement that the first job for any school is to actually set the policy they intend to enforce. That can present something of a challenge, not least because it's not just a technology issue – it's about the school's ethos and values,

and the kind of learning environment it wants to create. It's vital that all the stakeholders – governors, staff, IT team and, yes, the students themselves – agree on what the policy should do and how it should operate. And: there will ideally be a nominated individual responsible for security.

Network security in schools needs to be seen as an enabler, rather than as an inhibitor. This gives rise to discussion about, for example, whether the network should be secured via password – the thinking being, enforcing the use of passwords makes the network harder to access. The consensus here is that it's a price well worth paying – as is ensuring that all traffic on the network is encrypted, even at the risk of some potential loss of performance.

### DYNAMIC ANALYSIS

Similarly, when it comes to enabling rather than inhibiting, over-zealous content filtering is agreed to be best avoided – not least because it can force students to use proxy servers to reach sites that aid their research. Simple key word filtering is, it seems, generally best avoided: more sophisticated solutions are available that can dynamically analyse and categorise every web page that's requested.

There is a plethora of network security solutions out there, with numerous vendors to choose from. One recommendation that's often heard is to source the entire solution from a single supplier. Not only will that guarantee interoperability, it will also ensure complete coverage with none of the inadvertent omissions that can occur with a 'pick and mix' approach. The key phrase here is 'unified threat management'.

Security isn't, of course, just about protecting the network from abuse, misuse and threats. It's a foolish school that doesn't have a failsafe system that allows the network to continue to run even if, for example, the server

fails. Similarly, it's irresponsible not to back up – grandfather/father style – all of the school's data.

When schools relied much less on technology – not just back in the blackboard/chalk days, but even when each classroom saw an interactive whiteboard (IWB) deployed – network failure was less of an issue: the process of educating could still go on. Today, schools are no less network-centric than any organisation: losing the network can bring an end to lessons.

### GOOD NEWS

The good news for contractors in the business of equipping schools is that there are plenty of companies out there specialising in the installation, management and support of networks for educational users, and who understand the specific requirements of education. Here, partnering can provide a more manageable way forward than trying to acquire the necessary knowledge and skills in-house. As ever: if you can't do something yourself, the next best thing you can do to add value is to know someone who can.

And, in fact, rather than hire an entire IT team, many schools have chosen to outsource the management of their network, preferring to leverage the proven skills and experience of a company for whom this isn't all new – and terrifying.

Oh, and: one other thing that schools should probably do to protect themselves – and that's not to rely on an operating system that's no longer supported by Microsoft. Remarkably, it transpires that the NHS never did make the migration away from Windows XP – and the ransomware exploited a vulnerability that was fixed in subsequent versions of Windows. That's pretty astonishing – in fact, something of a schoolboy error. ■

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**Just as in the world of work, BYOD brings significant security challenges to schools.**

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For the past 10 years, Ian McMurray has worked as a freelance journalist in the global AV industry.



# EXERCISE SOME CONTROL

Proportional, integral and derivative are simple terms that can have complex ramifications in process control. In his regular series on instrumentation, **Glen McMurtrie** explains.

**P**ractically any programmable logic controller, distributed control system or mechanical pneumatic controller will incorporate proportional, integral and derivative (PID) terms.

The PID function in the controller is often used where continuous measurement and control is taking place, but not so much in discrete on/off conditions.

As a result, PID is used in conjunction with analogue inputs and outputs or digital protocols conveying 0-100% signal values. PID comes into play

according to how much we want to manipulate these values in the controller.

Proportional can be thought of as the controller's gain – a percentage output change versus the percentage input change. If an input changes 5%, causing the output to change 10%, the controller has a gain of two.

A proportional band is the percentage input required to drive the output a full 0-100%. A proportional band of 200% is a gain of 0.5, since a theoretical 200% input change would result in a 100% output change.

Depending on the brand of controller,

proportional may be set as a gain or band percentage. It's worth noting that the two are inverse, that is 100% gain equals proportional band percentage and 100% proportional band percentage equals gain.

The physical system we want to control – for example, a valve and flow transmitter installed in a pipe – exhibits a gain of its own.

The signal to the valve is increased 16%, resulting in a 20% change in flow. At this point of valve travel the steady state process gain equals 1.25.

If we multiply the gain of the controller by the gain of the process we end up with total loop gain. If total loop gain is equal to or greater than one, the process will oscillate. If it is less than one (ideally about 0.5) any moderate disturbances or upsets to the system should self-correct and settle.

Using the above, if I had a process gain of 1.25 and a

desired total loop gain of 0.5, a controller gain setting of 0.4 or 250% proportional band would be a good place to start.

Proportional-only control will suffice in high capacitance steady processes where load changes and disturbances are minimal and accurate control is not required.

A major disadvantage of proportional-only control is that input to the controller must be changing for the output to change. If the input value is above or below set point and stationary, the output will not move, causing a proportional-only offset to occur.

To overcome this problem, integral or reset action is used in conjunction with proportional to continually drive the output in order to eliminate offset or error.

Put simply, integral action is the ratio of how fast the output ramps in response to error. This time, if the input value is above or below set point and stationary, the output will continue to ramp until the input value reaches set point.

Integral or reset action is entered into the controller as a value of time, normally seconds or minutes. This value of time is the rate at which the controller is repeating proportional action in order to continually drive the output in response to error.

The shorter the time the larger amount of integral action.

For example, an input to a controller is 53%, the set point is 50%, the controller has a gain of one and the integral time is 10 seconds (six repeats/min). The output will ramp at a rate of 18%/min.

If integral time is reduced to five seconds (12 repeats/min) the output will ramp at a rate of 36%/min. Output %/min equals gain [error x repeats/min]. If error increases or decreases you can see that output ramp speed will change proportionally.

Integral action is particularly useful in



Proportional band set to 50% therefore a controller gain of two. A 5% input change causes a 10% output change.



Proportional band set to 100% therefore a controller gain of one. Integral time set to 10 seconds therefore six repeats per minute. 3% error on input results in a 3% change of output followed by 18% output ramp over one minute.

reducing process lag and for achieving accurate control where disturbances and upsets can be counteracted with an ideal amount of output in an ideal amount of time.

Nearly all process can be controlled with proportional and integral working together. However, there may be some instances in which the use of derivative is warranted. Be warned though – in most plants the D stands for ‘Don’t touch’.

Derivative or rate is introduced to prevent error occurring in the first place. It samples the rate at which the input is moving and takes quick, decisive action by offsetting (not ramping) the output in the hope that this input change will be stopped quickly.

Derivative is best suited to unstable processes in which the input value tends to ‘run away’ from set point. The downside is that the sudden output offset can be torturous to valves and drives and quite often causes more problems than it solves.

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**Be warned –  
in most plants the  
D stands for  
‘Don’t touch’.**

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Derivative is sometimes used in an attempt to speed up slow processes by giving the output a ‘kick in the guts’ for any input change.

Derivative is also entered into the controller as a time value, but more derivative time equals more derivative action.

Let’s say an input starts changing at 2%/second, the gain of the controller is one and derivative is set to five

seconds. The immediate output offset would be 10%. Output offset % equals gain [input %/s x derivative time in seconds].

It should be noted that derivative action is more than useless on noisy inputs with lots of small sudden fluctuations, as these can be sampled resulting in many output offsets. My advice is to use with extreme caution.

This has been an overview of some common control terms. You may be able to try applying PID using an online simulator or a redundant controller in your workplace.

Future articles will focus on PID loop tuning techniques, until then – happy controlling. ■

Glen McMurtrie teaches process instrumentation in the Electrotechnology department of TAFE Queensland SkillsTech at Eagle Farm in Brisbane.



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# BATTERIES INCLUDED

Grid support and domestic use are the two main applications for battery energy storage systems (BESS). Phil Kreveld outlines available technologies - like lithium-ion, sodium sulphur and zinc bromine flow batteries - as well as their pros and cons.

Chemistries for the two main battery applications are shared, although a larger storage capacity range is commercially available for grid support.

The technologies include lead acid in its various forms, sodium sulphur, lithium ion and nickel, as well as flow batteries.

Lithium is in the limelight at the moment, but that has a lot to do with public promotion efforts by Tesla to meet South Australia's requirements for grid support.

The various chemistries have advantages and disadvantages, and it's safe to say that battery technology will continue to be a fast-moving field.

From an Australian aspect, the development of large-scale battery energy storage systems (BESS) is very important.

Due to increasing wind and solar energy sources the Australian Energy Market Operator (AEMO) has commissioned detailed studies. A full description of BESS grid support is not dealt with, but some aspects are mentioned briefly.

Batteries for large-scale energy storage are contrasted with other forms of energy storage, including hydrogen generation, fuel cells, super capacitors, flywheels, syngas, pumped hydro and compressed air.

Despite the focus on batteries for grid support, some of these other forms of energy storage are viable alternative solutions for Australia.

Compressed air could be used in abandoned underground mines and artesian basins. Pumped hydro is the subject of studies being undertaken for the Snowy Mountains Engineering Corporation, as well as for the proposed construction of a pumped seawater plant for Port Augusta in South Australia.

## BATTERY BASICS

Details of chemical reactions vary for the various battery types, but the common principles are explained in Figure 1.

First we need to deal with the confusion between electron flow and 'conventional current'.

A good way of understanding electric current is to examine what happens in a metallic conductor. Basically there are opposing flows of negatively charged electrons and 'positive holes'.

In a metallic conductor there are 'loose' electrons [at an elevated energy level] in the conduction band and therefore not held onto in atomic structures in the so-called 'valence band'.

These 'conduction band' electrons are therefore free to move under the influence of an electric field. The holes are electron vacancies created by electrons moving readily into the conduction band from the valence band. An electron leaving the valence band creates a charge deficit [a positive atom which was neutral with positive and negative charges cancelling each other].

As an electric field moves electrons in one direction, the positive vacancies [holes] are created and flow in the opposite direction. The total current is the addition of hole and electron flows.

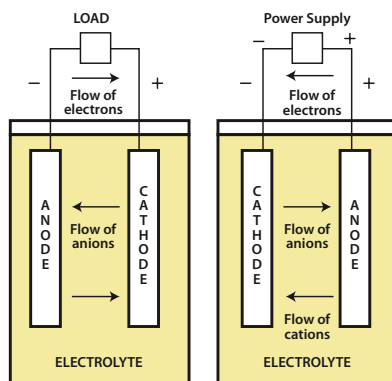


Figure 1: Chargeable cell battery diagram.

In a battery, the electric field is created at terminals connected to electrodes that are immersed in an electrolyte [a 'fluid', but not always a free-flowing liquid] in which electrons, and positive and negative ions, can move more or less freely.

Chemical energy exchange at one electrode [anode] causes electrons [anions] to congregate [chemists call this oxidation]. At the other electrode [cathode] electrons are stripped off it [this is 'reduction'].

The cathode is therefore positive in voltage with respect to the electrolyte, and the anode is negative with respect to the electrolyte. The voltage at each electrode is a function of the inherent energy difference of electrons in the electrolyte and in the electrode material.

The voltage differences at the anode and cathode are added to derive the battery cell voltage. Over time the oxidation and reduction processes at the electrodes ceases because the chemical reactions are complete.

In a secondary cell [our only concern here] the chemical process can be reversed by applying a voltage in the same polarity to the terminals, turning the cathode into the anode and vice versa during the charging process.

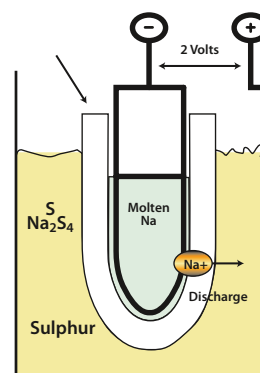


Figure 2: Sodium Sulphur battery.

## BATTERY TYPES

### Lead acid

There are three variants: flooded cell, valve regulated [VRLA] and lead crystal.

The last type makes use of a micro-porous high-absorbent mat used as a separator.

The crystallised electrolyte in combination with an absorbent mat can effectively protect the plates and prevent active material from dislodging during discharge.

Although used in substations, lead acid batteries have a low energy to weight ratio.

### Nickel cadmium

These are relatively high-cost batteries with roughly double the energy/weight ratio of lead acid types. They are employed in electric traction and uninterruptible power supplies [UPS]. Disposal is a problem because of cadmium.

### Nickel metal hydride

This type is extensively used in vehicles, the Toyota Prius being a good example.

### Nickel zinc

These have a higher cell voltage than the other nickel varieties mentioned above, but there are problems with electrode deterioration.

### Sodium sulphur [NaS]

The NaS battery consists of liquid [molten] sulphur at the positive electrode and liquid [molten] sodium at the negative electrode as active materials separated by a solid beta alumina ceramic electrolyte, as shown in Figure. 2.

The electrolyte allows only the positive sodium ions to go through it and combine with the sulphur to form sodium polysulphides. These batteries are used in peak shaving and other stationary applications such as substations.

### Lithium ion

The development of lithium transition oxides in combination with cobalt and nickel dates back more than 40 years.

During charging, lithium ions are released from a lithium 'metal' oxide to the electrolyte solution, which contains salt of lithium hexa-fluoro phosphide. Lithium ions – Li+ [one electron has been lost by 'reduction'] – are released to the electrolyte from the lithium 'metal' oxide cathode.

They travel to the graphite anode where they are intercalated [the technical term for being tied up into the graphite anode] by electrons flowing into the anode.

During discharge, the lithium ions are de-intercalated from the anode and travel back through the electrolyte to the cathode, releasing the electrons that were tying them to the anode thus providing useful electric current.

A major advantage of lithium batteries is the high voltage per cell – 3.6V and more – compared with 2V for lead acid batteries.

### Flow batteries

These use two electrolytes stored in separate reservoirs.

Pumps circulate the electrolytes through an electrochemical cell containing an anode and cathode separated by a permeable membrane.

An example is the zinc bromine flow battery [Figure 3]. This is sometimes compared to an electroplating device in which zinc is electroplated onto an electrode while bromine gas is formed.

On discharge, the zinc dissolves into the electrolytes and is available to be replated at the next charge cycle. A great benefit of this type of battery is its high cycle life, even at 100% discharge.

The vanadium redox battery is also an example of a flow battery, with a substantially larger storage capacity by virtue of there being little practical limitation on the size of electrolyte storage tanks used.

This type offers rapid response times, making it useful for grid support and UPS applications.

## BATTERY

### APPLICATIONS

- Sodium sulphur – grid stabilisation, frequency support, voltage support, power shifting
- Nickel cadmium – spinning reserve and power system stabilisation
- Lead acid – frequency control and spinning

reserve; load levelling, transmission line stability, VAR control, black start service

- Lithium ion – frequency regulation and spinning reserve
- Vanadium redox flow – peak shaving.

## PROPERTIES

In addition to cost and energy density, other properties of importance are depth of discharge and charge-discharge cycle times, maximum power available, thermal stability, safety of operation and efficiency [charge stored/charge supplied].

Lead acid batteries have low power density but are an economical solution in terms of power density cost per unit.

Battery life is very much affected by deep discharge.

Lithium ion batteries have high energy and power densities, but they are expensive to manufacture and require special charging circuits.

There are claims that lithium ion technology is yet to mature, but some commentators disagree.

An August 2016 report by Richard Martin in the United States publication MIT Technical Review states: "a number of start-ups are closer to producing devices that are economical, safe, compact, and energy-dense enough to store energy at a cost of less than \$US100 a kilowatt-hour.

"... but those batteries are not being commercialised at anywhere near the pace needed to hasten the shift from fossil fuels to renewables – even Tesla chief executive Elon Musk, hardly one to underplay the promise of new technology, has been forced to admit that."

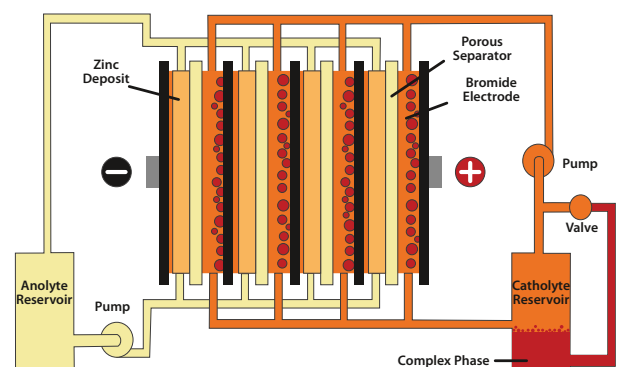


Figure 3: Zinc bromine flow battery.

Lithium batteries require temperature control and special precautions during charging, as they are unable to absorb overcharging, and trickle charging results in plating of the anode with lithium and the destruction of the battery.

Monitoring cell voltage during charging is essential, and when dealing with battery packs [eg: BESS units] equalisation of cell voltages is essential. A circuit for achieving this is shown in Figure 4, with capacitors constantly switching between cells, thereby swapping charge from higher charged cells to lower charged cells.

### OTHER OPTIONS

Flywheels have been developed with energy storage of 100Wh per kilogram – more than twice the capacity of a valve-regulated lead acid battery and equal to lithium-ion batteries.

Constructed of composite materials, the flywheels run about 50,000rpm in evacuated or helium-filled housings. Unlike batteries, they are able to be ‘charged’ in a matter of minutes, making them ideal for rapid response during fast grid support requirements.

Flywheels provide energy to a motor generator, in turn connected to the grid via an electronic converter.

Super capacitors represent a developed technology for traction applications in light rail systems, which have short distances between stops/stations. Charging occurs during braking, and from a third rail section while the vehicle is stationary.

Super capacitors are now available with energy densities of about 5Wh per kilogram. They are able to provide very high power levels, making them suitable for stabilisation during short-term grid fluctuations.

Enormous capacitance values of about 5,000 Farads have been achieved. A relatively new dielectric development, graphene – an allotrope, or different chemical form for the same element – of carbon promises very high capacitance and good voltage performance.

Voltage withstand ability is a challenge for capacitors, as capacitance is inversely proportional to the thickness of the dielectric separating the plates.

Hydrogen storage is based on electrolysis of water to store electrical energy.

Electricity generation from the stored hydrogen can be achieved using a fuel cell. Hydrogen fuel cells and batteries share an electrochemical principle but go about the job in different ways.

In the fuel cell, electrons are released from the hydrogen rather than the anode material. Energy is continuously created while oxygen is being supplied and the resulting water from the chemical reaction with hydrogen is removed.

Syngas is another method using hydrogen by reacting it with carbon dioxide to form methane. This can be mixed with gas created from other processes or derived from coal seams, etc.

For electricity generation, such a method could provide power and frequency support via a gas turbine-generator.

Compressed air is a well-established technique. It basically relies on valve switching of air compressor/motors connected to synchronous motor/generators for energy storage via compression and the release of that energy to the grid via the generator.

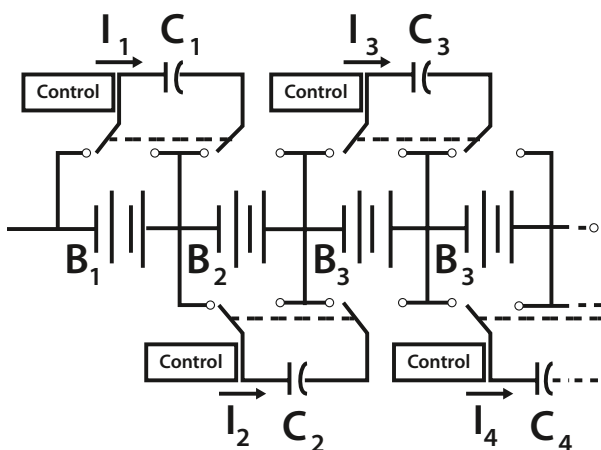


Figure 4: Batteries compared with other energy storage options.

ability to provide virtually immediate support, unlike base-load plant, which can take several minutes to respond to demand changes.

Load following, usually assigned to gas turbine plant, is another task for BESS.

Perhaps more surprising is the basic ability for black start duties.

AEMO employs frequency control ancillary service generators [FCAS] for frequency support and system restart ancillary service [SRAS] for black start situations.

In standard BESS mode, converter controls are synchronised to the AC bus voltage via a phase-locked loop [PLL]; the respective real and reactive current values are calculated in the d[active]-q [reactive] reference frame and feedback-controlled by AC vector current.

For black start, a so-called phasor control mode can be employed by the BESS inverter, providing ‘synchronous machine emulation’.

A small diesel generator would then start up to supply enough auxiliary power to keep the batteries charged and provide standby power to the converter solid state valve cooling system.

### CONCLUSION

For the foreseeable future, battery installations for the national electricity market [NEM] will grow in importance.

Battery back-up for rooftop solar photovoltaic [PV] will also grow, although large-scale back-up can be expected to far exceed domestic megawatt-hour storage capacity.

The low-voltage distribution networks in Australia are not well placed for large-scale insertion of renewable energy sources. Experiments with virtual power generation involving suburban rooftop PV systems, although interesting as concept, would pose serious problems if scaled up.

Medium and high-voltage insertion will permit a much-enhanced degree of control and is therefore more likely to be favoured by AEMO. ■

Phil Kreveld is an energy writer. He is an electrical engineer. He has worked in electrical, electronic and scientific instrumentation in Australia and the US.

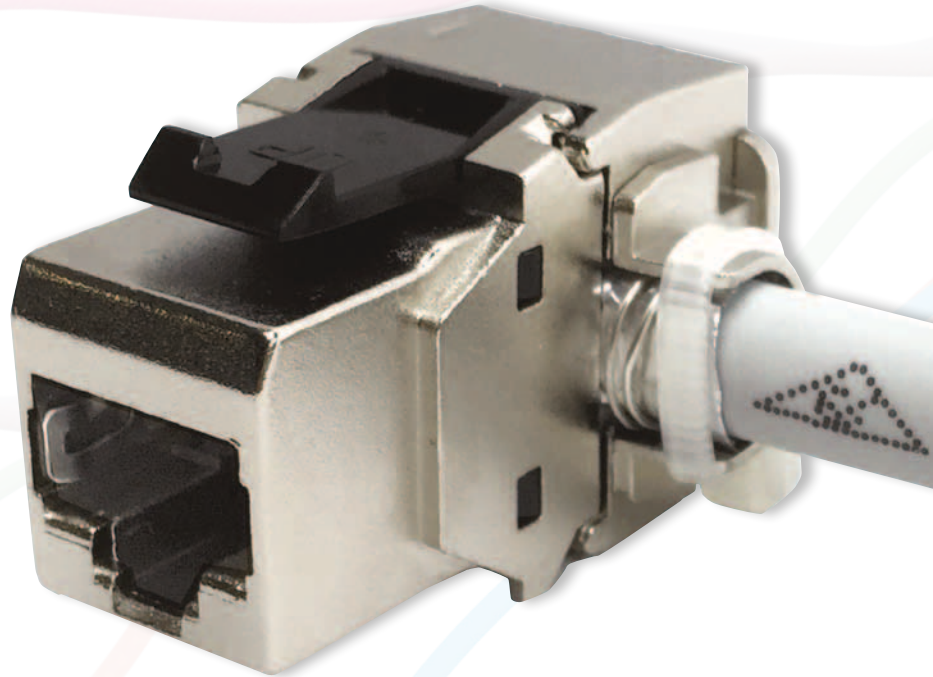


### GRID SUPPORT

The advantage of BESS facilities is an



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# JOB FACTOR JEOPARDY

Varying job conditions will affect total labour hours on projects. Understanding this is the key to successful estimating, writes *Labour Unit Manual* author **Brian Seymour**.

**T**here's a world of difference between estimating labour for an electrical installation on a construction site and estimating in the manufacturing sector.

A machine that makes widgets has the manufacturer's rating on how many it will produce per minute, and all machines and tools are in the same position from day to day.

A static workforce has the same tasks each day, and employees work in a familiar and controlled environment.

Not so in the construction field. Tools, materials and equipment can rarely be left at the workface. The workers are itinerant and must adjust to each new environment's characteristics, such as:

- Location.
- Living away from home.
- EBAs.
- Heat and cold.
- Working at height.
- Confined spaces.
- Changeable weather.
- Members of the public.
- Variable traffic conditions.

All of them have an effect on the project's cost.

Irrespective of the size of the project or budget, estimating an installation can be a daunting task.

To create a workable estimate, you must thoroughly understand your crew's strengths, weaknesses, skills and processes.

It is important that you are able to question your workforce on current construction processes and the effects of changes to industry Standards. This will ensure that you cover items that you and your potential client may not be aware of.

As an electrical estimator, you must have the ability to define a project's purpose, and you should consider your current resources and previous projects of a similar type.

Electrical installation is a labour-intensive process and needs solid working relationships with the installation crews so that they are part of the estimating function.

## SCOPE OF WORKS

You must own your role and responsibilities and have hands-on experience to alert you to factors that could cause a cost blowout.

The first duty is to understand the scope of work. Here is a definition:

"The division of work to be performed under contract or subcontract in completion of a project, typically broken out into specific tasks with deadlines."

The scope will explain the boundaries of the project, establish each team member's responsibilities and set up procedures for verification and approval of completed work.

Once the scope is understood and

you are comfortable in complying with the tasks, attention can be turned to process and installation method, which is reliant on resources, workforce skill and availability.

The characteristics of a good estimator include:

- An understanding of the scope.
- An understanding of architectural and schematic drawings.
- Knowledge of installation materials and methods.
- An organised method of take-off.
- Evaluating subcontractor and supplier estimates.
- Selecting subcontractors and suppliers that can meet the scope.
- Preparation of accurate estimates.
- An understanding of construction methods and materials.
- A detailed process for following up on why projects were accepted or rejected.

## SOFTWARE IS NO PANACEA

Good-quality estimating software is a great tool for speed, eliminating repetitive mundane work and reducing human error.

However, few computer programs take into consideration many of the environmental conditions mentioned above.

It is a mistake to rely on software without an internal control mechanism that guards against errors and omissions. It needs a free-thinking human being to ensure this control.





Few computer programs take into consideration many environmental conditions.

Many computer programs don't keep up with price changes for materials, and they need to be refreshed on a regular basis. It is important to use real data in your estimating process rather than dated information.

Estimating materials is not rocket science if you know your trade. However, if you are not familiar with specified catalogue numbers, it can spell disaster.

For instance, confusing the catalogue number for hazardous area lighting fittings with the number for bare tube fluorescents could be the difference between a successful project and a catastrophe.

### INSTALLATION LABOUR

Much greater skill is required when assessing installation labour.

The time that a worker will take in performing a unit of work varies according to the individuals, projects, climatic conditions, job supervision, operational complexities and other factors.

It requires more time to install lighting fittings at 4.5m above floor level than at 2.8m. Therefore, the installation productivity is defined as the quantity of work produced in a given amount of time by a worker or a specific crew.

To estimate productivity, an estimator needs a good historical record and a lot of experience. It requires the estimator to understand that in specific instances a 'degree of difficulty' may have to be applied.

This occurs when the installation is

affected by one or more of the environmental factors mentioned above and is usually expressed as an added percentage to the labour hours.

This also includes issues such as 'walking time' (time to get the workers to the workface), which may be time taken to access the higher floors on a multi-storey building or relocating from the car park or site shed on a large industrial site to the workface.

When adjusting the labour hours, based on the above aspects, you will need to consider the following factors:

#### Site conditions

- Access for labour, materials and equipment.
- Legislative requirements.
- Site standards.
- Code of conduct.

#### Variations

- Will it affect the program?
- Will it affect the liquidated damages?
- Price agreed before works start.

#### Exposed wiring

- Is it permitted?
- Will it require painting?
- Does it need to follow architectural features?

#### Building schedule

- Unrealistic timeframes.
- Critical path unavailable.
- Lack of scheduling accountability.

#### Individual job factors

- Inadequate resources.
- Heavy workloads.
- Quality considerations.
- Exposed electrical parts.
- Hazardous area installations.
- Unsafe equipment.

#### Workforce skill

- Do the workers have the required skills?
- Do they require specialised training?
- Do they understand the specific requirements of the client?
- Plant and equipment
- Purchase or hire (scissor lifts, cherry pickers etc)?
- Does the builder provide lifting?
- Who provides storage?
- Is the site secure?

#### Occupied premises

- Does it require out-of-hours ?
- Minimising disturbance (noise, dust, hazards)
- Protection of owner's goods
- Agreed access times
- Making good

#### Weather

- Outdoor installations can be hampered by weather
- Wet weather can be a hazard with electrical equipment
- Wet weather can cause site access problems
- Stormy weather can cause disruption in high installations
- Hot weather can require site shutdown.

You should always use sound judgement and common sense when preparing estimates. Take on board the above factors: it may mean the difference between profit and loss for the company or client.

Approach each estimate with a professional attitude and examine in thorough detail all areas of the work. Set aside specific times each day for entering estimated quantities and data without interruption. Total mental concentration is a basic requirement for preparing accurate estimates.

It is important to allow enough time to research and become familiar with the background and details of the project, complete the quantity survey and review various aspects of the project with the other disciplines involved. ■

Brian Seymour MBE is the author of *Electrical Estimator's Labour Unit Manual*, which is available at [www.tradestuff.com.au](http://www.tradestuff.com.au).





## A LABOUR OF LOVE

For some, a business is the longest relationship they'll ever have. So what happens when you've had enough? **Steve Keil** looks at what happens when the love leaves your (business) relationship.

**“I**t's not you, it's me.”  
Of course, we all know that as a popular justification for a break-up. Surprisingly though, I've heard similar words from owners on how they feel about their business.

The fire they once had for their business has gone out. This often leads to the next question “... so how do I sell my business?”

Just like relationship counselling, there's rarely a simple answer; however, those willing to commit to developing a plan are usually rewarded and sometimes in ways that are unexpected.

To better understand where the relationship went off the rails, it's worth looking back at the reasons why you got into business in the first place.

I've found it common that many contracting businesses began when the owner became a sole-trader business.

This is the starting point to building a business, rather than having a business. A sole-trader has merely swapped from one employer to themselves, hence the term 'self-employed'; whereas, a business has the capacity to continue to operate whether the owner is in it full time or not.

So, let's look at the decision to become self-employed. That is, someone who is a tradesperson first and a business person in the making.

Michael Gerber explains this type of start up in his book *The E Myth Revisited*, still one of the top five selling business books of all time. He defines the E [entrepreneurial] myth as:

1. The myth that most people who start small businesses are entrepreneurs.
2. The fatal assumption that an individual who understands the technical work of a business can successfully run a business that does that technical work.

It's one thing to do the work and quite another to transition into running a business that does the work. However, with perseverance, the technician can become a highly successful business owner.

So, what changed to cause the relationship breakdown? It's actually a symptom of growth.

Let me explain: the self-employed technician is good at their trade and great at getting and keeping customers. Because of this, the business grows, and the owner has to contemplate how to manage the additional work available to them.

The first light bulb moment is the realisation that by employing people, they can invoice more hours than what the owner can physically work. We're talking about leverage here, right? Accelerated revenue and the owner is now thinking like a businessperson.

Usually those first employees are a lot like them. They become friends and enjoy spending time together, both at work and after hours.

As the business grows, additional employees are required. It starts to become harder to get the same level of employee engagement as with the first ones. This is where there's potential for the shared values and culture in the business to slip, leading to lower customer satisfaction resulting in less work coming through. If left unchecked, it can be the start of a death spiral.

This can happen because there's less time available to the owner for selecting and onboarding employees on criteria such as values and culture, because the owner now has a whole new set of responsibilities. Ones they may not have fully taken into consideration when first commencing the journey as a self-employed technician.

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For the owners who love interacting with customers and their people that look after the customers, the transition into administrative business functions has probably been a slow creep of activities that entered the business and grew as the business did.

Then one day, the owner stops, draws breath and realises that this isn't what they signed up for when they started out. They are no longer working in their sweet-spot, their area of strength that fulfils them. Rather, they can feel captured in a relationship that they now want out of.

Seldom do you hear of electrical and plumbing contractors getting into business to build them up so they can focus all their attention on admin and accounting. That's a bit like saying you decided to have kids because you needed someone to mow the lawns.

It is usually the change in role of the business owner that reduces their enjoyment and drives the desire to sell the business.

If we want the relationship to endure, then the starting point is to assist the business owner to get their



Figure 1: The Rhythm Model.

passion back. This quite often means a structural change to transition them back into their areas of strength – the sweet spot that energises them.

I developed the 'Rhythm Model' a couple of years ago to assist business owners in understanding where the fun's gone, how to get it back and in the process drive business improvement [see Figure 1].

- **Blue:** This is the revenue generating part of the business. Think of the blue area as being a 'blue sky' space, that is, it can grow to be as big and broad as you want it to be – so long as the owner can staff it with the right people to ensure happy customers.
- **Grey:** The grey areas of business are critical. They don't generate revenue. In fact, they eat profit. However, in the process they can change revenue into money in the bank, so you want to do this right and at the lowest possible cost.

The blue area is where the self-employed technician spends most of their time when they start out. It's also what they transition out of as the business grows.

Do you see the irony here? The customers love this business because of the quality of product, service and interactions they have with the self-employed technician. As the business grows, the customer experience is increasingly left to employees, because the business owner is pulled out of the blue and into the grey. This is why it's critical that those employees in the blue deliver the customer experience that the business was founded on.

Back to our relationship counselling analogy. Once we've identified that it is indeed the shift from the blue to the grey that is driving the relationship breakdown, then the first action is to get the business owner back into the blue. That is, back to the business functions that they love.

Thankfully there's been a major shift in the cost of managing the grey areas of business due to cloud-based industry disruptors.

Setting up industry specific software and systems, supported by others to do the ongoing repetitious accounting and administration tasks, is now easier and cheaper than it's ever been. These systems and technology can also greatly

assist the blue areas of business too.

A business in rhythm is one where the owners focus their strengths and expertise into what they love. After all, it doesn't feel like work if you're doing what you love. We find this is usually the blue areas of business.

Not surprisingly, the blue areas are also where fun and creativity can be used to generate profitable revenue. In fact, all revenue is generated from blue activities.

The grey areas are being managed with precision as efficiently and as effectively as possible by systems or low cost, highly qualified personnel that are either employees or outsourced [i.e. bookkeeping services, VAs, etc].

Getting the structure right with appropriate tasks allocated in both the blue and grey areas are the first steps to bring relief and passion back for the owner.

Naturally, there's more to be done to prepare a business for sale, however, if the owner is back enjoying what they are doing and reaping the rewards of business improvement, we find they then have the energy to complete other tasks required to prepare a business for sale.

Of course, once the business is structured to support the owner operating in their areas of strength... they may not want to sell it. ■

**The fire they once had for their business has gone out. This often leads to the next question “... so how do I sell my business?”**

Steve Keil has spent his career in trade related businesses, first as a contractor then with an electrical wholesaler. In 2004, he founded Laser Plumbing & Electrical.



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## DRUM ROLL, PLEASE

The iconic Drum Theatre recently had 127 light fittings added to its facade, highlighting the building and its heritage features. But the makeover didn't come without its challenges, writes **Simeon Barut**.

**T**he Drum Theatre in Dandenong opened in February 2006 and is labelled the 'centrepiece of the City of Greater Dandenong's CBD'. The former Dandenong Town Hall today hosts more than 170 performances for over 85,500 patrons each year, ranging from professional touring productions to local theatre acts and community presentations.

Recently, the local council decided to give the increasingly-tired facade of the Drum Theatre a modern facelift that retained the intricate, ornate detail that locals cherish.

The Drum Theatre's Lonsdale Street facade is recognised as a reminder of the past. As such, it is listed as a 'heritage' building. Of course, adding

modern lighting technologies to such a building would pose many hurdles for the electrical contractor, Laser Electrical - Narre Warren North.

In recent memory, Laser Electrical - Narre Warren North has seen a dramatic increase in its government work portfolio. This history, in conjunction with a competitive proposal, resulted in Laser Electrical being awarded the tender for the external facade lighting upgrade for the Drum Theatre.

"The building is made of solid brick with lime render on the facade, which we found to be very fragile. There were certain parts of the building that Heritage Victoria would let us alter and some parts we weren't allowed to go near. Even during the process of our

team upgrading the lighting, a heritage consultant needed to be present to make sure we were doing everything in line with their audit," says Laser Electrical - Narre Warren North director Nick Masson.

"We devised alternative routes for the cables and we also worked out ways to hide them so it wasn't in plain sight. There were also a number of ceilings that we weren't allowed to penetrate. However, we still had to drill over 100 holes - some up to 950mm thick and 11m up from the ground. We also had to make sure that we didn't damage any of the original elements of the building or the light sealings.

"By drilling those holes, this allowed us to wire through the floor and install floor-mounted access panels so that

the control equipment was accessible for maintenance.

“A lot of it came down to the fact that we had to work extremely closely with the heritage consultant to find a happy medium where we could perform the installation the way the council wanted while still maintaining the heritage integrity of the building.”

The Laser Electrical team had to conduct new ways to fit the LEDs as well. The glaring problem from the start was the cable length from the fitting to the control equipment was only 9m. To combat this, access panels were installed on the ground floor to house the control equipment, cater for the 9m cable length and give the installation team an extra access cabling point.

They also sought help from bracket manufacturers as the supplied brackets were not suitable for use as each mounted light had a differing depth or angle of ledge, regardless of its position.

Laser Electrical, along with Heritage Victoria, decided to design and have manufactured six different types of brackets to suit all mounting areas of the building. These brackets were powdercoated to a colour that blended in with the colours of the building to make them as non-obtrusive as possible.

Safety was also extremely important to not only the members working on the project, but considering it was done during opening hours of the theatre, keeping occupants away from hazards was a major focal point.

“We were very careful in the selection of access equipment. This is because we were constantly working very close to pedestrians so we had to make sure no diesel machines were used,” says Nick.

“The entire team was very proactive with fencing and traffic management and because a lot of the work was done on a street frontage, cleanliness was of the utmost importance to us. We were also working extremely diligently with the busy schedule of the theatre, minimising any interruptions and prioritising the safety of the patrons.”

Nick says that getting the project done within the tight timeframe they were initially given was a true testament to the work ethic of his team and the culture within it.



The Drum Theatre is now the focal point of Greater Dandenong’s CBD.



The new facade lighting can change colour to suit different seasons and events throughout the year.

“Good communication and acting on this communication played an important role in finishing the project. Given the site was occupied and we were working on the facade – which is typically a tricky area that requires a lot of attention to detail – it was great to maintain such a high standard and quality that is expected from our workers,” Nick says.

“Obviously, we’re extremely pleased with how the final result looks.

The overall effect of the lighting is fantastic, the workmanship is top notch; our staff should be very proud.

“The project has truly made the building the focal point of the city at night.” ■

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# HARNESSED SAVINGS

The automotive industry has used wiring harnesses for years. Now, these systems are benefiting the electrical sector through prefabricated wiring systems. **Deborah Andrich** reports.

**P**refabrication continues to make inroads in the Australian construction industry.

Although the practice is more common among builders, electrical contractors can benefit from a similar approach – ‘plug and play’ wiring.

The idea behind prefabrication is to streamline construction processes by favouring offsite manufacturing rather than labour-intensive onsite methods.

Components for a building – individual apartments, flooring cassettes, wall sections – are factory built and transported to the site for installation.

For electrical contractors, prefabrication means they can have pre-wired modular cable sections rather than long runs of cable on a job site. Everything can be done elsewhere and simply connected to the mains at the appropriate stage.

The main benefits of such an approach are shorter construction times, lower waste and therefore costs and increased efficiency for the overall build.

The principles are similar to those in the automotive industry. Designs are created at the drawing board and tested in a concept model, and materials are specified to an accepted percentage.

When it is all fully approved, the design is locked in and manufacturing begins.

Simon Waldren is managing director of Apex Wiring Solutions, which specialises in pre-terminated power cables.

“Ordinarily, electricians have to roll out a drum of cable, cut it, strip it back and terminate it at junction boxes as well as at the wiring accessories,” Simon says.

“By doing all of this offsite, there is reduced waste. We already know what the cable lengths need to be because it has been measured, designed and agreed to by the design team for the project.”

## CONNECTORS

Apex has developed a proprietary connector in conjunction with TE Connectivity (a Tyco company) to facilitate plug and play connectivity.

The three-pin configuration provides the basic two core and earth; four-pin allows for emergency lighting and switching and five-pin allows for lighting control to be installed.

In a custom configuration in New Zealand, a seven-pin system and connector was designed to provide two pairs in the Apex Lighting Distribution Unit [LDU] for A and B line switching.

The connector is based on a gas-tight four-point and six-point crimp design to maximise connectivity, which reduces voltage resistance and minimises hotspots or resistance dips in the circuit.

To increase safety in the plug and play connectors, the earth pins are longer than the live and neutral. The earth is the first and last point of contact when

the connectors are joined or separated for safe make-and-break.

“The design of the connector is such that it clicks together,” Simon says.

“If it doesn’t click together properly then you don’t have a circuit. From a testing point of view, it makes it very easy onsite to determine whether the circuit is functioning.”

Of course, if a section is created off-site, how do contractors know what they are connecting to the mains?

“Every single product we make is factory quality tested to AS61535:2011 before being sent to the site. We package it so that it is well protected, by zone, floor or room.”

Training in onsite connection is provided to ensure users are fully conversant with the system.

If there is an issue and something does get broken, the damage will be obvious or the connector won’t click together. Once installed, the circuit is fully tested.

Each section of a building gets a multi-circuit home-run, so any faults can be traced quickly and the section repaired. There’s no need to rip out a whole floor of wiring and drag through another set of cables.

Simon says three main types of connector are available in the pre-terminated cable market.

“From our tests and experience the most effective connection method is



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a gas-tight crimp, where you get even dispersion in the connector so that it sits in the collar neatly and clamps down on the conductor. The socket and pin go together neatly and the voltage resistance is negligible.”

This option, which is used by Apex, is the most expensive but probably the best available, barring a soldered or hard connection.

“It gives you greater reliability and lower voltage resistance,” Simon says.

Other options are a push-fit connection and then screw termination options.

The push-fit connection works with the conductor being pushed into the contact and held by a retention clamp, this is a good option for site fitting and connections.

The screw connection is an option which is a torque screwed termination on the conductor.

## APPLICATION

Prefabrication can be used on single dwellings through to multi-storey developments and infrastructure buildings such as hospitals.

Prefabrication shines in the commercial, retail and residential sectors for its rapid build times. However, the full benefits are realised in larger commercial projects where repeatable prefabricated

elements are used – eg: hotel rooms or hospital wards.

Modular wiring uses the same principles as the automotive wiring harness in that it is designed and planned, measured and plotted onto an overlay of the electrical circuitry to achieve point-to-point systems.

Wiring is incorporated into wall and ceiling modules and completed from room to room. It really is a ‘plug and play’ solution.

In one Lendlease project, the Sunshine Coast University Hospital in Queensland, prefabrication resulted in substantial reductions in build time.

More than 28,000 light fittings and 4,700 emergency and exit lights were installed. In addition, there were 700 CCTV cameras and 800 duress buttons for security and patient safety, many of which would have been pre-wired in the modular system.

Apex was involved in the design phase in the four-year lead-up to the first sod being turned.

“We provided power, lighting and switching to the wards and offices throughout the building in a modular wiring system,” Simon says.

“We provided a home-run solution which is a multi-pole, six-circuit pre-wired system from the distribution board, which then goes to the service

corridors to serve the field wiring.

“The next stage is pre-terminated cable, which leads from the HRB to the power and lighting connections and the accessories in rooms and corridors – such as the services panels in each ward.

“Each wall drop or light fitting is a pre-terminated lead from a T-point. As you move along the serial circuit, each light fitting or power point has a pre-terminated lead to a pre-determined length.”

## BENEFITS

Apex’s pre-terminated cabling is primarily available in 240V single phase.

“We do have extra low voltage and three-phase solutions, but they are not widely used in Australia. In a typical residential floor plan there may only be one circuit that is three phase and extra low voltage is just being introduced.

“Builders, developers and consultants generally like these systems because they provide standard repeatable blocks with a generic circuit overlay that provides the basics for every module.

“This makes it cost effective for high-rise commercial buildings, student accommodation, hotels and aged care.

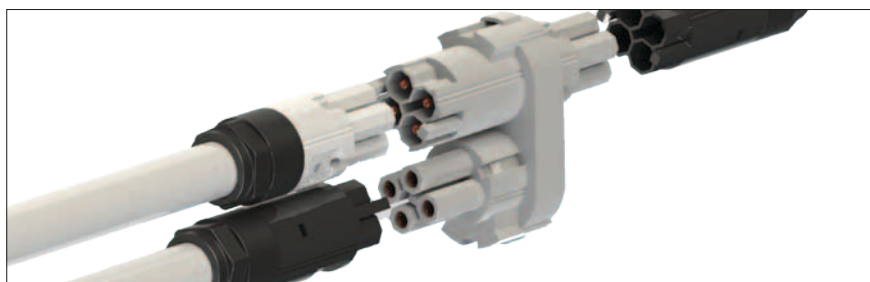
“To maximise the benefits, it is important that modular wiring design is brought into the conversation early on. Prefabrication is really a manufacturing process not a construction site method, so the design process is key.”

Early indications are that the Sunshine Coast University Hospital has realised the time savings forecast by the Lendlease team and Apex. Labour efficiency achieved was more than 60% greater than that for conventional construction methods. In the two years since installation there have been no defect reports.

“The first thing electrical contractors look at is cost,” Simon says.

“Our products are more expensive than conventional wiring methods, because they are engineered. But when you take into account the savings that can be achieved on labour and other areas, you can at least get a cost-neutral result.

“However, a 10-20% cost benefit is quite realistic.” ■



A gas-tight crimp, as used by Apex Wiring Solutions.



Modular wiring uses the same principles as the automotive wiring harness.

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# MONITOR WIZARDS

Distribution board monitoring offers analysis and control tools for all manner of businesses in regional as well as capital city locations. **Phil Kreveld** explains.

Individual circuit current, voltage and power data continuously measured at the circuit breakers of distribution boards is valuable for energy costing and equipment control.

Such a set-up is also useful for indicating malfunctions.

The recent development of multiple small current transformer (CT) sensor assemblies enables the gathering of digital electrical parameter data for measurement and control. These assemblies, which can be readily mounted on circuit breakers, integrate with the 'industrial internet of things'.

There are many other applications: in dairies, broiler industries, lamp and LED illuminated hot houses, irrigation, serviced apartments, hotels, hospitals, supermarkets, photovoltaic (PV) plant, cool rooms, etc.

PV systems using micro-inverters are employed in large power generation projects, and monitoring the output of individual panel inverters is crucial for maintaining their overall efficiency.

Because of the variety of switchgear encountered on low-voltage distribution boards, universal adaptability of the CT modules is important.

The illustrations in Figure 1 show CT sensor modules for three and 12 circuits. Individual circuit conductors are drawn through apertures in the



Figure 1

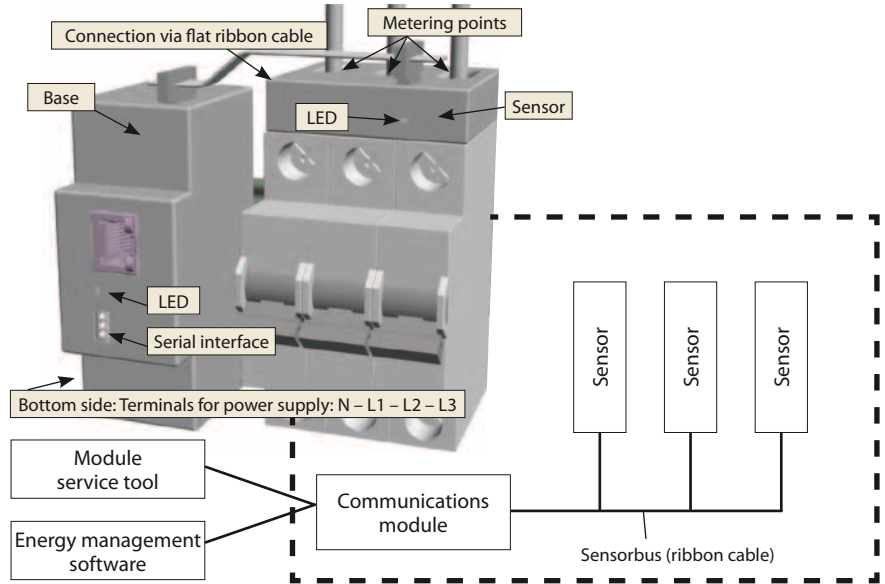


Figure 2: Courtesy of Power Parameters.

modules, which are then mounted on the switchgear.

A great advantage of this measuring and monitoring method is the elimination of much bulkier panel meters and DIN-rail mounting instrumentation.

Another important feature is the measurement of true rms current – requiring that harmonics are accounted for, at least to the 11th order and beyond.

In Figure 2, a typical monitoring arrangement for three circuits is shown. Sensors are connected via flat ribbon data bus, allowing easy expansion to 100 or more circuits simply by daisy chaining.

CT sensor data is centrally analysed in a communication module, providing current, voltage and power information for all monitored circuits.

The communication module connects via serial and Ethernet Modbus ports to programmable logic controllers (PLCs) and to computers equipped with analytical software. This provides, for example, cost allocation on the basis of power consumed in

individual circuits.

In combination with PLCs, measurement and control schemes are easily implemented for pumps and compressors, mills, belt and variable speed drives, etc.

Software for power cost allocation, with provision for email service to consumers (indicating, for example, excessive month-to-date consumption) gives single revenue meter organisations the necessary data for a large client base. Energy costs for common areas in shopping complexes, individual serviced apartments and offices can be apportioned easily.

A suitable service tool software module provides delineation of single and three-phase circuits, and scaling factors for measured and calculated electrical parameters in the communications module.

The provision of a complete set of parameters by the communications module – line current, phase voltage, power, power factor, apparent power and reactive power – extends the range of monitoring and control to motors and drives. Measurements and calculated values are set out below.

Note: subscripts refer to individual phases [circuits] as defined by the service tool software, serving as an arbitrary example.

**Measured by communication module:**

- $P_3 = V_3 I_3 \cos \phi_3$
- $P_4 = V_4 I_4 \cos \phi_4$
- $P_5 = V_5 I_5 \cos \phi_5$

**Calculated:**

- USEFUL POWER  
 $W = P_3 + P_4 + P_5$
- APPARENT POWER  
 $S = V_3 I_3 + V_4 I_4 + V_5 I_5$
- POWER FACTOR [cos  $\phi$ ]  
 $\cos \phi = W/S$
- REACTIVE POWER  
 $kVA_r = \sqrt{S^2 - W^2}$

A motor with a stator phase exhibiting intra-winding shorts or an open phase winding will have imbalance in phase current, and this will also show as imbalance in line current if it is delta-wired.

Stalled motors are usually protected by thermal relays. However, a motor

that is taking an excessive time coming up to speed is easily flagged.

Motors that are over-rated for their loads, or that have shed mechanical load [for example through malfunction of a clutch], will have low power factors. Motors whose mechanical load is increased through partial jamming or increased friction will draw balanced but excessive line currents.

The distribution board monitoring system described above is suitable for many applications. A supermarket with many refrigerated displays and freezers could individually monitor compressors and display lighting to signal excessive energy use. This might be through refrigerant loss and the consequent operation profile of the compressors.

Considering the slim operating margins of supermarkets and grocery stores, fast food and service outlets, the advantages of comprehensive electricity monitoring as described here are evident.

Integration of the monitoring system with PLCs for industrial processes such as bottling, palletising, machining, moulding, induction heating and heat treatment provides for efficient operation of plant as well as condition monitoring and the flagging of incipient problems.

In short, the distribution board monitoring system described represents a minimally disruptive installation that conserves board space. It would provide analysis and control tools for all manner of businesses in regional as well as capital city locations. ■

Phil Kreveld is an energy writer. He is an electrical engineer. He has worked in electrical, electronic and scientific instrumentation in Australia and the US.



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# IDEAL SURETRACE CIRCUIT TRACER

Finding cables and wires can be tiresome and time-consuming work. Here, **Paul Reilly** and the team at **Reilly Electrical Contractors** looks at a tool that can make circuit tracing simple.



**F**inding cables, wires and breakers can sometimes feel like a long game of hide and seek, extending labour costs and increasing customer downtime. It is frequently done by trial and error. When locating wires, opens and shorts becomes needlessly time consuming and short cuts are taken, nobody wins.

According to IDEAL, its circuit tracers can be used to quickly identify breakers and fuses, trace wires behind walls, and pinpoint opens and shorts with 'unparalleled accuracy'.

With the SureTrace circuit tracer there is no need to randomly cut holes in a wall to try and find a problem. Simply trace the circuit until you find your problem area and save time, money and a world of hassle by not having to call back different trades to repair the damage. Resulting in additional delay, cost and paperwork, and increased disruption to the householder.

We took a SureTrace into the field, to see how it would stack up against the competition.

## THE GOOD

Setting up the SureTrace is a doddle. There are very simple-to-follow diagrams and instructions printed on a sticker on the inside of the lid, which is a great idea for times when the paper manual gets lost. (The SureTrace comes with a full manual as well as a quick start guide, which is incredibly handy.)

The unit ships in a rather large, hard protective case that, while at times cumbersome, makes accessing the various add-ons, parts and connectors very easy.

The inductive clamp in particular is a great tool for use around field wiring, to be able to trace circuits when you can't get access to terminals.

Auto rotation of the receiver transmitter display is also excellent as it doesn't matter at what angle you are standing, the display will rotate. If anything, it is almost too quick to rotate. The LED display is easy to read as its yellow on black background and is also quite good to read outdoors.

The audible sound during operation is good too, but it can be challenging

to hear in a noisy environment. You can however cancel the noise if it gets annoying when using it for long periods, which is a good feature.

## THE NOT SO GOOD

Overall the SureTrace is a great unit with really only one downside – the single probes are too far apart to plug in to the active and neutral terminals.

The unit needs an Australian plug to be able to plug into a powerpoint. Not an adaptor, an actual plug.

Despite that, this unit is very useable and would not be out of place in an electrician's tool box. ■

*Note: IDEAL advises that the unit reviewed above is an international model and the plug mentioned will be changed prior to local release.*

Based in Shepparton, Victoria, Paul Reilly has been in the electrical industry since 1977, starting his own company in 1995.





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# CONTRIBUTING TO INTERNATIONAL ELECTRICAL STANDARDS THROUGH THE IEC



The International Electrotechnical Commission (IEC) is a global standards writing body that was established in 1906. It comprises members from all around the world, each representing energy and electrotechnical interests of their country, including regulators, industry, companies and businesses, educational bodies, testing laboratories and consumer interests. Every country that participates at the IEC does so through its National Committee (NC).

Standards Australia is the organisation responsible for administering the Australian National Committee to the IEC, providing it with the National Committee Secretariat, support mechanisms and the sub-structure of Australian 'mirror' technical committees and delegations

to the IEC technical committees.

Standards Australia, with the Australian National Committee, is responsible for engagement activities with the IEC in Australia, and specifically the technical committees that contribute to developing IEC International Standards.

Every year the IEC hosts its General Meeting around the beginning of October. This year the Russian National Committee hosted the General Meeting in the eastern city of Vladivostok. The General Meeting is held in parallel with Technical Committee meetings, IEC operational governance meetings, the IEC Council Board, capped off by the IEC Council session which includes all country members. The General Meeting is also an opportunity for the host nation to warmly

receive international delegates and showcase technical capabilities and areas of competitive strength.

Australia continues to punch above its weight at the IEC, representing Australian views and perspectives at the General Meeting across a spectrum of IEC areas of technical activity. While there is broad Australian participation at the IEC, the following committees particularly stand out as areas of Australian influence and technical capacity:

- IEC TC 31 and subcommittees [Equipment for explosive atmospheres] SC 31J [Classification of hazardous areas and installation requirements] – Chair TC 31 and subcommittees develops and maintains the widely applied IEC 60079 series on explosive atmospheres.
- IEC TC 34 and subcommittees [Lamps and related equipment]



- IEC TC 36 (Insulators) – Secretariat
- IEC TC 59 and subcommittees  
[Performance of household and similar electrical appliances]  
TC 59 and subcommittees develops test methods that underpin the Minimum Energy Performance Standards (MEPS) star rating system for energy efficiency.
- IEC TC 61 and subcommittees  
[Safety of household and similar electrical appliances] IEC SC 61H  
[Safety of electrically operated farm appliances] – Chair  
TC 61 and subcommittees develops and maintains the widely applied IEC 60335 series on household and similar electrical appliances.
- IEC CISPR and subcommittees  
[International special committee on radio interference]
- IEC TC 99 (High voltage electrical installations) – Secretariat
- IEC TC 106 (Assessment of EMF) – Chair  
Australia also participates on the IEC operational governance groups of:
- Standardisation Management Board (SMB)
- Conformity Assessment Board (CAB)
- Market Strategy Board (MSB)

While the above provides a short summary of Australian participation, there are many other areas where Australia is an active participant. Nevertheless, Standards Australia welcomes industry stakeholders to engage with IEC documents and their development through Standards Australia and the Australian National Committee. Emerging areas of standardisation at the IEC are:

- IEC SC 8B  
*Decentralised electrical energy systems*
- IEC TC 120 *Electrical energy storage systems*
- IEC TC 123 *Management of assets in power systems*

## Australia continues to punch above its weight at the IEC, representing Australian views and perspectives.

across borders. This in turn opens up markets, drives innovation and ensures that sectors remain competitive.

It is on this basis that Standards



The Australian delegation at the IEC Council session: (left to right) Jonathan Avery, Stakeholder Engagement Manager, Standards Australia; Ian Oppermann, Chair of the Australian National Committee to the IEC; Simona Tomevska, Stakeholder Engagement Manager, Standards Australia; Alex Baitch, Australian Delegate to IEC TC 99

- IEC TC 124 *Wearable electronic devices*
- IEC SyC *Low Voltage Direct Current*
- IEC SyC *Smart Energy*
- IEC SEG 7 *Smart Manufacturing*

International standardisation is a key driver that facilitates global trade and supply chains. The application of international standards in national economies means that quality and safety outcomes for products, components and installations can be maintained

Australia as a policy position seeks to align with IEC standards where possible. And in order to realise alignment, Australia must actively participate in the IEC standards development process to ensure that Australian perspectives and unique conditions are accounted for in the documents.

Further information about the IEC can be found at <http://www.iec.ch/>.

Otherwise Australian stakeholders are encouraged to visit the Standards Australia website to see how they can get involved in this important area of international standardisation. ■

Jonathan Avery is a Stakeholder Engagement Manager at Standards Australia and is responsible for standards development in the Energy and Electrotechnology sector.

## A word from the CEO

It was a pleasure to give recognition to Australia's best electrical and communications projects at NECA's annual Excellence Awards, held on 23 November.

Almost 400 industry representatives including contractors, educators and government representatives attended the Excellence Awards at the Sydney International Convention Centre.

Attendees heard from guest speaker the Hon. Craig Laundy MP, the Assistant Minister for Industry, Innovation and Science, who outlined the government's agenda for the electrical contracting sector.

There was a good geographical spread

of winners, with five winning projects from NSW, two each from Victoria, West Australia and South Australia and one each from Queensland and Tasmania.

We saw a fantastic range of projects this year. So it was even more challenging for our judges to decide on the national winners.

NECA thanks all the national finalists, congratulates the 2017 winners and acknowledges the ongoing support of the industry in making the Awards such a resounding success.

We would also like to particularly thank our sponsors, who have supported us in holding the awards for the past 29 years.



## 2018 Policy Statement

We've now released a refreshed and updated NECA Policy Statement for 2018, which was ratified by NECA's National Council at its November meeting in Sydney.

Our new statement continues to build upon our second iteration in 2016 and include new and amended policy positions in the renewable energy space, Continuing

Professional Development (CPD), building industry reforms and payroll tax concessions.

NECA's policy positions are critical for our industry as they signal to our stakeholders what members consider to be important issues for both themselves and the broader industry. To date we've had a number

of wins with respect to these positions we advocate for including payroll tax concessions, apprenticeship pilot programs, the return of the ABCC, the introduction of the Registered Organisations Act, the introduction of unfair contract provisions, and a focus on Security of Payment provisions to name a few.

## Nigel Peck honoured in re-named National Apprentice Industrial Award



This year, we've renamed our National Apprentice Industrial Award in honour of Nigel Peck, the founder of NHP, which he established in 1968 with a staff of 17. Nigel passed away in April this year, at the age of 89.

NHP is renowned for offering high-quality switch gear, advice and services across the Australia and New Zealand markets, having identified a market gap in for such products, 50 years ago.

In addition to Nigel's strong contributions to our industry, he was a highly valued philanthropist who dedicated himself to a range of causes across Australia. In June 2004, he received an Order of Australia medal for his services to the electrical industry and the wider community.

Naming our Industrial Apprentice Award in honour of Nigel's contribution to our industry is a fitting tribute to an individual who has supported NECA and the wider community.

# Congratulations to all our 2017 NECA Excellence and Apprentice Award winners.



They were honoured at a celebration in November attended by The Hon Craig Laundy MP, and almost 400 industry representatives including contractors, educators and government representatives.

Have you got a project that demonstrates outstanding commitment, innovation and professionalism? Information on how to nominate for the 2018 awards will be available early next year.

CATEGORY	PROJECT NAME	STATE	COMPANY
Domestic Residence	Modern Melbourne Residence	VIC	Advanced Lifestyle Solutions
Small Contracting Business	Curry Power	NSW	Curry Power
Work Health & Safety Management System (Project)	The Science Place - James Cook University - Townsville	QLD	Programmed Electrical Technologies
Work Health & Safety Management System (Company)	Kerfoot	NSW	Kerfoot
Industrial Small	Leonora Station Creek Telemetry Upgrade	WA	RCR Water and Water Corporation
Industrial - Medium Project	IKEA Multi Function Logistic Unit, Marsden Park	NSW	Barnwell Cambridge
Industrial - Large Project	Webb Dock International Container Terminal Project	VIC	Nilsen (VIC)
Energy Efficiency and Environment	Adelaide health and medical Sciences (AHMS)	SA	AZZO
Lighting	Sydney University's Great Hall	NSW	Elam Cabling Group
Voice/Data Communications & Audio Visual	Perth Children's Hospital - Communications Package	WA	DESA Australia
Commercial Small Project	TasWater North West Regional Offices	TAS	RBD Electrical & Instrumentation
Commercial - Medium Project	Wynyard Walk	NSW	Star Group
Commercial - Large Project	The New Royal Adelaide Hospital (nRAH)	SA	Nilse



**Alan Brown,**  
NECA National President



**Hon. Craig Laundy, MP**

## Apprentice Awards

	CATEGORY	EMPLOYER / HOST	STATE	APPRENTICE
<b>WINNER</b>	Industrial	Schneider Electric	VIC	Tim Stanway
<b>RUNNER UP</b>	Industrial	EGT / Host - Nilsen	WA	Justin Bennett
<b>WINNER</b>	Commercial / Domestic	Lanec Services	VIC	Jason Dupont
<b>RUNNER UP</b>	Commercial / Domestic	NECA Electrical Apprenticeships / Host - Kerfoot	NSW	James Brown
<b>WINNER</b>	Communications	PEER / Host - Integrated Cabling Solutions	SA	Christopher Cowan

## NECA reaches 5,000 members milestone

We're very pleased to announce that NECA now has over 5,000 members for the first time in its history.

Reaching the 5,000 member mark is a fantastic milestone in NECA's long and rich history. It's pleasing to see an uptake in membership and that the services that

we're offering are resonating amongst the electrical contracting sector.

It's encouraging to see that our products, such as WH&S advice, assistance in IR and contractual matters, training and apprenticeships as well as regular networking events are well received. We

will continue to work towards improving all of our offerings for the benefit of both our members and the sector more broadly.

We also look forward to continuing to work on behalf of the electrical contracting sector and delivering outcomes for our members in a number of critical policy arenas.

## Jamie Roberston wins Electrotechnology Industry Trade Award

Jamie Robertson, a former electrical services technician from the Ford auto-manufacturing plant in Geelong, has won the Electrotechnology Industry Trade Teacher Award for 2017.

Jamie is an A-Grade electrician who joined NECA Education and Careers in 2016 through its Teacher Pipeline recruitment process after completing both a Certificate IV in Training and Assessment and classroom time under the guidance of NECA Education and Career's Senior Teacher and Operations Leader.

The program has been created to bring in new trade teachers to the industry, based on their passion and dedication to mentoring the next generation of young electricians.

Despite Jamie's experience being limited as a teacher, there has been

positive feedback from staff, his students and employers according to NECA chief executive, Suresh Manickam.

"Jamie has an obvious way of connecting and engaging in the classroom and this has helped foster mutual respect," says Suresh.

"A strength of his is his motivation for continual learning and extending his knowledge within the electrical trade. References from his managers include 'regardless of the project he will always roll up his sleeves, have a go and learn along the way' and 'he is the absolute pinnacle of the culture and values we are promoting at NECA Education and Careers.'"

Trade Teacher Award judge Wes McKnight adds: "Once again, we were



highly impressed with this year's list of Trade Teacher Awards applicants and the ongoing success of this award is a testament to the quality of teaching across the industry. I wish to acknowledge all of this year's applicants and in particular, two others who we awarded a High Commendation to – Gregory Morgan from CET in Western Australia and Michael Cullen from the Holmesglen Institute in Victoria."

## Non-conforming building products

Parliaments around Australia are moving to address the very serious issue of non-conforming building products, which pose grave dangers both to public safety and our industry.

The Building and Construction Legislation (Non-conforming Building Products – Chain of Responsibility and Other Matters) Amendment Act 2017, which were recently passed in Queensland:

- Establishes a chain of responsibility, placing duties on building supply chain participants (including designers, manufacturers, importers, suppliers and installers) to ensure building products

used in Queensland are safe and fit for intended purpose; and

- Expands the compliance and enforcement powers of the Queensland Building and Construction Commission (QBCC), and the responsible minister.

To assist industry in meeting their obligations, the Department of Housing and Public Works has prepared a Code of Practice on non-conforming building products.

Similarly, at the time of writing there is legislation – the Building Products (Safety) Bill 2017 – before the NSW parliament which would:

- Give the NSW Commissioner of Fair Trading powers to stop new apartment buildings being covered with dangerous cladding;
- Impose fines of \$1.1 million for companies and \$200,000 for individuals if they use dangerous cladding; and
- Provide councils with the power to have non-conforming products removed.

NECA welcomes these initiatives, which align with our advocacy on this issue, including our submission to the Australian Senate's inquiry into non-conforming building products, which is scheduled to release its final report on 30 April 2018. ■

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# IT'S AWARD SEASON FOR KNX



Preparations are well under way for the Light and Building Fair in Frankfurt in March 2018 and as usual, the KNX Association has called for submissions for the prestigious KNX Awards that are held alongside the Light and Building Fair.

The KNX Award acknowledges and rewards KNX projects in home and building control from around the world. These projects are measured on how they stand out in terms of innovation and technical progress and acknowledge the achievements of integrators across a range of categories.

The concept of the KNX Awards is to honour outstanding projects in the home and building control sector that can display to the world the innovation and technical advancement associated with KNX. 2018 will be the 11th time the awards have been presented.

The criteria for a successful nomination are not related to the size and volume of the installation, instead the award judges place an importance on the following:

- the multitude of included trades in the design
- the flexibility and expandability
- the level of automation and complexity in the installation

- the user friendliness and acceptance through the user
- the convincing arguments for the client
- the implementation of products from different manufacturers

A jury panel is selected comprising professionally qualified people who are neutral experts from the KNX world. The jury makes its selection as a simple majority decision of the members of the jury. The jury will come together in December 2017 to commence the assessment process and then select five nominees in each award category. Further assessment is undertaken on the nominated projects until the eventual winner is announced at the KNX Awards night during the Light and Building Fair.

The award categories are:

- International Award – for projects across the globe
- Publicity Award – recognising projects that display the usefulness of KNX to the public
- Energy Efficiency Award – for KNX projects that emphasise the idea of energy conservation
- Young Award – for KNX projects that are implemented by young people, including trainees and classes
- Special Award – for KNX projects

that are highlighted by special characteristics

Australian projects and integrators have had success with the KNX Awards in past years with a number of projects achieving the final five nominees in a variety of categories including a successful International Award category winner for the building automation project for the Surf Coast Council offices in Torquay, Victoria.

The KNX Awards are an excellent showcase of technology, innovation and the advantages of multi-vendor solutions in the home and building sector across the world.



# STANDARDISATION

For some time we have spoken about the absence of a true standard in the home and building automation sectors of Australia and New Zealand. In the international community, the ISO/IEC 14543-3 standards have fulfilled a role to provide a standard for manufacturers, integrators and specifiers. This is the standard that KNX complies with and the ISO/IEC 14543-3 Standard has served the international community well for over 10 years as the only home and building automation standard available.

The benefits of standardisation provide clear benefit to the home and building automation sector. Through standardization, we have a mechanism for products from various disciplines and from multiple vendors to communicate with each other in an agreed and standardized way. The open

protocol from the standard ensures no manufacturer is disadvantaged in their involvement in a project. By promoting manufacturers to compete with each other without being hamstrung by protocol stimulates a naturally competitive and open market, allowing integrators freedom of choice for components and negotiation power with suppliers. The final result means a more competitive supply chain for the integrators and ultimately a lower cost to the end users.

A proposal to adopt the ISO/IEC 14543-3 standard within the Australian and New Zealand standards structure has been discussed for a number of years in Standards Australia. In recent months the proposal to adopt the international standard has passed a number of criteria set in the Standards Australia

procedures and an announcement of the final decision of Standards Australia is due to be made public in the very near future.

There are some options that Standards Australia for the standardisation pathway, to become an Australian Technical Specification or a full Australian/New Zealand standard. With either option, the opportunity for the home and building automation market to be able to nominate an official document on those projects where it is deemed necessary to provide the security and integrity of a standardised design, will provide strong benefits to the project.

It is anticipated that the decision about publication of the Standards Australia and Standards New Zealand document will be available by the end of the year. ■

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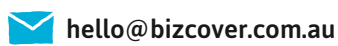
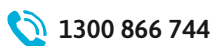
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# DOES LENGTH MATTER?

From seven years to three... are electrical apprenticeships actually teaching students enough to face the reality of working as an electrician? **James Tinslay** reports.

**M**any times, we have heard from, ahem, more 'mature' electricians that things were better in the old days – back when there were five-year electrical apprenticeships. Having said that, there appears to be no consensus on when the apprenticeship was reduced from five to four years.

It is well accepted that before World War I apprenticeships, in general, were seven years and it was reduced to four years after World War II. Since that time many apprenticeships have decreased to two or three years' duration.

Electrical apprenticeships notionally remain four years but there are cases based on merit where an apprentice might be signed off between three-and-a-half and four years. I believe it is no coincidence that this has occurred during a period which has seen an increase in adult apprentices and their significantly higher completion rates. Sadly, this position is in reverse since the decisions of industrial tribunals have meaningfully increased the wages

of mature age Australians wishing to enter an apprenticeship. But that is a separate story for another time.

It has become a set piece of industrial relations theatre that the ETU accuses NECA and other employer bodies of trying to reduce electrical apprenticeship to three years. NECA responds that the claim is untrue. It is a good piece of theatre, which provides fodder for some journalist to have a bit of fun. A bit like running a bottle up against a picket fence with a dog on the other side.

However, the inevitable and non-stop journey of technological advancement, especially virtual reality and artificial intelligence, may see some changes soon. Part of NECA's current project with the Federal Government dealing with alternative apprentice pathways has two elements of interest here. First is the examination of current practices and developing resources for better targeted simulated training for apprentices. The other, though not as relevant here, is customised training so that employers have training tailored

for their own apprentices so that they learn the skills relevant to the business in which they work. For example, many employers never deal with motors. So, should their apprentices learn the fundamental characteristics of AC and DC motors? Another topic for another day but it does go to the core of whether apprentice training is for the benefit of the employer, the apprentice or the overall industry.

Simulation is defined as any training or assessment activity that is undertaken in a non-workplace based environment while meeting the requirements of an accredited unit of competency or qualification. Simulation involves learners completing or dealing with the task, activity or problem in an off-the-job situation that reflects the workplace. Simulation is not, and should not be considered as, an assessment shortcut to the rules of evidence that still apply.

Unless you have been living under a rock, the use of virtual reality and artificial intelligence is now mainstream. It is finding a niche in industry and trade schools in other first world countries where it is currently being used. Is anybody trialling it in Australia right now?

Taking sides on simulated training is risky given the industry politics involved. However, I believe it will play a major part in future training of electrical apprentices, although it should not reduce the time of an apprenticeship in any meaningful way given the need to ensure mature responses by electricians in a potentially dangerous and complex industry. ■



As new technologies, like virtual reality and artificial intelligence, move mainstream, how will apprentices be affected?

James Tinslay is a consultant and engineer with some 40 years of industry experience. He is an ex-CEO of NECA and a director of NECA Electrical Apprenticeships.





# ATT

AUTUMN 2018

ACROSS THE TRADES



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A WORK OF ART OR AN ABSTRACT MESS?



86 MARKETING



90 THE 'GRIP TEST'



100 KEEP ON TRUCKIN'



## TOOLS



### Line laser

Bosch Blue is expanding its range of professional line lasers with the release of the GLL 3-80, featuring extra bright red laser lines and three 360° planes (one horizontal and two vertical lines).

Thanks to its three 360° laser lines, professionals can work with improved efficiency, saving the need to re-position the laser on the worksite.

Perfect for both indoor and outdoor applications, the advanced line laser also features a robust IP54 cover which is dust and water resistant, complete with a pendulum lock for safe transport.

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### Respirator filters

The silicone half-mask respirator with Press To Check filters from Pro Safety Gear is engineered to enable self assessment of the silicone mask's seal for better protection every time you use it.

On an ill-fitting mask, hazardous airborne particles may flow through gaps where the mask meets the face. Press To Check is a personal fit test system that can be administered anytime and anywhere.

It also features retro-reflective tape for improved wearer visibility, can be worn under most welding helmets and has enhanced four point cradle suspension for improved load bearing.

**Pro Choice Safety Gear**

[www.prosafetygear.com](http://www.prosafetygear.com)



### WalabotDIY

Vayyar Imaging has announced that the WalabotDIY is now available for Australian consumers. WalabotDIY gives users 'Superman-vision' to see up to 10cm into drywall, cement and other materials and determine the location of studs, pipes, wires and moving rodents.

With the Australian launch, WalabotDIY includes a new feature called 'Pan Mode', which significantly enhances its capabilities by allowing users to scan an entire wall and combine everything detected into a single image and see a 'map' of what's behind their walls. They can detect multiple studs, pipes and wires, follow the path of pipes and get a full picture of things that are hidden from view.

**Walabot**

[www.walabot.com/diy](http://www.walabot.com/diy)



### GPS and dash-cam combo

The Navman Drive Duo brings together the smarts of a GPS with a dash-cam that comprises of Full HD 1080P recording.

This clever gadget will protect you from fraudulent accident claims and will provide quality guidance all year around. It includes GPS features such as Landmark Guidance that uses objects you can see through your windscreen. It also has safety features like spoken safety alerts, Bluetooth hands-free, live traffic and 3D junction views, as well as premium driver alerts that warn you about merging lanes, or stop signs.

**Navman**  
[www.navman.com.au](http://www.navman.com.au)

### Elevated work platform

Bravi elevated work platforms (EWP) are distributed and backed nationally by Toyota Material Handling Australia.

The Bravi Sprint has already become the product range's volume-seller, suiting large retailers who need a fast and agile EWP solution in warehouses and on the shop floor, as well as commercial maintenance and building management operations such as window cleaning, ceiling repairs and electrical repairs and maintenance.

Safety features include a cut-out in the hydraulic lifting system if the interlocking gate is not closed correctly, and an operator platform service lock.

**Toyota Material Handling**  
[www.toyotamaterialhandling.com.au](http://www.toyotamaterialhandling.com.au)



### Earplugs

The new ProPod earplugs carry a Class 3 decibel rating which encourages wear by providing hearing protection while still allowing wearers to hear background noises such as an approaching forklift or co-worker communications.

The Propod earplugs also reduce the chance of ear infections, with finger-holds allowing workers to take them in and out them out without tainting the component that sits in the ear canal.

**Pro Choice Safety Gear**  
**Pro Choice Safety Gear**



# PUTTING THE HEAT ON

SHOULD WE HAVE LEGALLY ENFORCED MAXIMUM WORKING TEMPERATURES? **SAFE WORK AUSTRALIA** SAYS 'IT'S NOT THAT EASY'.

**I**mplementing a maximum temperature at which work should stop because of heat stress and dehydration risks is not a suitable control measure, according to Australia's national safety body.

A spokesperson for Safe Work Australia (SWA) said that setting a safe or unsafe limit based only on ambient air temperature is not appropriate because there are many other variables which together contribute to the onset of heat stress, including:

- relative humidity
- sun or heat exposure
- air flow
- physical demands of the work
- if the worker is heat acclimatised
- the amount of clothing and PPE worn
- work-rest ratio

Instead, SWA recommends that a risk management approach is implemented, with controls monitored for their effectiveness by the person conducting a business or undertaking (PCBU).

"Workers must be able to work in extreme heat or cold without risk to their health and safety... PCBUs must also monitor workers' health and provide better information about recognising and providing first aid treatment for heat related disorders," the spokesperson says.

Environmental monitoring tools that look beyond temperature and factor some of the many variables that contribute to heat stress will help. Wet Bulb Global Temperature (WBGT) - which is used in ISO 7243 - and Thermal Work Limit (TWL) are two such environmental monitoring indices.

While these tools are better than relying only on temperature as a measure of heat stress dangers, it is unrealistic to rely on any single measure and continued environmental and worker monitoring should be conducted to determine the effect



**Ending a work day due to extreme weather shouldn't rely on temperature alone. There are a number of other factors to consider, like humidity.**

of heat stress prevention and management strategies.

When asked whether work should be stopped in the event of extreme heat stress dangers, the SWA spokesperson says that work should cease if a risk assessment deems there is a serious risk to workers' health and safety and should not recommence until effective controls are introduced.

Further, workers also have the right to refuse to work if there are significant heat stress or heat illness dangers, although must remain available to carry out suitable alternative work, according to the SWA spokesperson citing Part 5, Division 6 (sections 83- 89) of the Work Health and Safety (WHS) Act.

They also cited the model Code of Practice: Managing the work environment and facilities as outlining controls in detail, which

broadly entail either modifying the environment or the work.

"In just about all situations, multiple controls will be required," the spokesperson said, adding that where required, expert advice should be sought.

Some of those controls may include crushed ice ingestion which acts as a heat sink on the body, cooling vests, PPE-free areas, loose-fitting clothing and cooling fans.

A great tool to assist in a heat stress risk assessment is WHS Queensland's Heat Stress Calculator (found at <http://bit.ly/2liWS10>). ▲

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# COMMUNICATING IN A CRISIS

S#IT HAPPENS AND THE ONLY WAY TO GET THROUGH RELATIVELY UNSCATHED IS TO MAKE SURE YOU COMMUNICATE EFFECTIVELY WITH THE OTHER PARTY. **CECELIA HADDAD** EXPLAINS WHY GETTING IT WRONG CAN COST YOU YOUR LIVELIHOOD.

**E**very business at one time or another will experience a crisis. The impact crisis has on your business and reputation depends on a number of factors and one of the most mitigating factors is how a company communicates during a crisis.

Money can't buy (or fix) a damaged reputation when things go wrong. A poor or ill-prepared response can do further damage to what is already a crisis situation. However, if communication is handled in the right way, the damage from a crisis can be minimised.

There are seven key rules that work with every crisis.

## #1 The first hour sets the tone.

How you act or react in the initial stages of a crisis will determine how the crisis is played out. If a crisis occurs, your instinct may be to run and hide or avoid questions but this will only make the impact even more severe. In the initial stages in all communications you need to be open, honest and state the facts. A short well-prepared message will minimise conjecture and provide the answers you want your audiences to hear. Failing to provide information in the early stages will just send your audiences, including media, to another source and it may not be the one you want.

## #2 The forgotten audience may be your best asset.

While you are scrambling around to find ways to protect your reputation, you may have overlooked the value of engaging employees first. From the outset deliver bad news to all employees first, at once and fast. This especially applies if your business operates at numerous locations and your team is on the road. This will dispel rumours and head off any speculation but more importantly, in a crisis, your employees will be your greatest asset if you communicate the right messages. Be sure you give them approved information

that they can share (if need be) so the message is clear and minimises conjecture or panic. If the incident is a more complicated one, prepare a FAQ (frequently asked questions) fact sheet employees can refer to for more detailed information.

### #3 Be prepared for media attention

If the incident is critical enough, media will pick up the story. Unfortunately, we have all read about tragic work site accidents that have led to severe injury or death of a worker. If the crisis escalates enough to grab media attention, prepare a holding statement as early as possible. Your holding statement will need to contain three elements: concern or empathy for the injured party; the action you are taking to help the situation; and perspective around this type of issue in relation to your safety record. An example in the situation where there is an injury or fatality might be:

We are extremely concerned for our employee who fell from a building site early this morning. At this stage he is being treated in hospital and we are unsure of the extent of his injuries. We are cooperating with authorities for a full investigation to determine why this occurred. We have not had an incident of this type in our 25 years in business and take employee safety seriously. We will be in a position to provide further information as it comes to hand.

If you know at this point that your company is to blame, then take responsibility and start moving forward to repair the damage to your organisation. If the fault is not known then avoid laying blame until a thorough investigation is carried out.

**#4 Communication is king**  
In any crisis situation, emotions are high, there is fear and panic. The most important



**If the incident is critical enough, media will pick up the story. If the crisis escalates enough to grab media attention, prepare a statement ASAP.**

aspects of communicating are to firstly keep communicating, keep everyone updated with progress and make sure

its two-way dealing with inquiries as efficiently and promptly as the situation allows. Secondly, don't just address reality, address perception. Even if the perception isn't real, it needs to be treated as a serious concern.

**The impact crisis has on your business and reputation depends on a number of factors.**

**#5 Don't ever lie.**  
Don't speculate, don't guess, don't make up answer, just don't lie. If you really don't know, admit you don't know and offer to find out the answer (if it's within your capability to do so). An honest mistake will be forgiven, a calculated lie won't.

**#6 Always reflect.**  
After the crisis is over, evaluate its effectiveness. Ask yourself - what worked; what didn't; how can you improve next time. When the dust settles it's the perfect

time to reflect, understand lessons from your actions and document it for future situations.

**#7 It is never over until...**  
The crisis may be over but the fallout won't be. What is said online stays online and while it may be old news to you, for anyone searching your company's name it will be front and centre on their computer screen. Now is the time to rebuild your reputation and image and essentially 'drown out' the negative news. Start putting out some good news stories and start to populate media and social media with some positive news and articles.

Applying these rules to every crisis may not make it go away, but it will definitely minimise the negative impact it can have on your business and your reputation. You may not avert the crisis but you can reduce its impact with effective communication. ▲

**Cecelia Haddad** is the director of Marketing Elements, which specialises in PR for the building and environmental sectors. She has over 20 years' experience and is the chair of the Registered Consultancies Group Committee for PRIA.

# A QUICK SALE'S A BAD SALE

LAWYER **MARTIN CHECKETTS** SHARES HIS TIPS ON HOW TO GET THE BEST PRICE WHEN SELLING YOUR BUSINESS – AND WHY A QUICK SALE IS RARELY A GOOD IDEA.

**Y**ears ago, a client came to see me and he was in bad shape. Unfortunately, he had been diagnosed with a serious illness and told, in that unique diplomatic way that doctors seem to have, to get his affairs in order. For good. It was the final curtain call.

This client had been a tradie his whole life. He had run his own construction business. It had decent goodwill with clients and plenty of repeat business. He didn't have anyone to take over the business, so he wanted to sell. Quickly. Enter the lawyers – or in my case, the lawyer.

It was a distressing scenario for all concerned and from the lawyer's perspective, it didn't make it any easier that I had to share an inconvenient truth: there is no optimum way to execute a quick sale. Once the buyer realises that they're in a 'fire sale' situation, the leverage is entirely with them. Of course, you could lie; you could conceal your illness or hope that the deal somehow gets done in the right timeframe. But rather than going down that slippery slope – and believe me, it's a very slippery one – I'd like to suggest an alternative: don't get yourself in that position to begin with.

Of course, there will be situations where a quick sale is unavoidable. Sometimes, you may not even want to avoid it. You might suddenly receive an offer for your business which is just too good to refuse. The key here is 'constant preparedness'. You don't know when life is going to throw you a curveball, but you can make sure that you'll be ready when it does come along.

Often this will come down to evaluating your own role in the business and coming up with a Plan B if you are out of the equation for any reason. As I wrote in an earlier article, this means putting some thought into succession planning, such as putting one of your kids in charge or promoting someone

from within the business. It may also mean taking out insurance to protect your income. But there are some situations where you may need to divest yourself of the business entirely and it's wise to be prepared for these.

Preparing for sale isn't something you scramble to do in a few weeks; it's an ongoing process and an inherent part of running a good business, even if you don't have any immediate plans to sell. Rule number one: keep your books in good order. If someone wants to run an eye over the top and bottom lines of your business, you should have that information ready at the push of a button.

This may sound like an obvious objective, yet it's a source of constant problems for business owners. I've seen tradies who are unable to demonstrate they have a profitable business because they've taken payment in cash and not kept any records. I've seen tradies put a bunch of personal expenses on the business account, which in turn produces an inaccurate profit as a result. It may not seem like a big deal when it's your business – but when the buyer comes in and wants to examine the books, it does become a big deal.

You should also keep copies of key documents relating to the business: employment contracts, contractor agreements, lease agreements, insurance policies, major customer agreements – all of these should be readily accessible and easy to hand over. If you're working in a regulated industry – and who doesn't these days – make sure you keep all of the relevant certification which shows that your business is complying with the relevant rules and regulations.

None of this is rocket science. But that's exactly the problem. Because the paperwork feels like the straightforward part of the business, we neglect it. It's all there somewhere, right? But unscrambling the mess when



a buyer comes knocking is the part that will prove all too hard when you need to do it in a hurry. It's one of the key reasons why the quick sale almost never produces a good outcome for the person selling the business.

Constant readiness is the key. Keep your books and documentation in order. And, to quote a certain British-American band of the '70s, don't stop thinking about tomorrow. ▲

*Please note that this article provides general comments and guidance only, and does not take into account your particular circumstances. Always seek independent professional advice before implementing any sale strategy.*

#### **Martin Checketts**

heads up the Private Advisory Team at national law firm Mills Oakley. He specialises in advising the owners of private and family businesses and high net wealth individuals on issues such as business succession and asset protection.



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OHS



## A HELPING HAND

THE WELLBEING OF ONE'S HANDS PROBABLY ISN'T SOMETHING MOST TRADIES THINK ABOUT ON A DAY TO DAY BASIS BUT EVEN A MINOR HAND INJURY CAN HAVE A LIFE-CHANGING EFFECT. **ADELLE KING** LOOKS AT HOW TRADIES CAN IMPROVE THEIR HAND HEALTH.

**A**ustralian tradespeople have some of the highest workplace injury rates of any sector and despite only making up 31% of the country's workforce, they account for 58% of accidents and serious injuries, according to Safe Work Australia.

Research conducted by the organisation found 40% of these injuries relate to the upper limbs, including hands, wrists, elbows and shoulders, and are traumatic in nature, meaning there is damage to the joint, ligament or muscle tendon. The research also found young workers under 35 were twice as likely to injure their hand as older workers.

The damage is generally caused by lifting, carrying or putting down objects and repetitive strain injuries from equipment and tools.

"We see a lot of tradies come in with hand injuries that can be quite devastating yet I don't think most tradies think about what they would do if they couldn't use their hands," says Melbourne Hand Rehab director and Australian Hand Therapy Association president Karen Fitt.

"In many instances niggling issues that could be quickly resolved by a hand therapist go untreated and turn into serious injuries and ongoing troubles."

Compounding the problem is the fact that tradies are generally reluctant to seek medical assistance and are likely to ignore health issues.

In its 2014 report, *Stop trading your health away*, the Australian Physiotherapy Association found 75% of tradies surveyed would regularly

ignore pain and all those surveyed stated that they were unlikely to visit a physiotherapist unless directed to do so by a doctor.

"Most tradies assume a few aches and pains are part and parcel of their work but leaving these untreated can make the problem worse. Early consultation and treatment for niggling pain, as well as major injuries, are important for tradies to get the full function of their hand back," says Karen.

"Having access to early intervention strategies and specialised hand therapy treatments is an effective way to prolong trades-based careers and improve the general wellbeing of those who work in them."

For tradies concerned about pain in their hands, a hand therapist can

administer a grip test, which uses a dynamometer to measure in kilograms how much power a person can generate with their grip. Examining grip strength is important in identifying injuries and determining the effectiveness of interventions.

Hand strength will depend on age, weight and sex so there are a set of normal values for hand therapists to compare results against for both the left and right hand. There are also established testing protocols in place to ensure accuracy.

"The grip test is an incredibly useful tool for picking up injuries and during rehabilitation to track improvements," says Karen.

According to the Australian Physiotherapy Association, tradespeople also have high rates of chronic health conditions, such as arthritis.

Many people assume arthritis is a disease that mainly affects elderly people and cannot be treated but 60% of people diagnosed with arthritis in

Australia are aged 15-60, according to the Australian Bureau of Statistics (ABS), and there are many treatment options available.

Hand therapists can do a lot to alleviate pain and strengthen the hand, including special exercises, wax baths, hand massages and splints.

"Tradies assume that there's nothing that can be done because it's 'just arthritis' but in fact there is a lot that can be done, especially for wrist and thumb arthritis, to enable tradies to continue working pain-free," says Karen.

"This is why it's so important to trust your hands to a practitioner of hand therapy. Members of the Australian Hand Therapy Association have over 3,600 hours of hand therapy experience and 300 hours of post-university ongoing professional education."

There is no referral required to see a hand therapist as a private patient but for those claiming through a compensable body, such as WorkSafe or



**Hand therapists can make work-friendly splints to minimise or avoid time off work.**

TAC, a referral is required.

"At the end of the day, most tradies rely on their hands to do their jobs so if they get a hand injury it can prevent them from working, which impacts their whole life," says Karen.

"Investing the time and money into seeing a hand therapist as soon as possible after a hand injury will avoid or minimise time off work as therapists can usually make work friendly splints." ▲

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AEG has launched its extreme-performance range of power tools and batteries that provide unrivalled power delivery and performance from an 18V system. Fusion™ tools are specifically designed and engineered from the ground up the most demanding tradesman. Exclusive to Australia and New Zealand, Fusion tools have been rigorously tested by Australian and New Zealand professional tradesmen in extreme application use.

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# GET PAID IN THE TRADES

SQUARE AUSTRALIA COUNTRY MANAGER **BEN PFISTERER** LOOKS AT HOW TRADIES CAN GET MONEY AND TIME BACK ON THEIR SIDE.

**A**sk any tradie running their own operation what their number one business challenge is and you're likely to get the same answer nine times out of 10: getting paid.

Waiting weeks or even months to get paid for projects is an instant path to a cash flow crisis - it can easily have a negative impact on your ability to pay wages, your ability to pay other suppliers and your ability to purchase new tools or equipment for future jobs.

The fact is that it is impossible to service your current clients properly and win more projects, without enough capital to resource your operations. And I'm not just talking about financial capital, time capital is just as important.

If you're running your own business, chances are you're probably working on the tools most days as well, so unless you stop working (which leaves you down a worker) or you hire more people, you'd be hard-pressed to find the time to grow your business.

Before you get disheartened, there are plenty of simple strategies that you can do to take control right now. Below are my top tips to help your business improve cash flow fast and get back some time in your day - and you can do it all on the go.

## 1 Use digital tools to get paid on the spot

The best way to get paid fast is to give your clients the ability to pay instantly. Having a mobile credit and debit card reader on hand, in your toolbox or work ute, helps you get paid straight away. It also, importantly, provides a simple and convenient way for customers to settle their bill immediately without worrying about cash.

And if you're on the road, back at the office or at home, you can simply take a payment over the phone. Digital platforms, like Square's Virtual Terminal, allow you to enter a customer's credit or debit card information straight into a web browser, eliminating a payment lag and ensuring you get paid instantly - no matter where you are.

## 2 Start sending user-friendly e-invoices

Don't spend hours manually writing up, mailing out invoices and chasing payments. If your client isn't onsite to pay immediately, send them an electronic invoice from your phone as soon as a job is done. When your customer receives an e-invoice they can conveniently enter their card details to make a quick payment, rather than having to log into their internet banking app or recall their bank account information. Many digital platforms now have advanced invoice capabilities which allow you to track when a customer receives, opens and pays

an invoice - you can also schedule recurring invoices and store cards on file, so you don't have to re-enter details for regular clients.

## 3 Integrate your payments and accounting software

Digital or cloud-based solutions are often talked about, but not often explained in simple terms, so here it is. Having a digital point-of-sale platform that allows you to take card payments in-person, online or over the phone is a faster, more secure and more reliable way to ensure you get paid. Team that with online accounting software that can easily talk to this system, and all your transactions will flow automatically into your accounts giving you an accurate record of your transactions all in one place. This not only improves accuracy, it significantly reduces the need for manual data entry which is a great time-saver for busy sparkies, especially at tax time.

## 4 Use payment data to improve your business

Having data and analytics tools is a must these days, especially for time-poor tradies who need to be on the tools as well. Analytics enable you to gain important insights into what's working and what needs to change in your business, so you can continue to make informed decisions to maximise revenue. ▲



Square's reader is available at [www.squareup.com/au](http://www.squareup.com/au).

### Ben Pfisterer

is Square's country manager for Australia and is responsible for building, deploying and managing Square's business and operational capabilities in the Australian market.



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# STATE OF THE ART CARTS

AS INTEREST IN ELECTRIC VEHICLES GROWS, ATTENTION IS TURNING TO THE LIGHT COMMERCIAL VEHICLE MARKET. **TERRY MARTIN** REPORTS.

**E**lectric vehicles account for only a fraction of Australia's booming new-vehicle market, and among light-commercials there is just a single option, Renault's Kangoo ZE compact van, that tradespeople can plug into.

But times are changing.

You might have noticed electric vehicle charging points cropping up in public places around Australia, and news headlines about state governments and industry either joining forces or going it alone in building a recharging infrastructure along major highways to ensure motorists can travel longer distances in EVs without fear of being stranded with a depleted battery.

Look a little deeper and you'll also see there are big moves afoot among the leading vehicle manufacturers - particularly in Europe, the US and China - in terms of ramping up development

of electrified vans and, in one notable case, even one-tonne utes.

This is happening at a time when sales of diesel-powered vehicles are declining in Europe - a shift which followed revelations that many diesel engines are emitting more pollutants than lab-based tests suggested - and as emissions regulations are getting ever more stringent.

Various countries are also now formulating plans to ban the sale of new vehicles with regular petrol or diesel internal combustion engines. Norway, for example, is preparing for a clampdown by 2025, France and the UK are following suit from 2040, and India has similarly raised the prospect of banning fossil fuel-based cars by 2030.

In the meantime, many other countries (and individual states) have set official targets for electric

vehicle sales, while major cities are establishing, or tightening up, congestion charge zones that allow free passage for EVs.

Australia has not announced any move to curtail petrol or diesel vehicle sales, and does not offer any incentive to purchase EVs, meaning the rate of change here is much slower.

But we are not immune to the overseas trends.

Renault has kicked things off with the Kangoo ZE and other brands are building a case for electric vans here - not only as their parent companies step up development, but as the benefits of owning and driving EVs become clearer.

## **RENAULT IN FRONT**

After running a pilot trial in recent years with Australia Post using the Kangoo ZE, Renault Australia now

has its hands on a heavily upgraded model that it is offering, for the first time, directly to the public - starting in Melbourne and Sydney.

Priced from \$45,990 plus on-road costs, the Kangoo ZE is available in long-wheelbase Maxi form and features a new 44kW/226Nm electric motor and higher-density 33kWh lithium-ion battery pack that offers a 270km driving range on the official New European Driving Cycle (NEDC) - up from 170km on the previous version.

Renault Australia's senior model line manager for electric vehicles, Elena Woods, says this extra range makes the Kangoo ZE "really quite accessible for your average small van user" and that with the further addition of an updated charger, the battery can now be fully recharged in six hours when plugged into a 7.4kW wall box - or topped up with 35km of range in just an hour.

Elena says tradespeople are on Renault's radar for the Kangoo ZE, despite it being priced \$19,000 above the regular diesel-powered model. She points to benefits such as its zero emissions, marketing advantages, feel-good factor, low running costs, ease of use (lack of noise and vibration causing less fatigue, for example) and quiet operation (which can allow for working at later hours in urban areas). And no compromise on load carrying capacity and the like.

"While Kangoo ZE is new to Australia, Renault has sold over 25,000 of them in Europe where they're very much a member of 'the today' rather than a trend for the future, and we would definitely advocate that this is the way things are going," she says.

In Europe, she says, Renault, which also sells the larger Master ZE, has found "drivers are calmer, companies have discovered that there are less sick days, less accidents - this is more anecdotal... but it is like driving something that feels very futuristic but is actually something that can blend into your business life.

"We plug everything else in, so why not our cars?"

## THE CHARGE POINT

Elena says the lack of public EV



**Mercedes-Benz is investing around \$233 million to electrify its commercial vehicle range. As part of this, it has developed the Vito E-Cell wall charger.**

recharging points in Australia is really a side issue for business operators in urban areas, who should have plenty of range from an overnight charge at home or work using a wall box delivering 7-22kW - a unit that typically costs \$2,000-\$3,000 fully installed by one of Renault's preferred suppliers.

"We tend to think of infrastructure in line with how we think of petrol stations," she says.

"They're very visible, they're external to our house, and they're everywhere - and obviously charging infrastructure is not to the same scale.

"However, in Europe, and which will most definitely be the case in Australia, most charging is done at home or at the office, so public infrastructure really plays more of a supporting role."

Topping up, if needed, is usually a simple matter of a quick charge at work during a lunch break or down period, with Elena adding that drivers "will effectively never have to go out of their way again to fill up their vehicle because it will always be there and charging when it has the chance".

Renault claims the updated Kangoo ZE is capable of up to 200km in 'real-world' conditions, up from 125km in the previous model. This depends on factors such as terrain, temperature, wind and driving style, but Elena says 'range anxiety' should not be a factor for the typical tradesperson working in the suburbs.

## LDV BUILDS CASE

Chinese auto giant SAIC Motor has developed a full-electric version of its LDV V80 large van and cab chassis which is now on sale in New Zealand (as well as China, Europe and the UK) and is under consideration for trial in Australia in partnership with local distributor Ateco Automotive.

The eV80's electric motor produces 92kW/320Nm - similar to the output of the 2.5L diesel version sold here - and combines with a 56kWh battery that can deliver a driving range of 192km (NEDC). A full recharge can be completed in about two hours with a fast-charge unit.

An electric version of LDV's smaller G10 van is also now available overseas, powered by a 75kW/380Nm electric motor - again, a close match to the current 1.9L diesel - and offers a driving range of about 200km. Just 90 minutes is apparently all that's needed for a full recharge using a high-capacity outlet.

"Electric vans very much are on our 'to do' list," says LDV Automotive Australia's Edward Rowe.

"With regard to Australia, we believe there is a clear and obvious place for an electric van or, indeed, vans of different sizes.

"Our studies show that our customers typically use their vans for 150-200km per day and their routine means they have a centralised place where one or two times a day, while loading or unloading, they can recharge their vehicles. ➤



Thanks to the Kangoo ZE 15, Renault is leading the charge for EVs in Australia.

"The vast majority of vans are used in metro areas and it is here that a zero-emission vehicle, especially one replacing diesel-powered vehicles, can make a significant contribution to reducing localised pollution, both air and noise pollution.

"Indeed, it is arguable that, given Australian vehicle usage and the fact that vans are working vehicles on the road most of the time, electrically powered vans could make the biggest contribution of all. Clearly, also, the driving conditions of metro areas are also ideally suited to an EV van."

### THE STICKING POINT

Edward echoes the sentiment from most other auto-makers in Australia when he says that the sticking point for LDV is "a lack of government commitment and policy on EVs".

"We are not saying that EVs need financial support or government financing," he says.

"What is required is for the government to have a policy on EVs that, with changes to all the legalities of importing and selling vehicles, at least places EVs on a level playing field with vehicles using existing energy sources and which recognises that EVs, by their very nature, require different rules from petrol- and diesel-powered vehicles.

"At the most basic level, a standardised plug for recharging EVs and a standardised power level (voltage/amps/phase) coming through that plug!"

He also emphasises that cities around the world are "actively planning to first ban diesel service vehicles - vans, light trucks and utes - and then mandate EV versions of these vehicles that, quite simply, keep cities functioning".

"So EV vans are very much the future and LDV very much wants and plans to be part of this fundamental change to how business vehicles serve the population in our cities," he says.

"LDV wants to be in the EV van market, we are keen to launch and LDV believes it can make a significant contribution to advancing EV use in Australia."

LDV is also known to be working on plug-in hybrid and hydrogen fuel-cell versions of its vans, while electric versions of the newly launched T60



Chinese auto giant SAIC Motor has developed a full-electric version of its LDV V80 large van and cab chassis.



Production of electric Mercedes Sprinter vans is expected to ramp up in 2018.



one-tonne ute were spotted recently by Australian journalists at SAIC Motor's proving ground in China.

### **MERCEDES AT WORK**

Mercedes-Benz is investing around \$233 million to electrify its commercial vehicle range, based on the Vito and Sprinter, and has secured a major deal with Hermes in Germany to electrify 1,500 mid-size and large vans by 2021. Pilot projects in Hamburg and Stuttgart are already underway.

"When series production of electric Sprinter and Vito starts to ramp up at the end of 2018, the intention is that electric vans will start to be offered to all our customers, including those in key markets outside of Germany," says Blake Vincent from Mercedes-Benz Vans [Australia/NZ].

"However, when this translates to production availability specifically for Australia is still unclear. We expect there to be significant interest in both Australia and New Zealand. We already regularly receive enquiries about electric vans from major fleet companies who are looking to improve efficiency and sustainability in their operations.

"Initially only one electric van was planned, but now both Sprinter and Vito will be available, which only strengthens the potential and our interest in launching locally."

Thinking further afield, Mercedes has developed new vehicle concepts such as the Vision Van and is trialling EVs as part of a broader connected network, where companies can facilitate things like optimal route planning and job allocations based on a van's battery charge and remaining range.

### **WAIT AND SEE**

There are a host of other full-electric and plug-in hybrid vans in various stages of development, pilot trials and production overseas from the likes of



**Mercedes has developed new vehicle concepts such as the Vision Van and is trialling EVs as part of a broader connected network.**

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**Australia has not announced any move to curtail petrol or diesel vehicle sales, and does not offer any incentive to purchase EVs.**

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Volkswagen (e-Crafter), Ford (Transit PHEV), Nissan (e-NV200), Iveco (Daily Electric) and Peugeot/Citroen (Partner/Berlingo Electric).

US EV giant Tesla Motors has committed to building a cargo van, and you can count on light commercial vehicles (LCVs) being among the 20 new EVs from General Motors by 2023. Toyota recently presented an LCV D-Cargo concept, signalling its intention to get in on the act, while pure-electric light-duty trucks such as the Mitsubishi Fuso eCanter is well established overseas.

Among the Australian divisions of these motor companies, there are no concrete moves to bring electric

vans or other plug-in LCVs here any time soon, with varying degrees of interest but a clear recognition that international trends cannot be ignored.

As Renault's Elena Woods puts it: "I don't think Australia is immune to global trends. At the moment, we would be considered to be lagging on electric vehicles, but that is quite possibly because there are no substantial incentives on their registration that other countries - the UK, France - have in place that has really enhanced the uptake.

"Our volume forecasts for the time being are modest, in line with the market in Australia today. But it would be remiss of us to not use the experience and wealth of knowledge that Renault has accumulated in Europe with the sales of its electric vehicles, to not bring them to Australia.

"As the market opens up for EVs, Renault will look at all opportunities." ▲



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## MERCEDES-BENZ X-CLASS PRICING

**M**ercedes-Benz has released local pricing and specification details for the four-cylinder versions of its hotly anticipated X-Class dual cab utility, which reaches showrooms in April priced from \$45,450 plus on-road costs for the tradie-oriented X220d Pure 4x2 manual cab chassis.

A load bed adds \$950, and a 4x4 driveline with the pick-up rear end starts from \$50,400, while the higher-output X250d is 4x4 only but available across both manual and auto and cab chassis and boxed ute body styles - starting at \$51,450 plus on-roads.

As anticipated, there are three trim levels - as well as Pure at the entry level, the X-Class is available in mid-series Progressive (from \$53,950) and top-spec Power grade (from \$61,600).

The standard gearbox is a six-speed manual, while shifting to the seven-speed automatic adds \$2,900 on X250d. Auto is not available on X220d.

The X-Class is based on the Nissan Navara and both four-pot diesels are Nissan-sourced 2.3L units, the 220d fitted with a single turbo and

generating 120kW/403Nm, while the 250d has twin turbos and is good for 140kW/450Nm.

X350d models will arrive mid-2018 using Mercedes' own 190kW/550Nm 3.0L V6 diesel.

Standard safety features across the four-cylinder range includes seven airbags, tyre pressure monitoring, a reversing camera (not available on cab chassis) and driver assistance systems including active brake assist and lane-keeping assist.

Mercedes says the Pure grade, which is readily identified by the black front, rear bumpers and (17") steel wheels, is designed for 'rugged, functional use'. It has plastic floor coverings, a 7" TFT infotainment system (with touchpad) and the usual array of creature comforts you'd expect at this level.

Adjustable load-securing rails in the bed and Mercedes' Parktronic parking assistance system is listed as a \$1,300 option for pick-up variants (not available on cab chassis).

The Progressive grade is fitted with 17" alloy wheels, body coloured

bumpers, satellite navigation, floor carpet, heated exterior mirrors, rain-sensing windscreen wipers, auto-dimming rear-view mirror, upgraded cabin trim and a digital audio system with eight speakers.

It also has three optional packages: Style (\$3,750), with LED front and rear lighting, an electrically opening rear window, tinted glass, side running boards, roof rails and 18" alloys; Comfort (\$2,490), which adds electric front seat adjustment, higher-grade seat trim, climate control and a stowage net in the front passenger footwell; and Parking (\$1,750), which includes a 360° camera and the Parktronic system.

At the top rung, Power variants come standard with key elements in the above packages, chrome exterior highlights, keyless entry/start and Mercedes' Comand Online multimedia system. It also has a Style package available for \$2,490, adding 19" alloys and other elements, while all three offer a 'Winter' bundle (\$590) with front seat heating and heated washer nozzles. ▲

## NISSAN TITAN

**N**issan has revealed that it is crunching the numbers for its full-size Titan pick-up truck to be introduced to all markets where the Navara is currently sold, meaning Australia is in line to receive the hulking V8-powered workhorse direct from the factory in Canton, Mississippi, in the US.

The numbers would obviously have to stack up for Nissan to retool its US plant for right-hand drive and a tilt at the Aussie market.

As a guide, the local conversion of Ram pick-ups run through American Special Vehicles - the joint venture between Walkinshaw Automotive Group and Ateco Automotive - had its sights set on 600 trucks a year (or 50 a month) but only managed just over half that (about 30 a month) last year.

The going is pretty tough when the asking price is north of \$100,000 - as seen with the Ram trucks and with Titans that are already available here through other local converters - but full factory backing and the benefits this brings with pricing, supply, specification and so on could make all the difference.

It will at least attract plenty of attention, with a V8 rumble that comes from either a 291kW/534Nm 5.6L naturally aspirated bent-eight petrol engine (driving through a seven-speed automatic gearbox) or a stump-pulling Cummins-sourced 231kW/752Nm 5.0L turbo-diesel that combines with a six-speed auto.

In the US, the Titan is sold in single, king and crew cab body styles, built on either a standard separate chassis or with a longer and heavier-duty 'XD' frame. No matter which variant you look at, the specs are high and mighty - the XD diesel crew cab, for example, is built on a 3,850mm wheelbase and stretches 6,165mm from end to end, 2,050mm from one side to the other and 2,000mm from road to roof.

The bed length on the diesel dual cab is still 2,000mm long, towing capacity is up around the 5,600kg mark (depending on the variant and towing set-up), payload is just shy of one-tonne and kerb weight 3,355kg.

At the top end of the Navara range, by comparison, the dual cab diesel uses a 140kW/450Nm 2.3L four-cylinder engine (with either six-speed manual or seven-speed automatic). It can tow up to 3,500kg and, while exact figures vary depending on spec, payload comes in just under 950kg and the kerb weight is around 2t. ▲



## MAZDA BT-50

**M**azda Australia has upgraded the infotainment system in its BT-50 ute in a bid to keep interest up in the ageing one-tonner as the Japanese manufacturer prepares to switch from Ford to Isuzu for partnership with its next-generation model, which is not due for release here until around 2020.

This is the Ranger-based BT-50's first update in a couple of years and brings with it a new infotainment system that Mazda has developed with the local arm of Alpine Electronics.

Fitted standard on higher-grade XTR and GT grades - leaving the XT with only a basic infotainment system - the upgrade brings a larger 8.0" high-resolution colour touchscreen with integrated reversing camera and improved satellite navigation that brings point-to-point four-wheel-drive off-road navigation with 3D digital terrain.

Mazda says that for the first time in a BT, the infotainment system has split screen capabilities, allowing both audio and navigation content to be viewed at the same time. It also displays air-conditioning and broader heating/cooling information, while incoming mobile phone calls can now be answered via controls on the steering wheel.

Passengers can watch pre-loaded TV shows or movies while the vehicle is stationary via USB or HDMI cable (the ports for which are now more accessible on the dashboard), as well play MP3, WMA, AAC or FLAC audio and MP4 and MKV video files. The HDMI input also replicates shows being watched via streaming services (such as Netflix, Stan or Foxtel), or on portable DVD players and tablets within the vehicle.

The system includes DAB+ digital radio - with four 50W amplifiers - and also has standard live traffic updates through the radio data system (RDA).

At the entry XT level, the BT is fitted standard with a 3.5" monochrome screen and has the usual array of connectivity ports and Bluetooth phone and audio capability, but no reversing camera. ▲

# LDV T60

**C**hinese brand LDV has launched its first utility, the T60, in Australia with an initial four-variant diesel-engined 4x4 dual cab range priced from \$28,990 drive-away for ABN holders.

As anticipated, Australian distributor Ateco Automotive has packed in loads of standard equipment, forged partnerships with local accessory outlets to enable tradespeople to tailor the vehicle for their business and is backing the one-tonne ute with a 5-year/130,000km warranty and 24/7 roadside assist over this period.

The T60 also comes with a 10-year body perforation warranty.

At launch, the ute is sold in two trim levels - the tradie-targeted Pro and higher-spec Luxe - with the option of manual or automatic transmission (both six-speed, the auto adding \$2,000) for the single powertrain on offer: a 2.8L four-cylinder common-rail turbo-diesel that produces 110kW of power at 3,400rpm and 360Nm of torque from 1,600-1,800rpm.

All have a 4x4 driveline with

selectable four-wheel drive and high- and low-range gearing.

The chassis setup is conventional body-on-frame with double wishbone front suspension and a solid axle leaf-sprung configuration at the rear, with the Pro version tuned for 'all day, every day loaded and working' requirements while the Luxe settings are pitched more toward the recreational market.

In something of a rarity in this segment, disc brakes are used at both the front and rear across the range - the latter are 324mm solid discs with a single-piston calliper, while a 300mm twin-piston combination is used up front - and braking performance is backed by a variety of electronic aids including an anti-lock system with electronic brake-force distribution and brake assist.

All versions have a 3,000kg maximum braked towing capacity, but the Pro has the advantage in terms of payload - 1,025kg for the manual and 995kg for the auto, while the Lux manual/auto come in at 875/815kg respectively. Kerb weight ranges from 1,950kg to 2,060kg depending on the variant.

What's arguably most striking about the T60 is the amount of standard equipment included across the range, with safety features - in addition to those already mentioned - running to six airbags (dual front, side and full-length curtain), a blind spot monitor, self-adjusting adaptive front lighting system, automatic dusk-sensing LED headlights (plus daytime running and fog lights), electronic stability and traction control, a separate vehicle dynamic control system, 'roll movement intervention', hill descent control, hill-start assist, rear parking sensors, a reversing camera and a tyre pressure monitoring system.

Significantly, the T60 has also earned a maximum five-star safety rating from the Australasian New Car Assessment Program (ANCAP) - and is the first Chinese ute to ever reach this mark.

Ateco has confirmed more variants are in the pipeline, including a 4x2 driveline, petrol engine and cab chassis rear end. Other body styles such as single and king cabs now look to be further afield. ▲





## RENAULT KANGOO MAXI DIESEL EDC

**R**enault Australia has finally got its hands on an automatic transmission option for its diesel-powered Kangoo van, priced from \$29,990 plus on-road costs.

As seen on petrol-powered versions of the French brand's updated compact van introduced a year ago, the six-speed EDC (for Efficient Dual Clutch) automated gearbox is available as a \$3,000 option over the regular six-speed manual transmission.

Whereas the petrol engine - an 84kW/190Nm 1.2L turbocharged four-cylinder unit - is restricted to the short-wheelbase (2,697mm) Kangoo Compact body style, the diesel engine provides extra muscle for the long-wheelbase (3,081mm) Maxi variants in the form of a 1.5L turbo-diesel producing 81kW of power and 250Nm of torque with the EDC - up 10Nm compared to the manual.

The five-seater diesel-powered Maxi Crew (priced from \$29,490) is not available with the EDC.

The new transmission brings a range of benefits including super-fast shift times of just 290 milliseconds,

according to Renault, 'creep control' (which makes life easier in stop/start traffic, pulling away gradually when the brake pedal is released) and the ability to shift gears manually.

Fuel economy is excellent, too, and while unable to match the manual diesel Maxi which returns 4.7L/100km on the official combined cycle, the EDC version is still a frugal little workhorse at 5.4L/100km. The EDC adds 28kg in weight compared with the manual.

Helping keep consumption down is the standard fitment of a driver-selectable 'Eco' mode on the diesel engine, which when activated modifies the management of the gearbox ECU (electronic control unit) and enables shifts at lower revs. The upshot, Renault says, is a cut in fuel use by as much as 10%.

All Kangoos come fitted standard with a high level of safety equipment including four airbags, electronic stability and traction control, ABS brakes with electronic brake-force distribution and emergency brake assist, and rear parking sensors. A

reversing camera is optional.

Other features onboard include air conditioning, a trip computer, cruise control (with speed limiter), electric windows, remote central locking and Bluetooth hands-free connectivity with audio streaming.

The 800kg payload on the EDC diesel Maxi Kangoo is down slightly on the manual version (825kg) but the load volume of 4.0m<sup>3</sup> is the same - as is the 1,050kg braked towing capacity.

Accessed via glazed dual rear doors (with 180° opening) and right- and left-hand sliding doors, the cargo area includes 14 tie-down points, tubular driver protection bars, mid-height lining, a rubber floor and lighting. It measures 1,862mm long, 1,218mm wide (between the wheel arches) and 1,251mm high.

The Kangoo range is covered by a 3-year/200,000km factory warranty with three years of roadside assistance thrown in. Service intervals are annual or every 30,000km, and covered by a capped-price servicing plan that, for the first three scheduled services, costs \$349 each. ▲

# VOLKSWAGEN AMAROK MY2018

**V**olkswagen Group Australia has applied a technical upgrade to its V6-powered Amarok utility range for the 2018 model year which increases its braked towing capacity by 500kg to 3.5t.

This now matches most of the German brand's major competitors in the one-tonne ute segment, although at the moment it only applies to the three 4x4 dual cab variants offered with the 165kW/550Nm 3.0L V6 turbo-diesel and standard-fit eight-speed automatic transmission.

Four-cylinder versions and earlier versions of the Amarok V6 remain at 3,000kg.

Volkswagen says the increased capacity comes as a result of an engineering tweak to the Amarok's rear step set-up, and the availability of a 3.5t-rated genuine VW towbar.

Pricing is unchanged, with the Sportline V6 starting at \$55,490 plus on-road costs, the mid-series Highline positioned \$4,500 further upstream at \$59,990 and, at the top end, the Ultimate flagship starting from \$67,990.

Faced with increasing competition from Mercedes with its forthcoming X-Class and Ford with its Australian-developed Ranger Raptor likewise due in 2018, VW has also signalled its intention to remain a leader in the one-tonne utility power stakes with a 190kW concept unveiled recently.

The Amarok Aventura Exclusive V6 show car emerged with a number of unique high-end elements but the headline act was, as VW described it, "a look at the future range-topping 3.0L TDI engine".

The power output is up 25kW compared to the current model - and on par with the maximum output in the X-Class. No torque figure was provided, but VW did confirm that it was higher than the current 550Nm - the peak torque figure that Mercedes' 3.0L V6 will offer at launch. ▲





## DESIGN AND INSTALL GRID CONNECT PV SYSTEMS WITH BATTERIES

The Grid-Connected PV Systems with Battery Storage: Design and Install course comprises online material including theory, quizzes, written answers and a system design task; and a three-day practical component including theory revision and the hands-on installation of a battery system, testing, commissioning and programming selected multi-mode inverters. This course has been prepared and mapped against unit UEERE4001A (Install, Maintain and Fault Find Battery Storage Systems for Grid Connected Photovoltaic Systems) and unit UEERE5001A (Design Battery Storage Systems for Grid Connected Photovoltaic Systems). Successful completion of the units UEERE4001A and UEERE5001A is not classified as an additional accreditation by the Clean Energy Council: it will be an endorsement applied to the applicant's existing Accreditation.

START DATE	LOCATION
07/02/18	Sydney
20/02/18	Brisbane
14/03/18	Sydney

## DESIGN AND INSTALL GRID CONNECT PV SYSTEMS

The Design & Install Grid Connected Photovoltaic Systems course consists of two main components: online theory completed at students' own pace and the face-to-face component held at the GSES training facility in Botany, Sydney. The required work includes the online and written assessments, the three-day practical course and a written open book exam. Electricians must complete both the online and practical components to be eligible for CEC Provisional Design & Install Grid-Connected PV Systems Accreditation.

START DATE	LOCATION
31/01/18	Sydney
13/02/18	Brisbane
07/03/18	Sydney
04/04/18	Sydney
17/04/18	Brisbane



For more training dates visit  
[www.trainingdiary.com.au](http://www.trainingdiary.com.au)

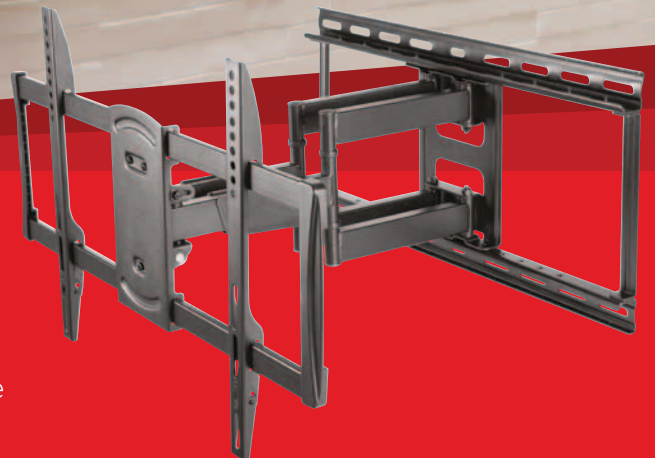


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**ELECTRICAL** CONNECTION  
training diary

## INSTALL ONLY GRID CONNECT PV SYSTEMS

This course has been designed to address the PV grid-connect market in Australia and is ideal for electricians who wish to expand their knowledge and skills. The delivery mode of this course is designed for busy tradespeople. With a fully flexible web-based format, the online course allows students to complete the theory in their own time. On completion of the majority of the online component, students then attend the practical component at the GSES Training Facility in Botany, Sydney.

START DATE	LOCATION
31/01/18	Sydney
13/02/18	Brisbane
07/03/18	Sydney
04/04/18	Sydney
17/04/18	Brisbane

## INSTALL ONLY GRID CONNECT PV SYSTEMS WITH BATTERIES

The Grid-Connected PV Systems with Battery Storage: Install Only course comprises online material including theory, quizzes, and written answers; and a three-day practical component including theory revision and the hands-on installation of a battery system, testing, commissioning and programming selected multi-mode inverters. This course has been prepared and mapped against unit UEERE4001A (Install, Maintain and Fault Find Battery Storage Systems for Grid Connected Photovoltaic Systems).

START DATE	LOCATION
07/02/18	Sydney
20/02/18	Brisbane
14/03/18	Sydney

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## CMT-16-510 NBN COPPER CABLE JOINTER

This course is designed for individuals with moderate experience and ensures that learning outcomes can be applied immediately to field activities using our advanced real-world, hands-on learning environments. On completion, learners will have the confidence to build common network infrastructure including connecting the node to the Telstra copper network under all scenarios including a variety of node types and pillar integration techniques. In addition this course will ensure learners can confidently complete pillar compressions, active cable cut overs as well as testing requirements for service activation.

START DATE	LOCATION
05/02/18	Melbourne
26/02/2018	Brisbane

## CMT-06-020 FIBRE OPTIC SPLICING & JOINT ENCLOSURE (TELSTRA APPROVED)

Designed for all skill levels, this course provides each attendee with an opportunity to secure the skills required to confidently install fibre optic joint enclosures used within a carrier network and splice fibre optic cores. Each attendee will construct a minimum of six carrier certified high fibre count joint enclosures. These are chosen to incorporate all the disciplines needed to confidently assemble most joint enclosures available and splice fibre optic cores without causing fault conditions.

START DATE	LOCATION
05/02/18	Melbourne
19/02/18	Brisbane

## CMT-11-180 ADVANCED OPTICAL COMMISSIONING & REPORTING

Designed for all skill levels, though an understanding of OTDR principles is highly recommended. This course is designed to provide attendees with the required skills to confidently provide an accurate OTDR analysis report with repeatable results.

START DATE	LOCATION
13/02/18	Melbourne

## CMT-16-445 NBN FIBRE SPLICER

This course is designed for individuals with minimal experience and ensures that learning outcomes can be applied immediately to field activities using our advanced, real world, hands-on learning environments. On completion, learners will have the confidence to build common network attributes including all optical joint enclosures used within the nbn optical architectures (TFN, DFN & LFN) as well as splicing ribbon and stranded optical cable types.

START DATE	LOCATION
05/02/18	Melbourne
19/02/18	Brisbane

## CMT-05-001 FIBRE OPTIC TEST COMMISSIONING & REPORTING (TELSTRA APPROVED)

Designed for all skill levels, this course provides all the information required to confidently operate and assess the quality of an optical fibre transmission link.

START DATE	LOCATION
19/02/18	Melbourne
27/02/18	Brisbane

## CMT-13-300 ETHERNET NETWORKING & TCP/IP

This course is designed to provide individuals with the knowledge of Ethernet and TCP/IP and associated communications standards and architectures. It focuses on guiding attendees on basic ethernet through the OSI layers, IP subnetting and different networking technologies that will help the individual build from a simple topology to a more complex one.

START DATE	LOCATION
20/02/18	Brisbane

## CMT-17-850 NBN FIBRE TESTER

This course provides attendees with the accreditation, competencies and skills to confidently test and fault find nbn's fibre optic network across the three different architectures: TFN, DFN and LFN/MTLFN. This course is designed for individuals with minimal experience and ensures that learning outcomes can be applied immediately to field activities using our advanced real-world and hands-on learning environments. On completion, learners will have the confidence to test and commission the nbn optical network to the published standards using modern equipment and techniques.

START DATE	LOCATION
12/02/18	Melbourne
26/02/18	Brisbane

## CMT-11-180 ADVANCED OPTICAL COMMISSIONING & REPORTING

Designed for all skill levels, though an understanding of OTDR principles is highly recommended. This course is designed to provide attendees with the required skills to confidently provide an accurate OTDR analysis report with repeatable results.

START DATE	LOCATION
22/02/18	Melbourne

## CERTIFICATE III IN TELECOMMUNICATIONS TECHNOLOGY (ICT30515) - RTO 40809

This is a structured traineeship program to effectively meet your organisation's resourcing needs. Perpetual's key objective is to equip new entrants with the necessary skills required to work in the telecommunications industry.

START DATE	LOCATION
29/01/18	Melbourne
03/04/18	Brisbane

## CERTIFIED KNX BASIC COURSE

KNX is an international building control standard that is used to put the intelligence into intelligent buildings. It enables the integration and programming of a range of products from a range of manufacturers using a single software tool. KNX products are all thoroughly tested for compliance ensuring they operate seamlessly together on a single, simple network.

START DATE	LOCATION
30/01/18	Brisbane
13/02/18	Sydney
13/03/18	Melbourne

## AERIAL CABLING ENDORSEMENT

This course is designed for participants to achieve the required skills and knowledge to install aerial cable for customer and hybrid fibre coaxial (HFC) networks. Participants will practice using basic rigging procedures, methods and equipment for working safely at heights and get introduced to formal documentation requirements as applicable to outdoor installation relevant to domestic, commercial or industrial installations. Communications applications include digital and analogue, telephony, data, video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia. It is recommended that participants already hold the Open Registration Licence or have completed the Open Registration course before attending this course.

START DATE	LOCATION
23/01/18	Clayton, VIC
20/02/18	Clayton, VIC
20/03/18	Clayton, VIC
17/04/18	Clayton, VIC

## OPEN REGISTRATION INCL. PRE REQUISITES

This course is for those looking to obtain the Open Registration. This is the best starting point for work within the Telecommunications Industry (on either the Customer Premises or Carrier Network). Once obtained, the Open Registration Licence covers various aspects of customer premises cabling, such as Telecommunications, Security Systems, and Fire Protection. Following completion of this course, learners will receive a statement of attainment which is used to apply for an Open Registration (previously known as the Austel Licence). Learners will also need to undertake supervised work experience on relevant cabling in order to gain the Open Registration.

START DATE	LOCATION
08/01/18	Gosnells, WA
08/01/18	NSW
12/01/18	Clayton, VIC
12/01/18	Derrimut, VIC
25/01/18	Clayton, VIC
29/01/18	NSW
02/02/18	Derrimut, VIC
09/02/18	Clayton, VIC
19/02/18	NSW
02/03/18	Derrimut, VIC
02/03/18	NSW
05/03/18	NSW
09/03/18	Clayton, VIC
30/03/18	Derrimut, VIC
06/04/18	Clayton, VIC

## ALARM INSTALLATION

This course is designed to provide you with the skills and knowledge required to install a basic alarm system from the sensors through to the alarm panel and control pad. You will also learn to install and maintain complex alarm systems including back to base monitoring. Alarm installation is a regulated activity in some Australian States and Territories. To find out about your licensing/regulatory requirements, please contact your Work Health and Safety Regulatory Authority at National or State/Territory level, or check on the Australian Security Industry Association (ASIAL)'s website.

START DATE	LOCATION
15/01/18	NSW
15/01/18	Clayton, VIC
12/02/18	NSW
19/02/18	Oxley, QLD
26/02/18	Clayton, VIC
19/03/18	NSW
03/04/18	Clayton, VIC
16/04/18	NSW

## CABLE HAULING

This course is designed for participants to achieve the required performance outcomes, skills and knowledge to haul underground cable, involving installation and recovery of cables, including multi-pair, coaxial and optical fibre in access networks or customer premises, in line with current Telstra standards.

START DATE	LOCATION
19/01/18	Clayton, VIC
24/01/18	NSW
07/02/18	Oxley, QLD
16/02/18	Clayton, VIC
21/02/18	NSW
07/03/18	Clayton, VIC
21/03/18	NSW
29/03/18	Clayton, VIC
13/04/18	Clayton, VIC

## KNX BASIC ACCREDITATION TRAINING

KNX is an international building control standard that is used to put the intelligence into intelligent buildings. It enables the integration and programming of a range of products from a range of manufacturers using a single software tool. KNX products are all thoroughly tested for compliance ensuring they operate seamlessly together on a single, simple network.

START DATE	LOCATION
16/04/18	Clayton, VIC

## INSTALLATION AND MAINTENANCE (BASIC) (MEETS TELSTRA STANDARDS)

This course is designed for participants to achieve the required skills and knowledge to carry out cable fault repair (using electronic fault location instruments) and telephone service installation in the Telstra network. It includes joint metallic conductor cable in Telstra underground pits and jointing or above-ground enclosures, installation of cross connections (jumper wire) in Telstra exchanges, pillars and cabinets, and work on the Telstra side of customer main distribution frames. Note: Prior to attending this course, learners must have completed the Telstra Network Site Induction and hold the Restricted or Open Registration Licence, in line with current Telstra standards.

START DATE	LOCATION
29/01/18	NSW
29/01/18	Clayton, VIC

## COAXIAL CABLING ENDORSEMENT

This course is designed for you to achieve the required skills and knowledge to competently install, terminate and test coaxial cabling on customer premises. This includes work in communications applications, digital and analog, telephony, data and video, digital broadcasting, computer networks, local area networks (LAN), wide area networks (WAN) and multimedia. Completion of this course will allow you to apply for the Coaxial Cabling Endorsement on their Open Registration Licence. This Endorsement covers work with Coaxial Cabling on domestic or commercial premises. It is recommended that you already hold the Open Registration Licence or have completed the Open Registration course before attending this course.

START DATE	LOCATION
10/11/18	Clayton, VIC
23/01/18	NSW
23/01/18	Oxley, QLD
06/02/18	NSW
06/02/18	Clayton, VIC
13/02/18	Derrimut, VIC
27/02/18	NSW
06/03/18	Oxley, QLD
13/03/18	NSW
14/03/18	Derrimut, VIC
23/03/18	Clayton, VIC
27/03/18	NSW
10/04/18	NSW
17/04/18	Derrimut, VIC

## WORK SAFELY AT HEIGHTS

This unit describes a participant's skills and knowledge required to work safely at heights in the Resources and Infrastructure Industries. This unit is appropriate for those working in operational roles where they are required to perform working at heights.

START DATE	LOCATION
17/01/18	Clayton, VIC
28/02/18	Clayton, VIC
26/03/18	Clayton, VIC
17/04/18	Clayton, VIC

## OPTICAL FIBRE CABLING

This course is designed for participants to achieve the required skills and knowledge to competently conduct optical fibre cabling. Participants in this course will be able to identify the different forms of fibre optic cable, gain an understanding of the propagation of light through the fibre and understand the various connection and splicing methods of optical fibre and where they are used in installations throughout the industry. Completion of this course will allow learners to apply for the Optical Fibre Internal Cabling Endorsement on their Open Registration Licence. This Endorsement covers work with optical fibre on domestic or commercial premises. It is recommended that participants already hold the Open Registration Licence or have completed the Open Registration course before attending this course.

START DATE	LOCATION
11/01/18	Clayton, VIC
24/01/18	NSW
24/01/18	Oxley, QLD
07/02/18	NSW
07/02/18	Clayton, VIC
14/02/18	Derrimut, VIC
28/02/18	NSW
28/02/18	Clayton, VIC
07/03/18	Oxley, QLD
14/03/18	NSW
15/03/18	Derrimut, VIC
26/03/18	Clayton, VIC
28/03/18	NSW
11/04/18	NSW
18/04/18	Derrimut, VIC

## CCTV INSTALLER COURSE

This CCTV installation course is designed to provide you with the skills and knowledge required to install and commission Closed Circuit TV systems from the cameras to the image processors and recorders. This kind of security system installation work is a regulated activity in some Australian States and Territories.

START DATE	LOCATION
22/01/18	Clayton, VIC
30/01/18	Oxley, QLD
16/02/18	NSW
26/02/18	Clayton, VIC
05/03/18	Clayton, VIC
23/03/18	NSW
09/04/18	Clayton, VIC
09/04/18	Clayton, VIC

## STRUCTURED CABLING (CAT 5 6 AND BEYOND - CPR ENDORSEMENT)

This course is designed for participants to achieve the required skills and knowledge to competently cable integrated voice and data systems to the Australian Standard AS/NZS 3080:2013 Information Technology – Generic cabling for customer premises to meet client communication needs in a commercial environment. Completion of this course will allow learners to apply for the Structured Cabling Endorsement on your Open Registration Licence. This Endorsement covers work with CAT 5 (and above) on domestic or commercial premises. It is recommended that participants already hold the Open Registration Licence or have completed the Open Registration course before attending this course.

START DATE	LOCATION
09/01/18	Clayton, VIC
22/01/18	NSW
22/01/18	Oxley, QLD
05/02/18	NSW
05/02/18	Clayton, VIC
12/02/18	Derrimut, VIC
26/02/18	NSW
26/02/18	Clayton, VIC
05/03/18	Oxley, QLD
12/03/18	NSW
13/03/18	Derrimut, VIC
22/03/18	Clayton, VIC
26/03/18	NSW
09/04/18	NSW
16/04/18	Derrimut, VIC
16/04/18	Derrimut, VIC

## POWER AWARENESS - 2 DAY TRAINING

This power awareness course is designed for you to achieve the necessary skills and knowledge to safely work near 'live' electrical lines and equipment while running or maintaining communication cables on electricity supply structures. Note: Telecommunication assets have co-existed on the overhead electricity network for many years. A typical example are above-ground telephone cables in areas where the installation of underground cables was not practical or economical at the time. In more recent years, Pay-TV cables have been added. With the current role-out of the National Broadband Network (NBN), Network Operators have established training requirements as an element of safe work systems for employees working in the installation of telecommunication cables for both NBN and existing telecommunication assets.

START DATE	LOCATION
15/01/18	Clayton, VIC
26/02/18	Clayton, VIC
27/03/18	Clayton, VIC

## PIT & PIPE

This course is designed for participants to achieve the required performance outcomes, skills and knowledge to install telecommunication pits and conduits, including customer lead ins. Participants will also learn the remediation of existing damaged or undersize pits. Note: This course does not include certification for asbestos removal.

START DATE	LOCATION
17/01/18	Clayton, VIC
22/01/18	NSW
05/02/18	Oxley, QLD
14/02/18	Clayton, VIC
19/02/18	NSW
05/03/18	Clayton, VIC
19/03/18	NSW
27/03/18	Clayton, VIC
27/03/18	Clayton, VIC
11/04/18	Clayton, VIC

For more training dates visit  
[www.trainingdiary.com.au](http://www.trainingdiary.com.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.

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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
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- ▶ informative newsletter and email updates
- ▶ access to services on [www.registeredcablers.com.au](http://www.registeredcablers.com.au) as an "NBN ready" Cabler
- ▶ links to our national network of industry affiliations

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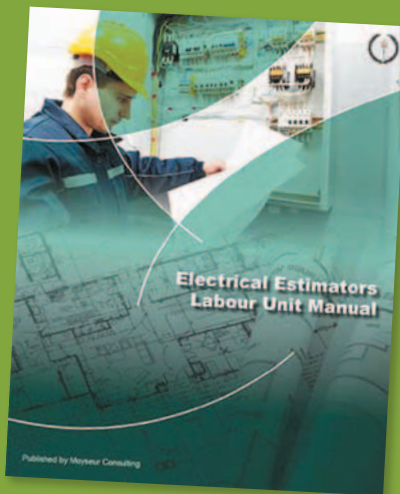


# TRADESTUFF

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## 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.



WRITTEN BY BRIAN SEYMOUR,  
ELECTRICAL CONNECTION CONTRIBUTOR

\$120.00 ..... CODE 583

## Electrical Wiring Practice Volume 1 & Volume 2

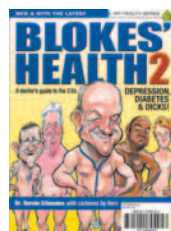
Volume 1 and 2 of *Electrical Wiring Practice* has been updated to provide guidance in the use of the Australian and New Zealand Wiring Rules, AS/NZS 3000:2007, including the 2009 Amendments. Taking a practical approach, this book employs clear visual tools to illustrate the knowledge and practices required by specified products and the Standards.



\$186.95 ..... CODE 086

## 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 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

## 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

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# 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 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 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 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 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 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

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Company: \_\_\_\_\_

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 CARD NUMBER:                     
 EXPIRY:   /

Cardholder's Name: \_\_\_\_\_ Signature: \_\_\_\_\_

CODE	QTY	UNIT COST	TOTAL \$
		\$	\$
		\$	\$
		\$	\$
		\$	\$
<b>TOTAL PAYABLE</b>			\$

\*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.

MAIL TO: CONNECTION MAGAZINES, UNIT 2/18-22 LEXIA PLACE, MULGRAVE VIC 3170

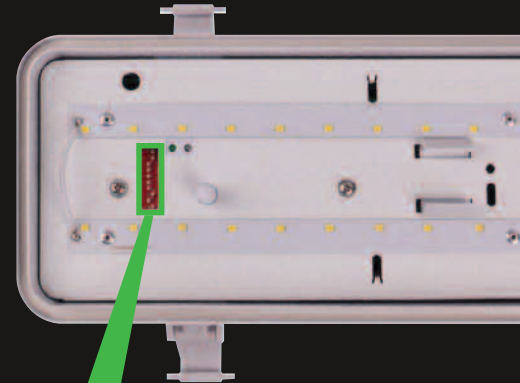
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# SmartSense™ Zone Control

## Truly Intelligent Lighting

SmartSense™ Zone Control is an elegant solution perfect for environments with long operational hours, providing illumination when needed and dimming when required.



Energy Savings  
as high as

**85%**



**Sensitivity**  
(3m-10m)



**Hold Time**  
(10s-10m)



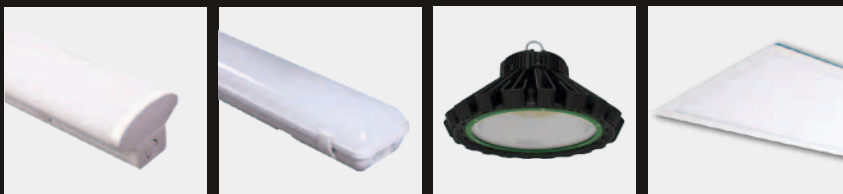
**Activation threshold**  
(10lux-50lux)



**Dim level**  
(10%-30%)



**Dim to Off time**  
(30s-20m)



Linear-Q  
Batten

Linear-Q  
Weatherproof

SkyBay 3  
Highbay

NovaBlade  
Panel

All products are easy to install, have movement and daylight sensing and are also a fast payback. Use these products for Carparks, Warehouses and Storage Facilities.



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