ELECTRICAL CONNECTION

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SUMMER 2016

INSIDE

SMOKIES:
LIFE SAVERS OR FIRE TRAP?

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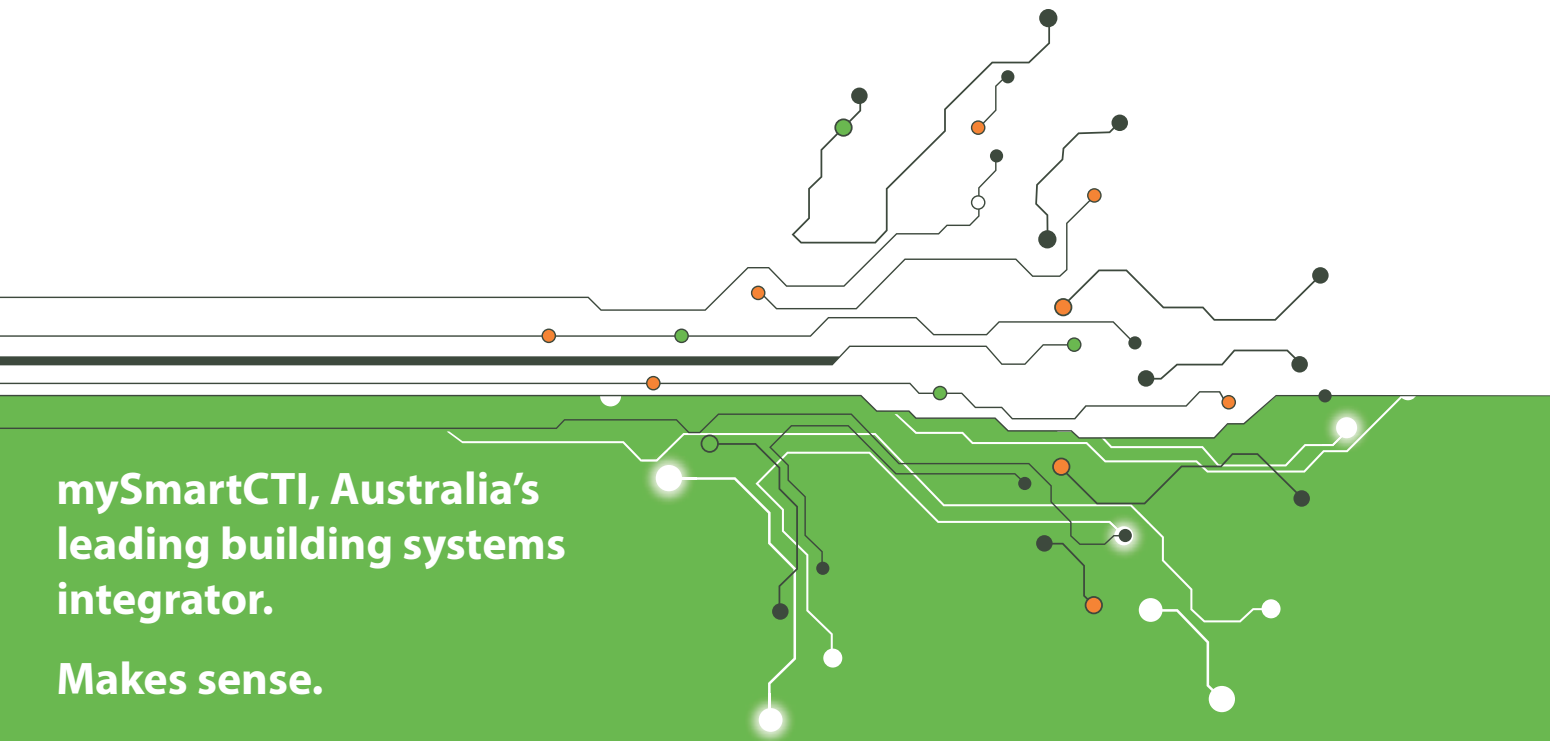

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There are two kinds of smoke detector on the market, but one of them doesn't deserve the name. 18

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CABLING CONNECTION

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ACROSS THE TRADES

SHERRIFF ELECTRICAL WHOLESALERS

ON THE MOVE!

4 New Branches

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SENDING TRADIES TO THE SHOWERS

About 18 months ago, I noticed a crack in the base of my shower.

It turns out the builder had installed a very cheap plastic base instead of the preferred fibreglass options. Then, instead of properly fixing the base to the floor, they had used patches of cement as if it was Blu-tac.

The whole thing was executed poorly, but I digress.

This story isn't about ragging on builders; rather, it's about ragging on the incredible lack of customer service I experienced at the hands of the tradie I hired to fix my shower base.

You see, upon noticing the crack, I did what most people would do – I ignored it for a good couple of weeks and then found a local shower repair 'expert' to come and remedy the issue.

He seemed to know what he was talking about, and his price seemed fair, so I employed him to replace the base and then we could both go on our merry ways.

Looking back, the first sign of a potential problem should have come when he struggled to reinstall the shower screen. (Pulling it down? No problem. Putting it back up? Oh...)

It was when I heard him using a hammer on a glass screen that I intervened and very quickly figured out the (very simple) slotting mechanism.

Yes, that was weird but the new base was now in place, the tiles had been refitted and re-grouted and the screen was now back in place. Great!

About a month ago was the first time I noticed the water damage starting to appear next to the new base. Further, mould had started to appear so I got back in touch with the 'expert' and asked him to come and have a look.

The scheduled appointment time came and went... no tradie. After that, he only conversed with me via text.

"Send me a picture," he said.

I did.

"There's too much mould. Spray Exit Mould on it and send me another picture," he said.

I did.

"I can't tell from these images... and there's no mould," he said.

And that, my friends, is the last I heard.

It's experiences like this that make customers wary of tradies. What's to say that you will do the job properly? Will you answer service calls?

Will a bitter journo ever write about his experience with you to 30,000 of your peers? I hope not.

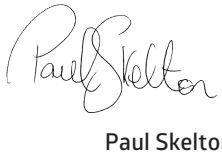
We work in a 'faith-based' industry so perhaps we all need to ask ourselves:

- Am I doing enough to ensure my customers believe in me and my company?
- Will the service I offer encourage my customers to recommend me to their friends and family?
- Do I deliver on everything I say I will do?

If you can answer 'yes' to all of these questions then you truly are a credit to your profession and your industry.

Perhaps the only question that is more important than those I have listed above is this: Does anybody know a good plumber?

Until next time,



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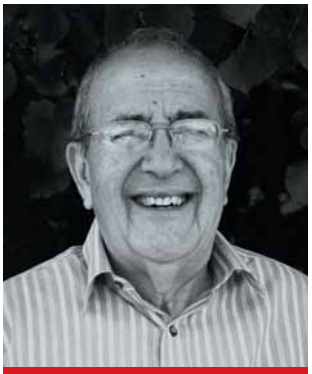


PHIL KREVELD

Let's Get Technical

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

> See pages 32 and 48

GARY BUSBRIDGE

The Buzz

Gary Busbridge has been with Clipsal for more than 40 years. Since 1997 he has been involved with Standards Australia and has held memberships in several Standards committees.

> See page 44

WES MCKNIGHT

McKnight On The Town

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

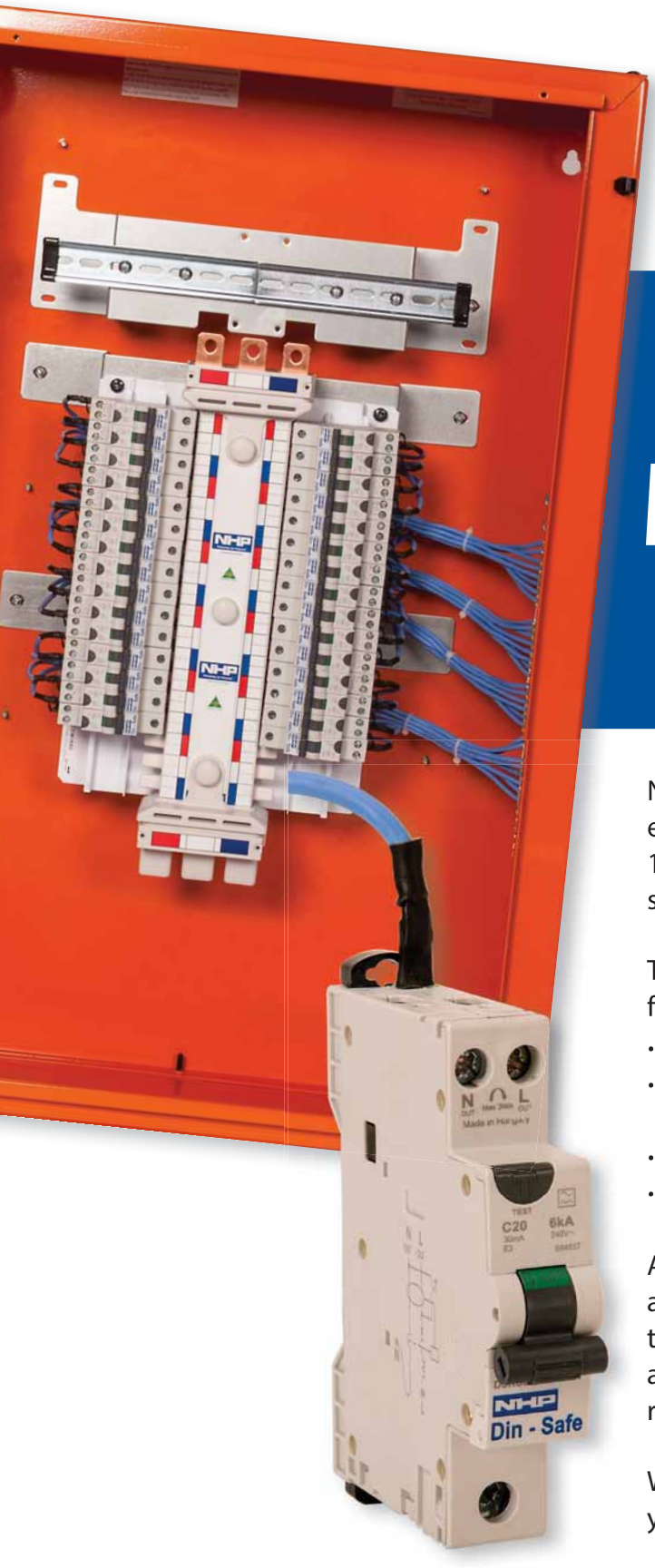
> See page 62

BRIAN SEYMOUR

Estimating

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

> See page 60



SAVE TIME, MONEY AND SPACE

NHP's range of earth leakage solutions has now expanded to include the compact Din-Safe DSRCBS 1P RCBO that offers the additional feature of a switched neutral.

The Din-Safe Compact RCBO with switched neutral, features:

- Suitable for loadcentres or panelboards
- Single screw line (active) and Pigtail line (neutral) connection
- 2 screw connection load side
- 6kA rated breaking capacity

Another advantage of this newly released unit is that a 4P chassis is no longer required. In its place, an off the shelf 3P panelboard can be offered resulting on average 30% space saving, 20% cost savings and reduced lead time.

What more could you need from an RCBO? Try it out for yourself and experience the Din-Safe difference today!

Available from your local wholesaler branch.

NWHSECDINTNOV_34107_09/2016

MAYFIELD ACQUIRES MODUCELL SWITCHBOARDS

Mayfield Industries has acquired all rights and licences to design, manufacture and supply Moducell Switchboards to the Australian market from i.Power Solutions. This follows other recent acquisitions to form a larger group of companies, which has seen growth triple in the past four years.

Mayfield continues to expand its range of services and products to navigate flat economic conditions in the mining and oil and gas industries.

"The acquisition of Moducell will enable Mayfield to extend its range of type-tested switchboard solutions that we can offer to our clients," says chief executive Chris Ware.

"Moducell has a significant installed base across Australia and will provide Mayfield access to the broader Australian and international markets, and extend its whole of life offering through on-site maintenance services.

"The continued growth has also enabled the group to continue with new safety innovations, supported by extensive type-testing of Moducell switchboard designs. This testing exceeds industry regulations, providing new safety standards for arc fault containment (AS/NZS 3439.1-2002). The safety innovation program ensures that each design is type-tested from 50kA through to 100kA, at 415V and 690V."

As part of their safety program, existing Moducell Switchboard owners are encouraged to register with Mayfield, to ensure they receive the latest Moducell *Switchboard Installation, Operation and Maintenance (IOM) Manual* and to notify of any changes to their plant or operations, to ensure ongoing compliance.

INTERNATIONAL LIGHTING & FACILITIES EVENT SCHEDULED FOR 2017

The peak industry bodies for lighting and facility management in Australia have announced a major exhibition and conference during the 2017 Vivid Sydney festival.

Plans are now underway for the sparc-FMA International Lighting & Facilities Event (sparc-FMA), which will be held at the new International Convention Centre at Darling Harbour over three days, 30 May to 1 June 2017.

sparc-FMA is a joint initiative of Lighting Council Australia and the Facility Management Association of Australia. The event will feature an exhibition showcasing the latest in lighting and facility management innovation from Australia and globally. It will also feature a conference involving world-renowned experts in the fields of lighting and facility management.

Lighting Council Australia chief executive Bryan Douglas says facility management and lighting are highly complementary industries and the combined event represents an excellent opportunity for Australia's lighting industry.

Facility Management Association of Australia chief executive Nicholas Burt says sparc-FMA will be Australia's largest and most significant event for the facility management and lighting industries. He said that the event will benefit by being owned and managed by the two industries – an event operated by industry, for industry.

Exhibitors, sponsors, partners and visitors are invited to register their interest at www.sparcfmaevent.org.

AUSTRALIAN SOLAR COUNCIL INTRODUCES NEW SOLAR INSTALLERS ACCREDITATION

The Australian Solar Council has launched a new initiative to promote quality solar installation called the Master Installer Program.

Electricians can join the program, complete the training and be recognised immediately as a quality solar installer.

The Australian Solar Council says achieving a Master Installer logo will let a business or individual:

- strengthen the business brand;
- get listed on the Master Installer's list which can generate free sales leads;
- obtain 100 CPD points; and,
- get access to latest updates on new products, standards and regulation changes.

To become a Master Installer you must complete the Solar Gold and Solar Essentials training and watch the standards update video.

If you have already completed the training, you will automatically be recognised as a Master Installer.

If you haven't completed the training, you will be recognised as an Installer Member and will still be shown on the Installer Customer Map.

Membership is a steal at just $330.

PARAMOUNT SAFETY ACQUIRES PRATT

Australian wholesale supplier of personal safety solutions, Paramount Safety Products has acquired Pratt Safety Systems, bringing the total number of safety brands under its umbrella to four.

Best known for its personal protective equipment (PPE) brand ProChoice Safety Gear, the 24-year-old Paramount Safety has been experiencing significant Australian and international growth, particularly over the past five years thanks to strong PPE sales and a string of successful business ventures.

These include the launch of LINQ Height Safety Gear, SignViz Safety Signs and the clinical research, development and release of industrial hydration and heat stress solutions, THORZT.

The acquisition of the 40-year-old Pratt Safety Systems – manufacturer of premium dangerous goods storage systems, emergency showers and eye wash stations – was a great fit for Paramount, says managing director Tim Bird.

"Pratt was the market leader in bringing emergency showers to Australia and has lead the way with a very high quality product all the way through," he says.

"Pratt actually has a signage business too, which we will be merging with SignViz.

"With our significant distribution network throughout our five warehouses in Australia and New Zealand, we can now offer Pratt products with next day delivery to most areas in Australia and New Zealand."

SIEMON DEVELOPS PLANNING GUIDE FOR AUTOMATED INTELLIGENT BUILDINGS

Siemon has released a new *Zone Cabling and Coverage Area Planning Guide* that was developed to assist designers and architects ensure flexible zone cabling designs that provide benefits within intelligent buildings.

The growing adoption of Internet of Things (IoT) will be optimally supported by a cabling design where low-voltage building, network and security systems are converged on a single IP network infrastructure and powered by advanced Power over Ethernet (PoE) technology.

Ideally suited for these converged infrastructures, zone cabling consists of horizontal cables run from telecommunications rooms to intermediate connection points housed in zone enclosures typically placed in the ceiling space. Cables from zone unit enclosures connect directly to building devices such as sensors, wireless access points, cameras and digital signage or to outlets serving any such device.

Combining these connections within zone enclosures supports rapid, less disruptive changes and reorganisation of work areas while simplifying deployment of new devices and applications.

"Deploying a zone cabling approach that facilitates building device connections within zone enclosures saves significant cost for automated buildings where a variety of low-voltage systems are converging on a single unified physical infrastructure," says Siemon global sales engineer Valerie Maguire.

"It's important for those designing these converged infrastructures to realise the benefits of this highly economical and functional standards-based design and to understand how best to deploy it."

The *Zone Cabling and Coverage Area Planning Guide* explains the various patterns that designers and architects can use for effective arrangements of coverage areas and their associated zone enclosures. The guide also highlights best practices for optimising device density, scalability, and flexibility, and it covers considerations for selecting cable media and complying with industry standards.

NECA ANNOUNCES 2016 POLICY STATEMENT

The National Electrical and Communications Association's (NECA's) 2016 Policy Statement has now been released and made available on the Association's website.

The 2016 Statement builds upon NECA's inaugural statement in 2015, adding five new policy themes and expanding another to further grow the electrical sector:

- Unfair contract terms.
- Renewable energy.
- Security of payments.
- Building and contents insurance.
- Home safety and energy audits.
- Competency-based wage progression.

"This statement outlines 12 key policy themes and makes 43 specific policy recommendations. NECA believes these recommendations will deliver a more prosperous and effective electrical contracting sector through the creation of new employment opportunities, increased safety and compliance standards and a boost in growth for our national economy, should they be actioned by Government," says NECA chief executive Suresh Manickam.

The updated statement is now being distributed to Federal Members of Parliament.

AUTOMATIC TRANSFER SWITCH CONTROLLERS

NHP Electrical Engineering Products
www.nhp.com.au

The ATL610NHP automatic transfer switch controller from NHP is easy-to-use, expandable and provides reliable transfer switch control for the secure supply of power.

The unit includes all the necessary features to supervise two power supply sources and to control the relative transfer equipment your application requires.

The ATL610NHP has the ability to sense under voltage, over voltage, phase loss, asymmetry, under frequency and over frequency conditions, with measurements shown on the graphic LCD display with a white backlight ensuring readability even under conditions of poor visibility.

ELECTRICAL UPGRADE KIT

ABB
www.abbaustralia.com.au

ABB has launched an upgrade kit that keeps old electrical systems working longer – and connects them to cloud-based energy management, supervision and diagnostics functions.

The kit directly replaces older Megamax breakers approaching the end of their working life with intelligent Emax 2 circuit breakers, while retaining the original switchboard.

Further, the inclusion of Ekip SmartVision can boost energy savings by up to 30% by combining the connectivity and sensing capabilities of Emax 2 circuit breakers with a cloud platform.

ROOM AUTOMATION SYSTEM

WAGO
www.wago.com.au

WAGO's flexROOM system is a standardised room automation system that is easy to implement. Now, in order to improve the speed of parameterisation, the company has released a fundamentally reconfigured software application.

The new release includes a completely reworked user interface that noticeably improves usability.

WAGO points out the new system doesn't merely look and feel better, it incorporates fundamental changes like reorganised configuration templates and expanded settings possibilities to make the workflow more consistent.

LED DIMMER

Gerard Lighting
trade.gerardlighting.com.au

Gerard Lighting has announced a new range of Diginet LEDSmart dimmers, timers and electronic light switches. The new range features MultiMate Technology, which allows electricians to provide a cost effective solution for single point and multi-way dimming.

Only one type of LEDSmart dimmer is required for all applications – single and multi-way – of all load types and all wall plates. The dimmers also provide excellent compatibility with other common lamp types such as incandescent lamps, 12V halogen lamps and dimmable CFLs.

ELECTRICAL ACCESSORIES

Clipsal by Schneider Electric
www.clipsal.com

Clipsal by Schneider Electric has launched Iconic, a product range of switches and sockets that incorporates smart home functionality such as multi-way dimming, app-enabled devices, smart timers, dimmers, USB chargers and network connection points into one switch.

Easy-to-install and maintain, the Iconic range has been designed with mountings so the products can be fitted off to all current ranges of wiring device brackets and wall boxes.

Iconic features changeable skins, a translucent edge and plain or personalised rockers.

NETWORK TESTER

NETSCOUT SYSTEMS

www.netscout.com

NETSCOUT SYSTEMS has enhanced its OneTouch AT G2 network tester with new WiFi features. NETSCOUT's v5 firmware release gives the OneTouch AT powerful new troubleshooting capabilities, letting technicians and network engineers quickly and easily validate performance of high capacity WiFi networks where numerous access points are required, such as at stadiums and theme parks. The new firmware also lets OneTouch AT users accurately pin-point the physical location of interfering sources.

The OneTouch AT now has the ability to distinguish between 802.11 and non-802.11 signal sources in each channel. The newly enhanced OneTouch AT can detect and classify the type of non-802.11 interferer, such as Bluetooth, microwave or other sources in the 2.4GHz and 5GHz bands, letting field technicians isolate the cause and work to mitigate the issue.

COOLING PADS

Seeley International

www.breezair.com.au

The introduction of newly-developed mini-cell Chillcel pad technology by Seeley International across its entire Breezair range of ducted air conditioners makes it the only manufacturer able to offer evaporative cooling pads that are fully manufactured in Australia and specifically designed to maximise cooling in the harsh local climate.

The enhanced small cell design of the mini-cell structure is the culmination of years of development and rigorous testing, and achieves up to 21% more cooling capacity than previous models.

DISMANTLING TOOL

Tridon

www.tridon.com.au

Design and function work together in the new Knipex ErgoStrip. In the past, electricians needed a number of tools to dismantle and strip different types of cables. The ErgoStrip changes this.

The pistol grip design provides space for additional functions, making it possible to combine the stripping of all common NYM cable with the dismantling of data cable and the stripping and dismantling of coax cable – in a single tool. In addition there is no need to change grip when dismantling.

The ErgoStrip enables dismantling in confined spaces and is ideally shaped for work on junction and distribution boxes.

SOLAR STORAGE SYSTEM

Fusion Power Systems

www.fusionps.com.au

Aquion Energy and Fusion Power Systems have announced Titan SmartStorage, a fully integrated solar energy storage solution for residential applications in Australia.

Titan SmartStorage is a fully integrated, safe and easy-to-install residential system that combines clean and cost-effective Aquion Energy Aspen saltwater batteries with an Australian-made, purpose-built inverter and charge controller, designed and built to withstand Australian conditions.

The systems are modular and scalable for maximum flexibility. They are free of toxic chemicals, 100% recyclable, non-combustible and completely fire-safe.

SINGLE PHASE GENERATOR

Power Equipment

www.powerequipment.com.au

The Yanmar YH series of diesel-powered commercial and industrial three-phase generators has been expanded with five new single-phase four-pole (1,500rpm) models, ideal for a wider range of settings – including residential.

The new single phase four pole (1,500rpm) models range from 6-26kVA prime power, with larger high capacity fuel tank bases optional.

The YH series includes safety features including a turn-key start, digital control panel, rain cap for outdoor use, key-lock fuel access, engine oil drain pump for easy maintenance, emergency shutdown and more.

WHERE THERE'S SMOKE...

THERE ARE TWO KINDS OF SMOKE DETECTOR ON THE MARKET, BUT ONE OF THEM DOESN'T DESERVE THE NAME. PAUL SKELTON REPORTS.

The heat is on for ionisation alarms as units fail to activate in the event of a fire.

Ionisation alarms were introduced in 1972 and now feature in about 90% of Australian homes.

The trouble is, they were never intended to be smoke detectors – they are designed to detect flame. By installing such a unit you could be putting your customers' lives at risk.

When photoelectric smoke detectors entered the market they proved to be a capable replacement for ionisation alarms in homes. It seemed like an easy path ahead for photoelectrics, but that was not to be.

WHAT'S THE DIFFERENCE?

Ionisation and photoelectric smoke alarms are designed to detect fire, but the different technologies mean they detect fires at different stages.

Ionisation alarms 'smell' the smoke that comes from the flames of a fire. The ionisation chamber is charged with electrical particles, ions, by a small amount of radioactive material.

Unlike the photoelectric model, ionisation alarms are sensitive to small particles of combustion that disrupt the balance of ions, causing the alarm to sound. This means they are marginally better at detecting flaming fires that produce smaller amounts of visible smoke.

Photoelectric units 'see' the smoke before it bursts into flames. The chamber has a light source projected into it, so when visible smoke enters the chamber it scatters and disturbs the light. The alarm sounds once the large smouldering fire particles are detected by the light-sensitive receiver.

Both types are effective in detecting most types of fire, but photoelectric alarms are more advanced at detecting smouldering fires, which are most often associated with residential fatalities.

According to the Fire Protection Association of Australia, this is because smouldering fires are more likely to occur while you are sleeping and won't have enough time to avoid the fire's effects.

On the other hand, ionisation alarms are marginally faster at detecting fast flaming fires.

Flaming fires are still a threat, but they are most likely to occur when residents are alert – stoves or ovens are sources of high heat, and gas cooktops introduce naked flame.

It's also important to note that ionisation models are prone to false alarms, as the technology can be set off by high humidity from showers, harmless cooking steam or smoke from burning toast. This is important. A high incidence of false alarms leads to occupant complacency and is an incentive to disconnect the alarm.

THE IONISATION PROBLEM

It seems simple: photoelectric models

are seemingly far superior to ionisation for residential applications, and yet ionisation alarms still dominate the market.

Adrian Butler is a retired firefighter who started The World Fire Safety Foundation in 2000 with the goal of educating the market about flawed detectors and to have ionisation alarms eliminated from Australian homes.

Adrian estimates that as many as 90% of homes have ionisation units installed, and they will likely not operate in time for you to escape in the event of a fire.

"This issue can be traced right back to the 1970s. The International Association of Fire Chiefs commissioned a report that found that ionisation alarms weren't safe, lives were at risk and fire chiefs should recommend only photoelectric alarms," he says.

"The battle has raged for more than 40 years.

"Perhaps foolishly, I believed that when we started The World Fire Safety Foundation in 2000 the problem would be resolved in a couple of years. The evidence back then was so profound."

And yet very little has changed – until recently.

Before starting the foundation, Adrian ran a successful franchise in Australia and New Zealand that sold ionisation alarms.

"We sold between 10,000 and 20,000," he says.

"But then we noted that these alarms would go off when people were cooking but not when there was an actual fire.

"Some people just refuse to believe there is an issue. Their alarms go off when they cook their toast, so they think their alarm is really effective. It isn't.

"Ionisation alarms are sub-micron particle detectors. They will detect sub-micron particles (invisible to the eye) emitted by the heating elements of a toaster or griller. However, they won't detect visible smoke, even though they are sold with 'smoke detector' on the packaging.

"In the middle of the night, if your house catches fire – specifically a smouldering fire, the type that kills – ionisation alarms remain silent.

"Until there's sufficient heat to generate sub-micron particles they don't make a sound."

Adrian says a house can fill with deadly smoke, and it's not until the flames erupt that an ionisation alarm will activate.

At that point it's usually too late for a safe escape.

"The solution isn't actually that difficult. The industry just seems to want to make it complicated so they don't have to admit that they screwed up.

"Ionisation smoke alarms are so dangerous they should be banned and recalled."

"However, some manufacturers decided to change the definition of the word 'smoke' from visible particles of combustion to include invisible particles. Effectively, they have rewritten the dictionary.

"So, while the public perception of smoke is that it is something you can see, the industry disagrees. And that's where all the problems arise. Sub-micron particles aren't present in sufficient numbers to set off an ionisation alarm in the early, smouldering stage of a fire."

The main test involves what is called 'light obscuration', which measures the level of smoke that must be present to activate an alarm. Photoelectric alarms, for example, must go off before light obscuration reaches 15%.

> Ionisation alarms were never intended to be smoke detectors – they are designed to detect flame.

If Adrian is correct that up to 90% of installed alarms in the country are ionisation units, the question must be asked: 'who is benefitting?'

"I think it's more a case of manufacturers being afraid of litigation if they have to admit that the alarms they have sold for decades don't detect visible smoke," he says.

TESTING TIMES

In order for a smoke detector to be sold in Australia, it must be tested by CSIRO to ensure it complies with Australian Standard 3786.

Section 2.1 of the Standard states "smoke alarms shall be designed to respond reliably to the presence of smoke". Adrian says this is the primary reason why ionisation alarms should be outlawed.

"As ionisation detectors don't respond to smoke, obviously compliance with this part of the Standard is not possible.

"As for ionisation alarms ... well, nobody knows exactly," Adrian says.

"Whenever we have asked for testing data from the manufacturers or from CSIRO, which performs the compliance tests, we are told it's commercial in confidence. But somehow this is only the case for ionisation alarms and not photoelectrics.

"I even got my local member of parliament to ask for the data, and they refused to tell him. Why?"

Recently, Adrian was asked to testify as an expert witness in a court case in Alabama after three young girls perished in a house fire. The home was fitted with three operational ionisation alarms.

"We told the family's lawyers that the manufacturer, which sells its products in Australia, needed to produce its testing data, to show the level of smoke at which its ionisation alarms activated. Within 48 hours of the data being received, the case

was settled out of court, a confidentiality order was placed on the settlement and a protection order was placed on the documentation.

"Now, do you think that if ionisation alarms activated at a safe level the manufacturer would have done this?"

In 2007 the Standards Committee FP-002 *Fire Detection, Warning, Control and Intercom Systems* identified an issue in the testing of ionisation alarms and tried to have an anomaly fixed.

"Specifically, the current edition allows two pass criteria for the same product [smoke alarms], resulting in different performance outcomes," the group wrote.

"Australia is the only country that uses two different pass criteria: all other regional and international Standards use an acceptance criterion based on light obscuration.

"CSIRO has reported to FP-002 that the different criteria result in significant differences in the performance of smoke alarms.

"Photoelectric smoke alarms, when tested in accordance with the requirements of AS 3786 typically respond between 8% and 16% obscuration per metre (Obs/m) while ionisation smoke alarms typically respond between 40% and 60% light Obs/m, with the majority of ionisation smoke alarms operating at the least sensitive end of this range.

"Under the current Standard, ionisation smoke alarms are permitted to have a lesser response to obscuration, which results in a significant negative impact on the Available Safe Evacuation Time.

"Australian and international research demonstrates that the highest number of fatalities in residential fires occurs between 8pm and 8am when occupants are typically sleeping, and these fires typically begin with a smouldering phase. Of principle concern is the impact of resultant smoke obscuration and toxic species on the occupants' ability to escape."

Ultimately, the group was unsuccessful in changing the Standard to make testing consistent across the two types of detectors.

DISMISSING EVIDENCE

Despite the wealth of evidence against ionisation alarms, some groups are staunchly against changing the Australian Standard or the National Construction Code (NCC) to favour photoelectrics in residential applications.

The reasoning put forward is sometimes unclear.

CSIRO executive director of manufacturing, digital productivity and services Anita J. Hill made a submission to an inquiry into the use of smoke alarms for preventing fatalities caused by smoke and fire.

Dr Hill's submission to the Senate Legal and Constitutional Affairs Committee included:

"CSIRO is aware of a longstanding industry debate around smoke detection technologies used in alarms, usually categorised as photoelectric or ionisation types…

"CSIRO's review of the results of Australian and international research indicates a number of viewpoints on the merits of each detection technology."

In an interview with *60 Minutes* the general manager of the Australian Building Codes Board (ABCB), Neil

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Savery, said: "There's very little difference [between the two detector types] at the end of the day in terms of adequate warning. The board is not satisfied at this stage that it needs to make any further changes to the code.

"It hasn't been demonstrated to the board's satisfaction that one performs better in all circumstances over the other and the board doesn't delineate between different types of products.

"If there was an overwhelming body of evidence that that was the case then the board would give that serious consideration, but that won't be reflected at the mandating of a particular product."

Interestingly, and perhaps a little confusingly, photoelectric smoke detectors have been mandated in commercial buildings and hospitals since May 2004, but the ABCB has been outwardly dismissive of making the same ruling for the residential market.

Adrian says he just doesn't understand this position.

"Why would the ABCB pass legislation to mandate the installation of photoelectric smoke detectors in all shopping centres, hotels and hospitals but not for homes?

"The Queensland Government has even released a flyer called *Wake Up To Photoelectric Smoke Alarms*, which tells people they should replace ionisation alarms. But the ABCB still somehow refuses to make a change to the NCC."

A CHANGING TIDE

The issue first made national headlines in 2004 after *A Current Affair*, then hosted by Ray Martin, ran an exposé on the technology.

But it wasn't until last year that it finally appeared that people were listening.

On 4 December 2015, at a Senate Hearing into smoke alarms, Fire & Rescue NSW commissioner Greg Mullins said: "Only photoelectric smoke alarms should be allowed [to be sold]. My personal view is that ionisation alarms should be banned and that the standard itself is flawed."

Commissioner Mullins is arguably Australia's most senior fire official, serving as president of the Australasian Fire and Emergency Service Authorities Council (AFAC).

AFAC is the peak representative body of all A/NZ fire brigades.

Since the hearing, Commissioner Mullins has stated on national TV and in newspaper reports that ionisation alarms should be banned.

Subsequently, in June 2016, the Queensland Government passed legislation mandating the installation of photoelectric alarms.

Every Queensland residence will need to be fitted with photoelectric, interconnected smoke alarms in all bedrooms and hallways of new dwellings.

The Minister for Police, Fire and Emergency Services, Bill Byrne, says it won't matter which part of a house catches fire, the alarm closest to the occupants will sound.

"If you are asleep, an alarm will sound in your room, even if the area is closed off to the rest of the house.

"Research shows that photoelectric, interconnected smoke alarms are the most effective on the market for alerting people early."

Mr Byrne says a 10-year phased rollout of the legislation would allow ample time for everyone to have alarms installed correctly.

"Hard-wired, interconnected photoelectric smoke alarms will require a qualified electrician to conduct the installation and ensure that alarms are working as they should.

"There is also an option to install photoelectric alarms with a 10-year lithium battery that have the capability to achieve interconnectedness wirelessly. This option may be more suitable for Queenslanders living in remote areas where attendance of an electrician could be difficult."

All houses being built or substantially renovated must comply with the smoke alarm legislation upon completion after 1 January 2017. All houses leased or sold must comply after five years, and all owner-occupied private dwellings must comply within 10 years. Any smoke alarm replacement after 1 January 2017 must involve a photoelectric unit.

After 17 years of fighting to have ionisation alarms banned, Adrian says he is delighted by Queensland's new law.

Most of the people reading this article will go to go to bed with a smoke alarm on their ceiling that is nothing more than an ornament.

"People tend to think I'm a zealot and don't know what I'm talking about. Everything I say can be backed up with documented evidence.

"I don't sell smoke alarms, and I don't solicit or accept donations. And now I just want this whole thing to come to a head because it has gone on far too long. Too many people have died, and I don't want to keep on doing this campaign. It needs to be over.

"Actually, it should have been over 40 years ago.

"The scary thing is that most of the people reading this article will go to bed with a smoke alarm on their ceiling that is nothing more than an ornament." ■

> **The World Fire Safety Foundation www.smokealarmwarning.org**

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A GLARING EMISSION

Discomfort and disability from intense, blue-rich LED lighting can decrease visual acuity and safety, creating a road hazard.

LED STREET LIGHTS HAVE CAUGHT THE ATTENTION OF THE AMERICAN MEDICAL ASSOCIATION, WHICH IS CALLING FOR A BAN ON CERTAIN MODELS OF LAMP. PAUL SKELTON REPORTS.

LED street lights are bad for your health; at least, that's what the American Medical Association (AMA) is saying... kind of.

The AMA is an association of medical professionals that aims to "promote the art and science of medicine and the betterment of public health". Recently, physicians at the group's Annual General Meeting tabled a report conducted by its Council on Science and Public Health entitled *The Human and Environmental Effects of LED Community Lighting*, which looked at the increasing popularity of LED street lights and the effect it was having on human- and animal-kind.

"Despite the energy efficiency benefits, some LED lights are harmful when used as street lighting," AMA board member Maya A. Babu says.

"The AMA encourages proper attention to optimal design and engineering features when converting to LED lighting that minimise detrimental health and environmental effects."

High-intensity LED lighting designs emit a large amount of blue light that appears white to the naked eye. This creates worse nighttime glare than conventional lighting.

Discomfort and disability from intense, blue-rich LED lighting can decrease visual acuity and safety, resulting in concerns and creating a road hazard, the AMA says.

"With the advent of highly efficient and bright LED lighting, strong economic arguments exist to overhaul the street lighting of roadways," the report says.

"Valid and compelling reasons driving the conversion from conventional lighting include the inherent energy efficiency and longer lamp life of LED lighting, leading to savings in energy use and reduced operating costs, including taxes and maintenance, as well as lower air pollution burden from reduced reliance on fossil-based carbon fuels.

"However, not all LED light is optimal when used as street lighting. Improper design of the lighting fixture can result in glare, creating a road hazard condition.

"LED lighting also is available in various colour correlated temperatures. Many early designs of white LED lighting generated a colour spectrum with excessive blue wavelength. This feature further contributes to disability glare (i.e. visual impairment) due to stray light, as blue wavelengths are associated with more scattering in the human eye, and sufficiently intense blue spectrum damages retinas."

Accordingly, the report explains, significant human and environmental concerns are associated with short wavelength (blue) LED emission.

"The main reason for converting to

LED street lighting is energy efficiency; LED lighting can reduce energy consumption by up to 50% compared with conventional high pressure sodium (HPS) lighting. LED lighting has no warm-up requirement with a rapid 'turn on and off' at full intensity. In the event of a power outage, LED lights can turn on instantly when power is restored, as opposed to sodium-based lighting, which require prolonged warm-up periods. LED lighting also has the inherent capability to be dimmed or tuned, so that during off peak usage times (e.g. 1am to 5am), further energy savings can be achieved by reducing illumination levels. LED lighting also has a much longer lifetime (15 to 20 years, or 50,000 hours), reducing maintenance costs by decreasing the frequency of fixture or bulb replacement.

"But depending on the design, a large amount of blue light is emitted from some LEDs that appear white to the naked eye. The excess blue and green emissions from some LEDs lead to increased light pollution, as these wavelengths scatter more within the eye and have detrimental environmental and glare effects.

"The first generation of LED outdoor lighting and units that are still widely being installed are '4,000K' LED units. 29% of the spectrum of 4,000K LED lighting is emitted as blue light, which the human eye perceives as a harsh white colour. Due to the point-source nature of LED lighting, studies have shown that this intense blue point source leads to discomfort and disability glare.

"More recently engineered LED lighting is now available at 3,000K or lower. At 3,000K, the human eye still perceives the light as white, but it is slightly warmer in tone and has about 21% of its emission in the blue-appearing part of the spectrum. This emission is still very blue for the nighttime environment but is a significant improvement over the 4,000K lighting because it reduces discomfort and disability glare. Because of different coatings, the energy efficiency of 3,000K lighting is only 3% less than 4,000K but the light is more pleasing to humans and has less of an impact on wildlife."

Disability glare is defined by the Department of Transportation (DOT) as: "when the introduction of stray light into the eye reduces the ability to resolve spatial detail. It is an objective impairment in visual performance."

"This glare can be greatly minimised by proper lighting design and engineering. Glare can be magnified by improper colour temperature of the LED, such as blue-rich LED lighting," the AMA says.

"LED lighting is inherently a bright point source and can cause eye fatigue and disability glare if it is allowed to directly shine into human eyes from roadway lighting.

"Much has been learned over the past decade about the potential adverse health effects of electric light exposure, particularly at night. The core concern is disruption of circadian rhythm. With waning ambient light, and in the absence of electric lighting, humans begin the transition to nighttime physiology at about dusk; melatonin blood concentrations rise, body temperature drops, sleepiness grows and hunger abates, along with several other responses.

"It is estimated that a white LED lamp is at least five times more powerful in influencing circadian physiology than a high pressure sodium light based on melatonin suppression. Recent large surveys found that brighter residential nighttime lighting is associated with reduced sleep time, dissatisfaction with sleep quality, nighttime awakenings, excessive sleepiness, impaired daytime functioning and obesity."

In addition to its impact on drivers, blue-rich LED streetlights operate at a wavelength that most adversely suppresses melatonin during night. It is estimated that white LED lamps have five times greater impact on circadian sleep rhythms than conventional street lamps. Recent large surveys found that brighter residential nighttime lighting is associated with reduced sleep times, dissatisfaction with sleep quality, excessive sleepiness, impaired daytime functioning and obesity.

The detrimental effects of high-intensity LED lighting are not limited to humans. Excessive outdoor lighting disrupts many species that need a dark environment. For instance, poorly designed LED lighting disorients some bird, insect, turtle and fish species.

Glare can be greatly minimised by proper lighting design and engineering.

Recognising the detrimental effects of poorly-designed, high-intensity LED lighting, the AMA encourages communities to minimise and control blue-rich environmental lighting by using the lowest emission of blue light possible to reduce glare. The AMA recommends an intensity threshold for optimal LED lighting that minimises blue-rich light. The AMA also recommends all LED lighting should be properly shielded to minimise glare and detrimental human health and environmental effects, and consideration should be given to use the ability of LED lighting to be dimmed for off-peak time periods.

The guidance adopted by grassroots physicians who comprise the AMA's policy-making body strengthens the AMA's policy stand against light pollution and public awareness of the adverse health and environmental effects of pervasive nighttime lighting. ■

WILD CONDITIONS FOR THE SUNSHINE STATE

THE QUEENSLAND GOVERNMENT'S PLAN TO START AN ELECTRICAL CONTRACTING FIRM HAS BEEN MET WITH WIDESPREAD CRITICISM FROM SPARKIES UP NORTH. PAUL SKELTON REPORTS.

It sounds like a great idea: the Queensland Government is embracing renewables while at the same time making a concerted effort to reign in the spiralling cost of power. For hippies and non-hippies alike this is great news; the announcement seemingly addresses environmental concerns as well as the hip pocket of consumers.

Sadly, an addendum to the plan carries a heavy cost for electrical contractors.

On 1 July 2016, the Queensland Government announced the formation of Energy Queensland, "a single entity which unites customers from the Torres Strait to Tweed Heads through the merger of Ergon Energy and Energex".

"This is more than simply bringing organisations together – today we establish the means of ensuring that the electricity grid that underpins our economy will remain at the core of how customers choose to use electricity," Energy Minister Mark Bailey, said at the opening of the new entity's Townsville headquarters.

That sounds great, but where things get a bit problematic for contractors is in the creation of a complementary 'energy services business', which the Government says will "initially focus on providing access to renewables and storage through the grid for a broader range of customers; using renewable energy supply options to reduce expensive diesel costs in remote communities; and, options to enable Queenslanders to take control of their electricity needs through tools and systems including smart meters."

In simple terms, the Queensland Government is planning to start its own electrical contracting firm to compete with mum-and-dad operators, many of whom are based in rural areas where work is already difficult to source.

The move has caught the ire of both industry associations, the National Electrical and Communications Association (NECA) and Master Electricians Australia (MEA).

MEA chief executive Malcolm Richards says the Queensland State Government is clearly planning to take work away from small contractor outfits.

"This is the start of what we believe will be a very tough period for mum-and-dad electrical businesses in Queensland," Malcolm says.

"This is particularly true in regional areas, which the State Government has specifically nominated as a key target market for this taxpayer-funded giant.

"And sadly, we're already seeing electrical businesses adjusting for the future, with a number of businesses that we are aware of laying off staff.

"This is like the Government paying Coles and Woolworths to set up across the street from the local corner store."

Malcolm says emerging technologies are the bread and butter work for all electricians, whether they are based in the regions or in the city.

"There's already an army of innovative and enthusiastic small businesses across regional areas rolling out a range of new, green technology.

"The Government hasn't outlined any plans to grow the size of the electrical contracting sector and will therefore only be taking work that is currently performed by private businesses.

"In most cases, these are small businesses whose owners have spent years of investment and hard work to carve out a position in a very competitive market.

"Now their hard work – and the jobs of their apprentices and employees – are being put at risk."

The executive director of NECA's

Queensland branch, Mick Logan, has written to Queensland Premier Annastacia Palaszczuk asking her to reconsider the Government's position with the creation of Energy Queensland.

"We believe it's the Government's role to create the proper regulatory and safety settings to ensure an efficient, market-based sector. The decision to create Energy Queensland to compete against mum-and-dad owned electrical contracting businesses, while adjacent Government departments regulate the sector, creates not only a negative perception of conflict but the potential to seriously distort the market and drive up service prices once smaller players are driven out of business."

Mick has significant concerns about how far Energy Queensland will 'creep' into the market.

"Say there was a project to replace a remote community's power supply from diesel engines and generators to solar. Normally, electrical contractors will be hired by the distribution entity to install all those solar panels; now, Energy Queensland is saying that it will do it.

"But what's to stop them from creeping into the domestic market? If someone's hot water system breaks down, will they fix it? What about installing solar panels on roofs?

"They have the ability to allow people to pay for these services through their power bill over a extended period of time. It might even be offered under an interest free arrangement – electrical contractors simply won't be able to compete."

Mick explains that NECA is ultimately not against the amalgamation of Energex and Ergon.

"This merger will create efficiencies that will hopefully reduce the cost of power, which is very high in Queensland," he says.

"Our issue is the Government's plan to setup a contracting company to hang off the merged entity to do the work they traditionally gave to NECA members. We feel this is using their market power unfairly. Our members can't compete with the Government."

NECA and MEA have both indicated that they will continue to fight the Queensland Government over this issue, but the clock is ticking. ■

RUNNING A TIGHT SHIP

AN EXTENSIVE ELECTRICAL UPGRADE TO THE MARITIME MUSEUM ENLISTED PRECISION PLANNING SKILLS FROM ONE NSW CONTRACTOR. PAUL SKELTON REPORTS.

Located in the bustling Sydney suburb of Darling Harbour, nestled between the ex-Navy destroyer HMAS Vampire, submarine HMAS Onslow and patrol boat HMAS Advance, the Australian National Maritime Museum Warships Pavilion serves as a reminder of the great sacrifice made by the men and women of the Royal Australian Navy (RAN).

Recently, to mark the centenary of World War I and to commemorate 100 years of Naval service, the Warships Pavilion underwent an extensive electrical upgrade that would see the company responsible, Kerfoot, overcome the challenges of working in an unpredictable environment.

Kerfoot was contracted to design, supply and install all electrical services to the new pavilion, including the integration of the new system with the warship and submarine's existing systems.

This included the supply of a new 400A main switchboard and power distribution system; step down transformers to convert AC power for the submarine; general power to the pavilion, including corrosion-proof under-wharf reticulation and marine-grade submains; complex architectural lighting; a Cat 6A structured cabling system; a fire detection and electrical wiring interconnect system (EWIS) integrated with the existing vessels' systems; and, a lightning protection system.

Project manager Josh Kerfoot says the new pavilion will ensure the stories

The Australian National Maritime Museum Warships Pavilion has undergone an electrical upgrade that saw the company responsible, Kerfoot, overcome the challenges of working in an unpredictable environment. (Images courtesy: Brett Boardman Photography.)

and experiences of RAN servicemen and women will be remembered and shared with future generations.

"We are well aware of the significance that this building holds within the community. Over half a million people, including 50,000 school children, visit the pavilion each year to learn about the role of the RAN during and following World War I," he says.

"The pavilion has become a permanent tribute to the men and women of the RAN."

The project itself was rife with challenges, Josh says, including the necessity of having a team working under the wharf; planning around the tidal conditions of the harbour; working between the wharf and the vessels to connect services; extending fibre optic cabling and mains cabling under the wharf; using boats to complete installations; and, installing lightning conductors in the water.

"When electing which of our team members would work on this project, we had to be certain of their abilities and commitment to the project because many of the installation components were considered 'high risk'. Suppliers were also heavily scrutinised as any delay in the supply of material could prove detrimental to the completion of the project.

"Safety was the main focus for the Kerfoot team. Condition monitoring and knowledge of the tides was required for all works under the wharf and on the water while integration with the vessels took place.

"The Kerfoot team had to plan months in advance with the vessel crew to complete disconnects, alterations and reconnects to the vessel services."

Working from boats to install large submains, lightning conductors and under-wharf reticulation also required careful planning and management as some of the tidal conditions only allowed work to be completed under the wharf for a maximum of four hours a day.

"Further, Kerfoot was not the only trade to carry out works under the wharf and therefore coordination between trades was a necessity.

"The busy nature of the harbour also posed a challenge as passing ferries and boats could cause large waves. To manage and overcome this challenge works were booked weeks in advance and planned with great precision."

Due to the inherent difficulties of working on and near the water, the Kerfoot team undertook CPR and lifesaving training to ensure all team members were aware of the risks involved with the situation and how to respond to an emergency.

"Large sections of the works were completed using boats and special working platforms elevated over the harbour; but, the project was delivered on time, with no safety incidents and minimal disruption to the visitors and client."

Technically speaking, given that the vessels were not a permanent fixture of the museum, disconnection from the pavilion needed to be a simple process for staff, Josh says.

"These vessels required 415V power, structured cabling and a fire detection system to be connected. The submarine alone also required a 110V DC supply.

"The Kerfoot team engineered a quick connection box for both vessels. This quick connection box contained plug-in modules for all of these services allowing the vessels to be relocated for maintenance and cleaning without a major electrical shutdown.

"These boxes were designed to be concealed in the ceiling void located just under the gangways on the vessels."

The brief also called for the installation of a lightning protection system to protect the building's delicate facade. Kerfoot worked with the architect to conceal all lighting protection components while maintaining compliance with Australian Standards.

"Stainless steel hand railings and small fins connected to the building were used as lightning conductors, to minimise the visible components. The footings were also part of this system, which let us hide the conductors below the deck of the existing wharf. This made the installation almost invisible."

Another important aspect of the project was to ensure that all works undertaken on the water had no impact on the environment. This posed a challenge when drilling and cutting into the wharf as all dust and debris had to be contained.

> "The pavilion has become a permanent tribute to the men and women of the Royal Australian Navy."

As a result, Kerfoot worked closely with the Environment Protection Agency (EPA).

"On completion of the project the EPA signed off on all works, meaning that we had had no effect on the environment," Josh says.

In September, Kerfoot won the Commercial – Small Project category at the 2016 NECA NSW Excellence Awards for its work at the pavilion.

"For Kerfoot to be recognised as a winner not only reflects the high standard of work our dedicated team can produce, it also confirms our position as a top electrical contracting and management company within the industry," Josh says.

"This shows our ability to adapt to any of our client's requirements, overcoming environmental boundaries, however difficult they may be." ■

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GROWTH IN THE LIGHT MARKET

WITH INCREASING INTEREST IN THE GROW LIGHT MARKET, SMALL START-UPS ARE SOWING THE SEEDS OF AN AGRICULTURAL REVOLUTION. JOE YOUNG REPORTS.

When it comes to grow houses, Plantilium's lights are nine times more efficient than discharge lights and twice as efficient as broad spectrum LED designs.

Australia has no shortage of land or sun but there still is a developing interest in using specially-designed LEDs as grow lights in the horticultural market.

Increases in industrial vertical farming and domestic inner city veggie gardens have motivated a few new local players to emerge, such as NSW-based start-up, Plantilium.

Co-founder Doug Ford says LED technology is now at a point where it completely out performs conventional light sources in producing wavelengths to encourage and give the user more control over plant growth.

The current de facto lights for people growing indoors in Australia are 400W metal halide lights. While they are cheap, Doug believes attraction to these will decline as they are harshly bright to the eye, run very hot and give off a yellowish spectrum, which is not ideal for plant growth.

"A red light optimises leaf growth and a more blue light encourages fruit to flourish," Doug says.

"Our LEDs use a combination of a red and blue colour spectrum which allows plants to naturally transition from leaf to fruit growth."

This design is ideal for any chlorophyll-based life form to flourish but it's optimised to promote veggie growth.

The company currently has two lights in its stable. The PHG-150 is a grow light that Doug says is nine times more efficient than discharge lights and twice as efficient as broad spectrum LED designs, which use white LEDs. It can be used in a linear array making it ideal for industrial farming.

The PHG-18 is targeted more towards domestic use for applications such as indoor herb or veggie gardens. It uses a PAR38 form factor with an Edison screw base.

Both luminaires' outputs operate across four wavelengths and over a wide range of mains supply voltages.

Most grow lights require the use of cooling fans, which mean moving parts and consequent noise and unreliability, particularly since fans used in grow light applications will often be in moist environments. Plantilium lights use a heat sink and natural convection instead of fans to circulate air. The heat sinks use heat pipes to convey the heat resulting in the overall temperature staying low and avoiding hot spots. The entire fixture rises to about 26°C above ambient and stays there.

"The cooler you can run the electronics, the longer the life span. Also when red LEDs get hot, their output drops," Doug says.

Australia isn't experiencing the same push towards indoor growing as some European countries that are short on space and sunlight or in the US where there are areas too polluted to grow outdoors.

However, with an increasing number of algae farms, vertical farming, and herb and veggie gardens in the inner city; interest from the cut flower market; and, with laws around marijuana growth being debated in parliament, Plantilium is confident its products will quickly find a place in the Australian market.

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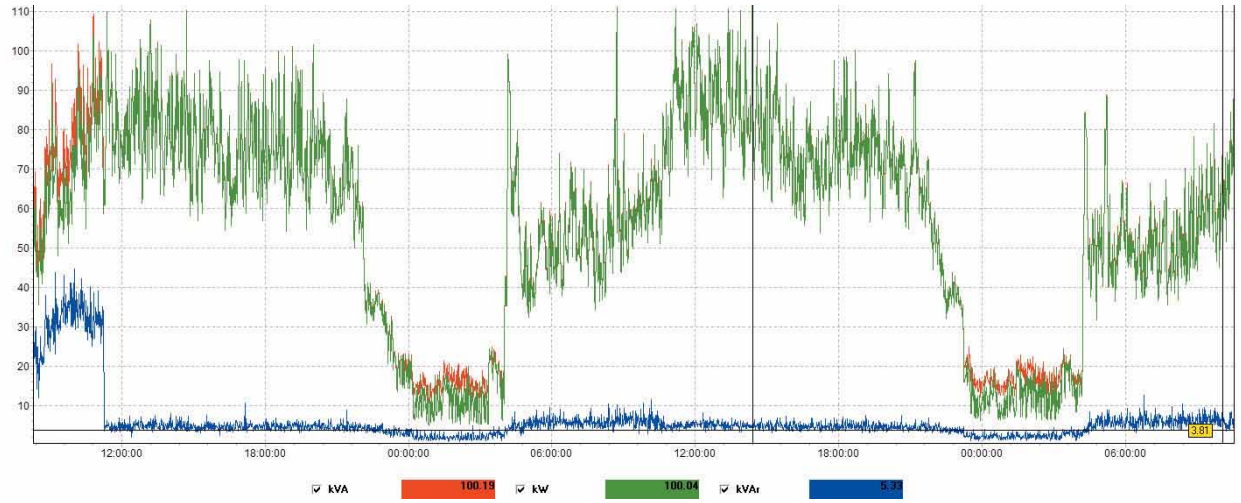

Power consumption of a fast food restaurant in NSW. The red trace indicates apparent power (kVA). The green trace indicates useful power in kW and the blue trace shows reactive power in kVAr. The image indicates the situation after the installation of a Sinexel SVG static var compensator. Note the dramatic reduction in kVAr from 40kVAr to 5kVAr after the var compensator was activated. The power factor has now been improved to value of 0.9988. The static var compensator is stepless allowing compensation without under or over compensation. (Image courtesy of Fuseco Power Solutions.)

DEALING WITH POWER QUALITY PROBLEMS IN SMALL AND MEDIUM INSTALLATIONS CAN BE A SOURCE OF NEW BUSINESS FOR CONTRACTORS. PHIL KREVELD EXPLAINS.

There's money to be made by poking your nose into customers' electrical consumption.

It's OK to use larger energy-intensive industries as examples, but they fall outside the financial capabilities of smaller electrical contractors.

However, there's business to be had from the more modest consumers of electricity.

Don't be surprised if you get a cool reception at first, because many people think there isn't much that can be done to save on electricity.

When you next walk in to your supermarket, big or small, think about the following:

- Annual electrical consumption can be as high as 500MWhr for a 1,000m^2 store. Scale that down by floor area for your local store and you still have a good potential prospect.
- Grocery retailing energy costs can be as high as 1% of sales. In case that sounds low, remember that profit margins are not much greater.
- The big loads are heating, ventilation and air-conditioning, and refrigeration – representing about 70%, with lighting at 20%. There's also loss of refrigerant, which is a big cost, and it makes equipment consume more energy.

Your local fast food outlet might well be able to save 10-20% of its energy bill, and the usage might be 50-100MWh a year.

Regional hospitals typically consume more than 100kWhr/m^2 each year, and their tight budgets make saving energy an important issue.

There are also energy savings in agricultural and regional centre businesses as shown in Table 1.

In general, substantial savings are likely to be found in kVA demand reduction as well as in kWh reduction. Have a look at a sample calculation set out further down.

TABLE 1: ELECTRICITY COSTS AS A PERCENTAGE OF OPERATING EXPENSES

Dairy	4%
Beef/sheep, broad acres	2%
Vegetable crops	3%
Broilers	15%
Supermarkets	15%
Fast food	5%

WHAT'S BEEN HAPPENING

In the national electrical supply sector we are flat-lining in terms of terawatt/hours (equal to 1,012Wh).

This wasn't caused by Labor's carbon tax, as it barely got up anyway. Rather,

BY
PHIL
KREVELD

it is the closing down of some major industries, with more closures on the way.

Energy demand is not the reason for rising electricity prices – it's peak demand.

Peak demand occurring for short times will strain transmission and distribution systems, requiring greater capital expenditure and prompting tariff increases. Figure 1 (overleaf) shows what's been happening to energy demand in peak gigawatts over the past 17 years.

However, real demand is measured in kVA, MVA or, in the case of the graph, in GVA to keep things on the same scale. That measure is determined by power factor. There is every reason to think that the power factor issue is not going away, and this is why:

- growth in HVAC; and,
- growth in 'electronic' loads including lighting.

They add to the old-fashioned notion of power factor.

They also add to the bill, as electricity prices now include a kVA demand charge. The poorer the power factor is, the more you get slugged, because everything that depends on good voltage regulation in the transmission/distribution system depends on flattening that demand.

ELECTRICITY METERS

Material published by the distribution sector, and companies selling power factor correction gear, includes images of beers and coffees topped with foam.

The slogan is 'You also have to pay for the foam.'

Then there's the right-angle triangle explanation for the more technical reader. The triangle is the graphical explanation that:

$kW^2 + kVAr^2 = kVA^2$

There's a sharp definition of what a kilowatt is – you heat water with it – and torque multiplied by revs for mechanical loads driven by motors.

There is no immediately sharp definition for the other terms. That's because of the prevalence of electronic loads including HVAC, and the increase here and there due to wind farms and solar farms with increasing capacities being connected to distribution networks.

The kVA measure depends not only on the meter but also on the quality of power being delivered.

Installations can't be allowed to spew out more than a certain level of harmonics or there's trouble with the distribution company. That's why so many installations now feature harmonic filters.

Then there's power factor. Capacitor banks or active filters, or a combination of the two will improve the power factor – you hope. It may well, but not necessarily as much as 'calculated' from the right angle triangle theory.

It's how kVA is measured that influences the demand charges. To put it succinctly: irrespective of the metrology employed in the electricity meter, kVA represents your current (including your harmonics) multiplied by the power supply's voltage (including its harmonics).

The basic metrology for kVA is the summing of small time-slice, synchronously sampled voltage by current multiplications.

The more distortion by way of voltage harmonics there is in the supply voltage, the more the kVA becomes.

If you would like to know the nitty gritty, there are publications explaining the IEEE 1549-2010 methods on how to measure kVA.

However, it's doubtful that a local poles and wires outfit will be able to answer the kVA theory of measurement question. Furthermore, after December 2017 it won't be their business to automatically supply the electricity meters. That will be the business of meter co-ordinators (MCs), a separate type of company created by the Federal Government's Power of Choice program.

In short, the kVA portion of the bill is determined by a less than precise kVA computation (certainly on the part of the consumer) and a precisely known tariff.

> There's business to be had from the more modest consumers of electricity.

CAN WE FORGET KVAR?

The 'froth' factor or real power factor is simply kW divided by kVA.

But we can't forget the kVArs. There's the kVAr which, when too high, causes network instability. This is the 'displacement' kVAr, responsible for the displacement power factor.

Distribution companies want customers to keep to acceptable limits. It's part of the kVA, but only a part, as explained above.

What sort of effect from harmonic distortion can you expect on kVA demand? It's not necessarily dramatic, but it can tip you over the edge if there's a maximum kVA beyond which a punitive rate applies.

Additions to kVA can be major if there is substantial voltage distortion. That is something you should test thoroughly. The procedure can be trying. You need to switch off loads likely to influence the voltage distortion then check voltage distortion at the switchboard. For a new installation it's easy – do the test, then connect.

And before we let the topic go, there

can be 'issues' with kVArs. Electronic/smart meters have several ways of measuring this, giving a different power factor to the one you would calculate from the right-angle triangle.

THE ECONOMICS

By way of example, we will concentrate on smaller installations, say from 100A upwards.

These often have no restriction on power factor, unlike so-called contestable installations in which it must be more than 0.9.

Let's look at a 415V, 150A installation with a power factor of 0.8 and a power demand of 65kW.

Depending on the load diversity factor, annual energy consumption is 200MWhr. This type of installation will attract a kVA charge, typically about $15 per kVA per month. Based on the power factor of 0.8, the measure is 81.3kVA, or about $14,600 a year in demand charges.

With the power factor increased to 0.95, the measure would be 68.4kVA and annual savings on the demand tariff would be about $2,300.

The figures with a power factor varying between 0.6 and 0.8 based on the same usable power as above (65kW) give an average of 92.9 kVA. The savings from improving the power factor to 0.95 are about $4,400.

The economics depend on a detailed knowledge of tariffs, and we won't identify individual distributors.

However, the tariffs are public documents and easily accessible, although not necessarily easy to interpret. Nevertheless it will pay off to study them closely then go prospecting among larger consumers, possibly bearing a soft copy of your services.

REGIONAL DISTRIBUTION

Problems do occur with voltage regulation, in particular on SWER lines.

Consumers connected to the SWER distribution network can encounter nasty problems with motors stalling because of low voltage, and solar inverters cutting out because of low or high voltage thresholds being exceeded.

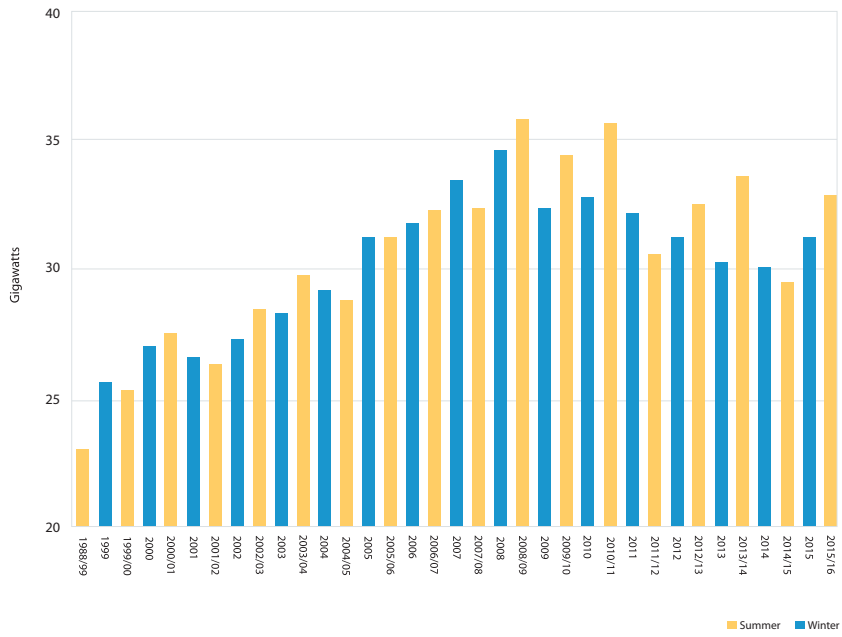

Figure 1: Energy demand in peak gigawatts over the past 17 years.

Larger consumers, dairies for example, will have standby diesel generators. Doing a power quality test for these installations is more than just a good idea.

Without solid data on the level of voltage regulation and harmonics, harmonic resonance of the converter of a VSD with local capacitor power factor correction on the SWER line can end up damaging customer equipment and cause metering problems.

SWER distribution has great construction cost advantages but can be tough on power quality.

ANALYSE FIRST

Power quality problems can disadvantage consumers due to higher bills and can drive up maintenance costs.

Contractors can render a valuable service by providing power quality surveys. These should always be done when considering capacitor bank power factor correction, and also if harmonic mitigation is planned.

Furthermore, the gathering of power quality data is important when disputes arise with distributors. Many companies offer power quality analysers, and some have rental options.

CONCLUSION

The distribution sector is generally privatised, but it is highly regulated and tariffs go up in accordance with capital expenditure approvals by the Australian Energy Regulator.

To a large extent the joy of electricity cost reduction is found in technical solutions. The largest individual consumers have been aware of this for a long time and have adopted sophisticated demand response strategies.

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POWERING THE BATTERY BOOM

STATE GOVERNMENTS CAN DELIVER BENEFITS TO ELECTRICITY CONSUMERS, AUSTRALIAN INDUSTRY AND THE PUBLIC PURSE BY USING HOME BATTERY STORAGE INCENTIVES TO ENCOURAGE CONSUMERS TO 'TRADE IN' GENEROUS SOLAR FEED-IN TARIFFS, WRITES SIMON HACKETT.

Redflow chief executive Simon Hackett with ZCell battery enclosure.

Announced 10 years ago, solar feed-in tariffs (FITs) have already proved enormously successful in achieving their goal of kickstarting solar panel adoption in this country.

Australia is the world leader in its per capita deployment of solar panels. Earlier this year, Energy Minister Josh Frydenberg, speaking on the ABC's show *Q&A*, said that nearly 15% of Australian households have solar panels on their roofs.

"That's the highest number of solar panels on people's roofs per capita anywhere in the world," he said.

The Conversation's fact-checking service subsequently upped the ante by reporting that the latest data suggest this penetration rate is more like 16.5%.

Independent community organisation Solar Citizens released a report in June this year that says Australians have installed 23.2 million solar panels. Consumers have spent more than $1 billion of their own money to install small solar systems with less than 10kWh of capacity.

From a public policy point of view, this is 'Mission Accomplished'.

The solar panel installation industry is now well and truly established in Australia. Continuing to pay generous solar FITs beyond this point represents a substantial forward liability for the public purse that does not deliver improved public good outcomes.

However, state governments are clearly sensitive to the political risk of simply cancelling these long-running tariff schemes, some of which hold liabilities to as far as 2028. Fortunately, policy makers have an attractive way to solve this problem - a solution that will deliver both public policy and industry development benefits and keep voters happy while simultaneously removing long term liabilities.

This solution involves inviting consumers to voluntarily trade in the residual life of

their FIT in return for funding them to buy a home energy storage system. This would have the dual benefit of eliminating this long-term liability for governments while kickstarting a home energy storage industry in Australia – all using money that they have already 'spent'.

The remaining forward liability for a given customer can be easily estimated based on past subsidy payment patterns. In many cases, governments may actually spend less to subsidise a battery today than to fund the long-running forward liability of the FIT for the next 12 years.

The time is right for this sort of innovative thinking. Over the past year, Australia has emerged as a global battery testing ground because of its widespread deployment of solar panels and high electricity costs.

Competition in the energy storage sector is now creating a wider range of choices and driving down prices. Global companies such as Tesla, LG, Panasonic and Enphase have entered the market with lithium-based batteries, which are based on an energy storage chemistry developed for portable electronics such as notebook computers and mobile phones and, most recently, electric vehicles.

Australia also has its own horse in this race in the form of Redflow Limited, an ASX-listed company of which I am CEO, executive chairman and the largest shareholder. Brisbane-based Redflow has developed the world's smallest flow battery, an alternative chemistry to lithium-based batteries, which offers compelling advantages for on-grid and off-grid stationary energy storage applications.

Redflow's Australian-developed zinc-bromine flow batteries are already deployed in Australia, Africa, Asia, America and Europe. Earlier this year, Redflow launched its ZCell energy storage system for the residential sector.

This activity shows that Australia is entering the second phase of the renewable energy revolution. The first phase – which saw solar panels and wind farms appear nationwide – had one significant limitation – intermittency. The sun doesn't shine all the time nor does the wind always blow.

The second phase of the renewable energy revolution will bring widespread deployment of batteries that will allow renewably-sourced energy – specifically wind and solar – to be stored and supplied when it is required.

By solving the problem of intermittency, energy storage systems will enable wind and solar generated energy to become available 24/7. This will create a viable path for Australia to meet its renewable energy targets by replacing fossil fuel-powered baseload energy generators with renewable energy stored in batteries.

This creates an enormous opportunity for Australia at a number of levels – from consumers and electrical contractors to energy utilities and the Federal Government. The solar FIT buyout concept has generated significant interest in the Australian renewable energy sector and, according to media reports, is being considered by the Queensland Government.

When you look at the cascading levels of benefits delivered by energy storage, it's easy to see why this proposal is gaining widespread attention. Just as with solar incentives, a solar FIT buyout will prove politically popular with citizens who increasingly regard home batteries as a way to reduce electricity costs and increase their energy independence.

For electrical contractors, energy storage systems offer a 'second breath' for an industry that has grown strongly on the back of installing solar panels. While demand for solar installation remains robust, growth has slowed considerably since its peak in 2012 and 2013, when it was fuelled by the availability of attractive solar FITs.

Repurposing this same FIT expenditure to encourage energy storage uptake will support industry growth and build a wider range of skills and experience in an area of world-leading innovation.

This proposal has the virtue of re-using funds previously committed to kickstarting the PV solar panel sector to encourage the emerging energy storage sector – with associated jobs and business growth.

Widespread energy storage will also benefit far-sighted electricity companies by reducing demand during peak power usage periods and giving them the potential to buy home-stored energy as a 'virtual' on-demand power source rather than relying on fossil fuel-driven peaking gas generators.

Nationally, widespread energy storage, both at the consumer level and the grid scale, will help Australia achieve its international carbon reduction commitments by time-shifting renewable energy so it can be used 24/7, not just when the wind is blowing or when the sun is shining.

So there is a compelling case at each of these levels for state governments to buy back existing long-term solar FIT liabilities with an immediate incentive to buy and install home batteries – which in many cases will save these governments money.

Even consumers in those states, such as NSW, which are terminating generous FIT schemes in the near future, can benefit from such a buyback scheme. By encouraging battery uptake, the buyout program will create greater competition and drive down prices throughout the country.

Swapping solar FITs for home battery installations is not just a win-win: It's the gift that keeps on giving. ■

Simon Hackett is chief executive and executive chairman of ASX-listed Australian battery company Redflow Limited, which has developed the world's smallest flow battery. Simon, a technology entrepreneur who invests in innovative Australian businesses, sold Internode in 2012 and subsequently served as a director for iiNet and NBN Co. Visit www.redflow.com.

AN ARTFUL SOLUTION

WITH MASSIVE GROWTH IN MOBILE DATA TRAFFIC, TRADITIONAL CELLULAR NETWORKS ARE IN DANGER OF EXCEEDING CAPACITY. BUT ARTEMIS, A SILICON VALLEY START-UP, MAY HAVE JUST TURNED THE PROBLEM ON ITS HEAD. JACOB HARRIS EXPLAINS.

We are at the beginning of an era where smart mobile devices form an integral part of our day-to-day lives. A rapid increase in the use of smart phones, tablets and connected cars, coupled with data-intensive applications such as HD video streaming, is creating an almost exponential increase in mobile data demand worldwide – and it's a trajectory that shows no sign of letting up.

According to the *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015–2020* white paper, global mobile data traffic will increase nearly eightfold between 2015 and 2020. Mobile data traffic will grow at a compound annual growth rate (CAGR) of 53% from 2015 to 2020, reaching 30.6 exabytes per month by 2020.

"Asia Pacific will account for 45% of global mobile traffic by 2020, the largest share of traffic by any region by a substantial margin. North America, which had the second-largest traffic share in 2015, will have only the fourth-largest share by 2020, having been surpassed by Central and Eastern Europe and Middle East and Africa. Middle East and Africa will experience the highest CAGR of 71%, increasing nearly 15-fold over the forecast period. Asia Pacific will have the second-highest CAGR of 54%, increasing nearly ninefold over the forecast period," it says.

Many industry bodies believe this growth will see our finite spectrum running out of data capacity. But Silicon Valley start-up, Artemis, may have created a solution: pCell technology, a wireless system the company claims can achieve mobile data rates over 50 times the capacity of current systems. And all while maintaining compatibility with legacy LTE devices.

pCell technology from Artemis claims mobile data rates over 50 times the capacity of current systems.

Current cellular networks work by each tower transmitting a radio signal that forms a large cell. Each cell must avoid interference with other cells. Every user within a cell's radius shares the cell's capacity with every other user, effectively taking turns so they don't interfere with each other. According to Artemis, even with more spectrum and smaller cells, demand is outpacing capacity and we will soon hit a physics upper limit.

"We're running out of spectrum and current technologies that are using densification through small cells in 4G LTE networks are not enough for satisfying such a skyrocketing growth in data traffic," says Artemis principal scientist and co-founder Antonio Forensa.

pCell, the company says, provides a solution to this problem by increasing

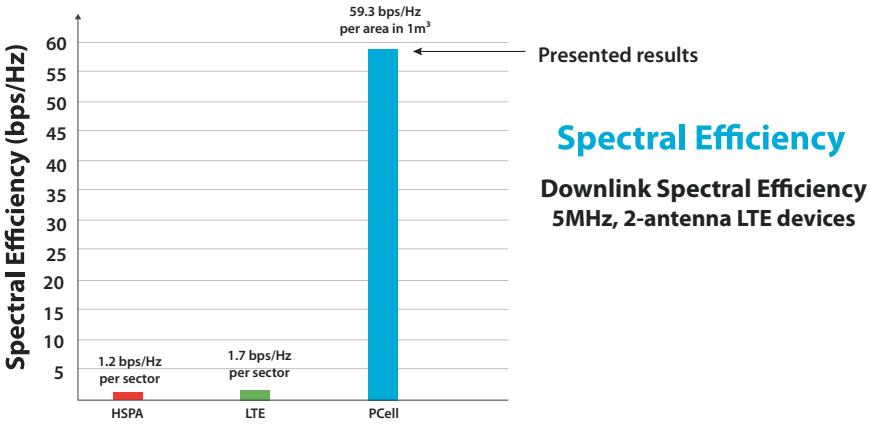
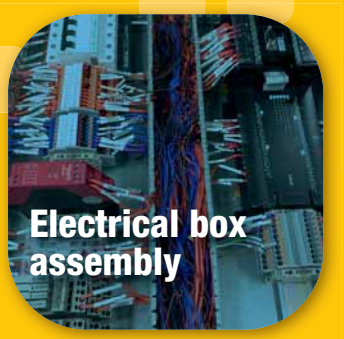
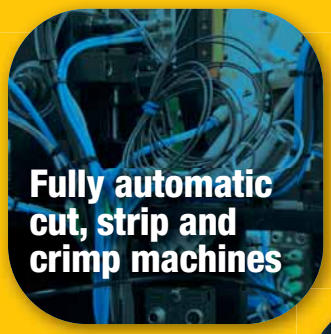


Figure 1: Spectral efficiency of up to 59.3bps/Hz with 16 4G LTE devices clustered in 1m².

Cable Assembly & Box Build Assembly





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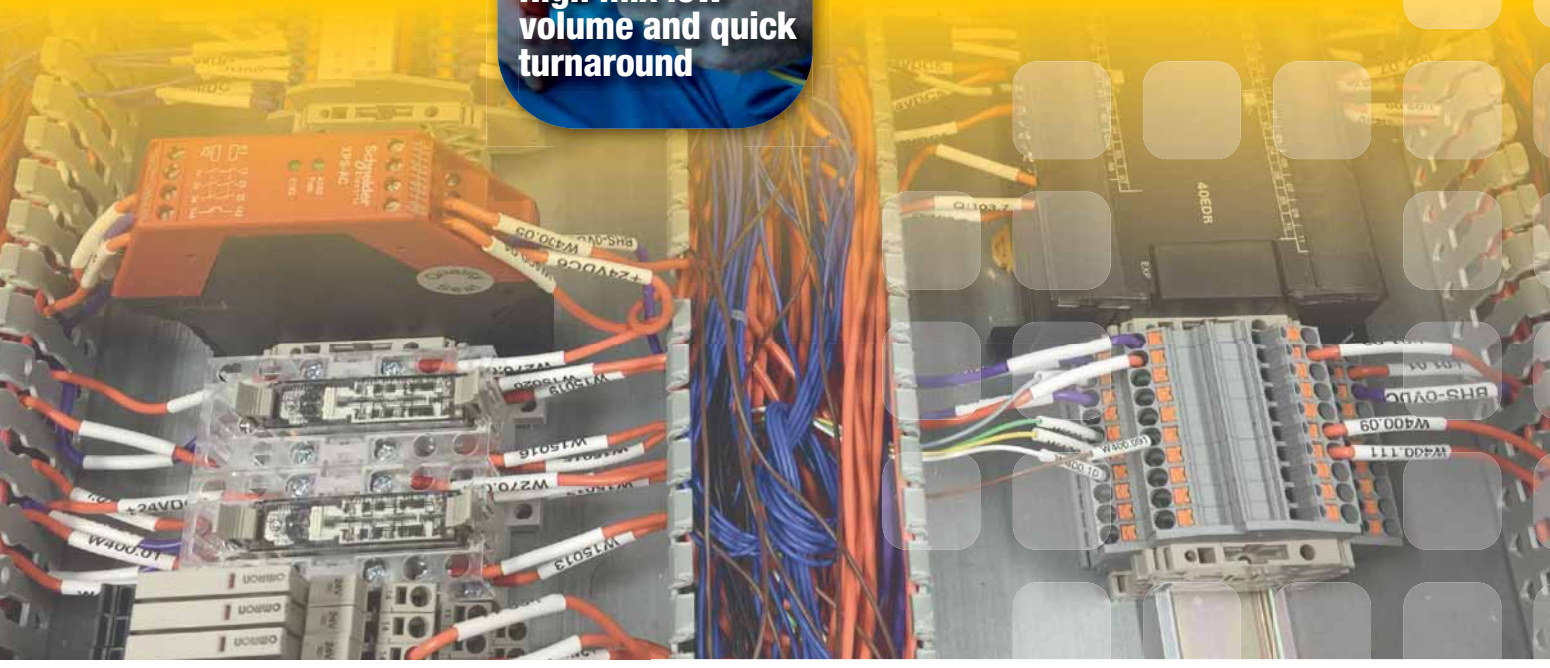

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spectral efficiency. Instead of dodging interference, pCell exploits it by combining radio signals to synthesise small, personal cells, or pCells, that follow each device around. This means that instead of users taking turns – sharing the capacity of one large cell – each user has access to full wireless capacity at all times. Instead of cell towers, the technology uses pWave radios: small transmitters about the size of a lunchbox (connected to data centres) that create signals that interfere with each other and are calibrated to synthesise pCells about 1cm in size around every device in range.

"When we compare the different wireless technologies, we see that 3G HSPA+ achieves 1.2bps/Hz per sector average down-link spectral efficiency as opposed to a 4G LTE 1.7bps/Hz – so we can see there's only a marginal gain. But with pCell technology we have achieved spectral efficiency of up to 59.3bps/Hz with 16 4G LTE devices clustered in 1m² (see Figure 1). So we're achieving these results in a worse than a worst case scenario," says Antonio.

To explain how pCell achieves such a high spectral efficiency gain, Antonio compares a conventional cellular layout against a pCell architecture.

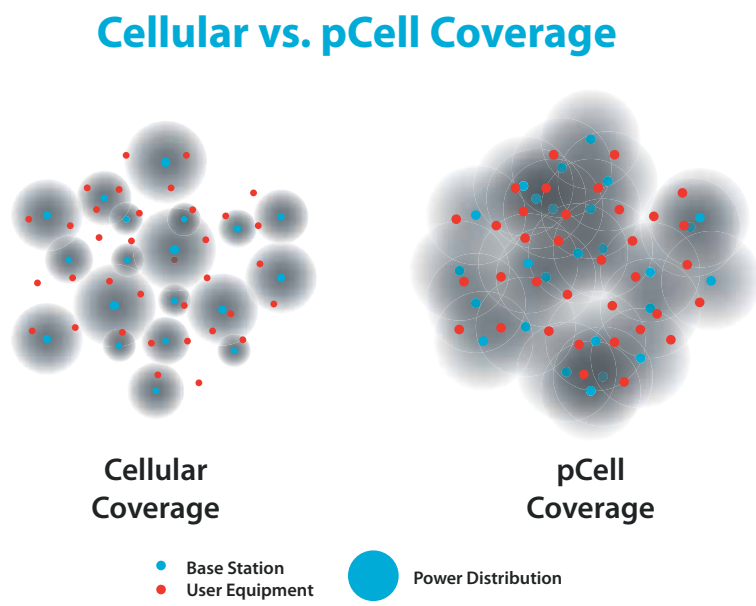

Figure 2: Conventional vs pCell coverage.

depending on their location. So as a user moves from the cell centre towards the cell edge, the signal quality degrades because of path loss and shadowing as well as inter-cell interference, particularly in a frequency use one system such as LTE networks.

"On the other hand we have pCell (the blue dots indicate the position of the access point). In its simplest form it is single antenna transceiver that can be placed anywhere. They can transmit at higher power and they can also be placed in much higher density than a cellular layout because the interference from all these access points is what we exploit in order to create a high signal quality around the user's location."

> We're running out of spectrum and current technologies that are using densification through small cells in 4G LTE networks are not enough...

"A conventional cellular system has base stations (indicated by the blue dots in Figure 2) that are placed based on a very specific cell plan. They can transmit a higher or lower power depending on whether it is a macro cell or a small cell (often small cells will overlap a macro cell umbrella).

"Performance varies dramatically for users (indicated by the red dots)

The technology has started to pique the curiosity of some big players in the US. Late last year, Nokia Networks and Rearden LLC (Artemis' parent company) signed a memorandum of understanding (MoU) to jointly test pCell in 2016 with wireless operators.

The test will initially take place in large indoor venues and other high density areas, and will be offered as pCell Proof-of-Concept deployments to selected Nokia Networks customers. The collaboration may also be extended to consider further advanced features that could be enabled by pCells, such as precise 3D location positioning.

Another company that is helping to test pCell technology is Webpass, a provider of high speed internet to residential and business customers in several US cities. Webpass has installed Artemis antennas in buildings it provides internet to.

What makes this partnership particularly interesting is that Webpass has recently been acquired by Google Fibre, giving the tech giant a first-hand look at pCell in action. ■

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Certain groups of plasticisers used in PVC compounds are soluble in aromatic polymers and petroleum based products. When in direct contact with such materials (e.g. styrene, Styrofoam, polyurethane and bituminised papers) PVC compounds can demonstrate plasticiser migration. This migration can result in;

1. The loss of physical and electrical protection afforded by the insulation and sheath components of the cable, leading to potentially dangerous situations.

2. Degradation of the material which the cable is in contact with. The breakdown effect of migration is mainly long term but can be exacerbated by the size of the surface contact area and elevated temperatures such as found in roof sheeting.

RECOMMENDED INSTALLATION PRACTICES:

It is recommended that installers ensure general market PVC insulated and sheathed electrical cables be installed in such a manner that they do not come in to direct contact with aromatic polymers (e.g. styrene, Styrofoam and polyurethane), bituminised papers and waterproofing. Cables should be installed in suitable conduits or protected by the use of polyester or polypropylene separation tapes. Alternative PVC cables using nonmigratory plasticisers are available, installers should ensure any such cables sourced can demonstrate suitable long term test results to substantiate performance.

Prysmian recommends the use of Afumex sheathed cables for these installation types. These cables have insulation and sheaths that do not contain PVC (plasticisers) and therefore do not exhibit the associated migration issues. Afumex cables are low smoke zero halogen types complying with AS/NZS 4507 classification RHE-1.

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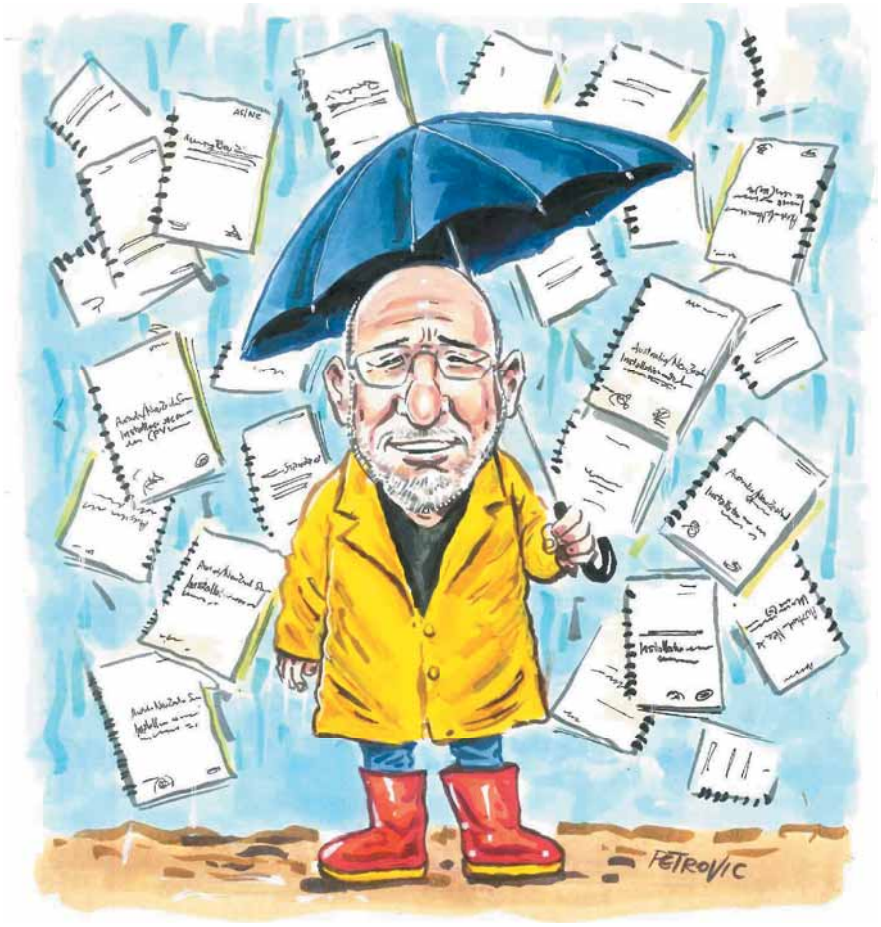
SETTING THE STANDARD FOR 2017

CHANGES TO THE WIRING RULES WILL IMPROVE SAFETY AND COULD ALSO HELP YOUR BUSINESS GROW IN UNEXPECTED DIRECTIONS. GARY BUSBRIDGE REPORTS.



Over the past few months I have been travelling around Australia in support of the revision of the Wiring Rules, AS/NZS 3000.

Presentations were made to more than 3,000 tradies at 21 shows, demonstrating that electrical tradespeople want to know what is happening in their industry.

It was a first, in that the proposed changes were presented before the Wiring Rules were changed. Several proposals have been thrown out or put on the first amendment pile.

More than 2,000 public comments from the trade were received, and the committee has been working through them to see what should be included, noted or rejected. Some comments required new work and have been put into the next round for discussion.

The aim is to publish the revision by mid-2017. By that time we should be into the first amendment and planning a release date. The Wiring Rules is an evolutionary document – technologies and work processes are continually added or updated.

Another activity worthy of mention is the revision of the generator Standard, AS/NZS 3010. This has created a lot of interest, as the use of generators is quite common – from large back-up systems in data centres and hospitals through to portable units used in camping and emergency situations.

The public comments have finally been addressed: they were shelved for a short while because of the Wiring Rules revision. The two Standards are linked, so we must ensure they are not published out of sync.

Most of the figures have been updated. Colours are included so that it is much clearer as to where the actives, neutrals and earths are connected to ensure a safe supply. The content has been markedly improved to provide more clarification and detail where required. This Standard is also expected to be published in mid-2017.

You are probably sick of reading Standards stuff, but that leads us to a very important standards revision for Medical Installations, AS/NZS 3003. Unfortunately, this has always been a little unclear for the specifier and installer, often leaving unanswered questions. This can lead to serious faults in an installation that may be costly to rectify later.

The committee looking after maintenance of the Standard has been quite forthright in discussions to alleviate these issues. For example, the delineation of patient areas and where a body or cardiac protected area finishes in an installation has always been a point of conjecture and tough to nail down.

BY
GARY
BUSBRIDGE

The revision will include diagrams to show how the boundaries can be determined, and many other details have been clarified. At this stage the revision has been agreed and will soon be issued for public comment, with a view to a possible mid-2017 publishing date.

You may ask what the burning issues are at present, and I can tell you that the revision of the DC isolators Standard, AS/NZS 60947-3, is just cranking up. Details of the new requirements have been tentatively agreed but the committees involved need to put the right words together.

Faulty DC isolators in photovoltaic systems are still causing fires. A few brands have been blacklisted, as they exhibit dubious quality and performance. Check with state regulators for the details.

This Standard is an adoption of an international one, but state regulators are keen for the committees involved (a joint working group of the switchgear and PV Standards) to add extra requirements for performance and testing.

For example, the test for checking operating temperature will have to be done at an elevated ambient temperature to simulate the effects of the harsh Australian environment.

As for weather ratings, there will be a new one that most of us know as 'hose proof'. However, there's a small difference in that it will not allow any moisture ingress into the enclosure. Typically, the assembly of the switch and its enclosure will have to pass this stringent requirement.

The days will be gone when you could buy a DC isolator and a separate enclosure then put them together. That's fair enough, considering water ingress is the biggest culprit when it comes to fires.

This revision is urgent and will be used to assess any DC isolator assemblies sold in our market. It should be ready for publishing in the first half of 2017.

Now as we all know where there is fire there is smoke (I know, it's the other way round). Smoke detectors have been in the news, what with a Federal Government inquiry into the effectiveness of the good old smokie. That inquiry went into abeyance during the last election, but the Queensland Government version, has kept chugging along.

There is now a discussion paper on the findings of the federal inquiry. In general, it supports the installation of the photoelectric type of smoke detector in all installations but still supports the use of the ionisation type as a secondary measure.

It seems that findings from the Queensland inquiry have been handed down. They are much more to the point, as state legislation has been implemented.

Photoelectric smoke detectors – hard wired or with a 10-year lithium battery – are required in all bedrooms and hallways of a dwelling. This means they should also be interconnected.

New dwellings or substantial renovations will have to comply after 1 January 2017, and there's a five-year window for compliance on premises sold or leased. Government-owned housing must comply within five years, and after 10 years all domestic dwellings must comply.

Sparkies in Queensland had better brush up on this legislation to ensure compliance. The move also offers opportunities in regard to the five-year change-over to photoelectric.

It wouldn't be surprising if this change makes its way into other states. The Northern Territory has been photoelectric only for quite a few years.

The Federal Government is also carrying out special studies into LED Lighting and its use with dimmers. This is in relation to the Minimum Energy Performance Standards (MEPS) for the operation and testing of all LED lighting and control units, dimmers and power supplies.

Most sparkies will be aware of the issues when replacing MR16 halogen downlight lamps with LED units. Invariably it all goes pear shaped, as the power supply electronics are not compatible with those in the LED lamps. It can be a costly exercise when the home owner finds this out the hard way.

The government department in charge of producing these Standards is doing a lot of research into compatibility.

Speaking of compatibility, there is also an issue with dimmers and LED lighting. Too many times the home owner is confronted by flickering downlights as a result of incompatible dimmers and LEDs. Research continues into this as well.

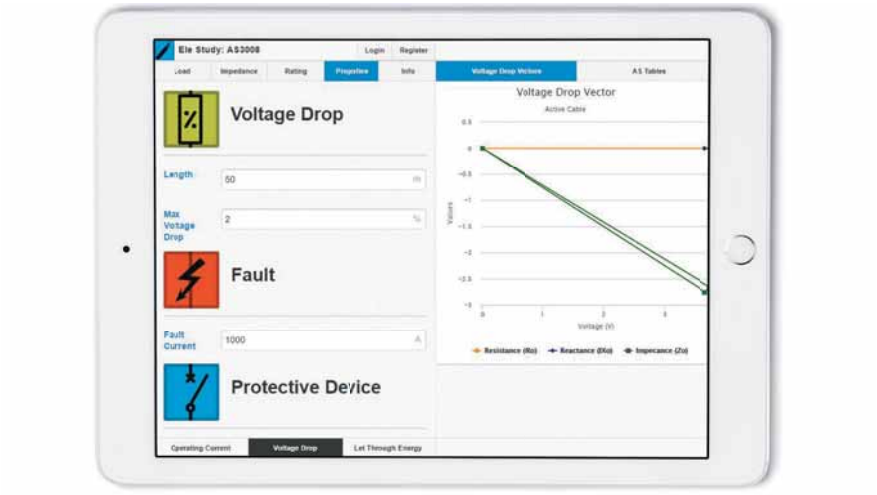
Reputable lamp or luminaire suppliers always provide the necessary information on product compatibility, so it is most important to use reputable products, not the cheap stuff that seems to be everywhere.

The aim of the government department is to make the change-over and ongoing maintenance of LED lamps, luminaires, dimmers and power supplies as easy as possible for sparkies and home owners by setting out consistent minimum performance requirements for all products. ■

> The aim is to publish the revised Wiring Rules by mid-2017.

SIZE DOES MATTER

AS FAR AS AUSTRALIAN STANDARDS ARE CONCERNED, CABLE SIZES MATTER. NOW, A WEBSITE HAS BEEN CREATED TO MAKE POWER CABLE SIZING EASY FOR ELECTRICIANS. JOE YOUNG REPORTS.



The website, www.as3008.com, has been created to ensure AS3008 compliance.

Picture yourself on a job site about to pull a cable. You know selecting a cable too small will cause a series of problems and if the cable is bigger than necessary, it would be a waste of time, effort, money and space. Also on your mind are the consequences of laying a cable not compliant with AS3008, the Standard concerned with cable selection.

It's enough to make even the most seasoned of sparkies sweat. But, the thought of meticulously thumbing through page after page of the Standard is enough to put anyone to sleep.

The website, www.as3008.com, has been created to assist electrical engineers, technicians and electricians to quickly select and size cables and ensure AS3008 compliance.

Using their smart phone, an electrician can input relevant data into the website and it will instantly create a simple cable selection and sizing report based on the Australian Standard.

If you wanted to know the load capacity of a cable for specific site conditions, you would input the cable's current, power, phase voltage, power factor, phase rotation and phase and the website would then respond with a graphical report showing phase vector information, current waveforms, power, de-rated current capacity, percentage voltage drop and the thermal stress limit for a particular sized cable.

To calculate impendence, you would input the cable's metal, core structure, core type, material group, insulation designation and configuration.

For current rating, you would input the cable's highest ambient temperature, arrangement and the number of circuits.

It will also calculate voltage if you input cable length, max voltage drop, fault current, clearance time, let-through timing and fault current timing.

Andrew Cripps created the website because he wanted to be able to check the calculations he was using in his work as an electrical engineer.

For this reason the website has been designed to help users gain a better understanding of the mathematical underpinnings of the website's calculations, which is why Andrew includes graphical representation of the data in the reports.

"A lot of electricians have learnt about vectors and the graphs give them a way to play around with the result and get a better understanding of what is going on," Andrew says.

"Originally I designed it with electrical engineers in mind, for use during the design process; but, after putting the app on a few online forums it has become popular with electricians as an easy way to size cables on site."

When the website was first built, it had more functionality but Andrew got the feedback that at times it was too complicated to use.

"I've redesigned the site so it's intentionally very simple in its design and function," Andrew says.

"The most important thing for me is that people who are not familiar with the app should be able to pick it up and get the answers they need within a minute. There's no need for training to know how to use it."

And best of all, unlike the AS3008 document it's free.

Of course, there are sparkies out there would will prefer to size cables the old fashion way, which is a bit like using the street directory instead of Google Maps. For them, the site can still be helpful as a reference to know where to look in the AS3008 document ■

> **Ele Study: AS3008**
> **www.as3008.com**

TWINSPOT LITE IP65

FEATURES

- Lumens 2 x 140 lm
- Lithium batteries (LiFePO4)
- Fully compliant (AS/NZS 2293)
- Average power consumption <0.45W

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The battery used is safe for the environment.

IP65
The Twinspot Lite has an IP rating of IP65.

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TOWARDS THE LIGHT

GROWING VEGETABLES OUT OF SEASON, ISOLATED FROM THE WEATHER AND WITH NO NEED FOR ARABLE LAND MAY NOT BE A UTOPIAN DREAM ANY MORE. PHIL KREVELD INVESTIGATES.

Back in 1949, two scientists in the United States – Borthwick and Parker at the Plant Industry Station in Beltsville, Maryland – published results on the use of carbon-arc lamps for growing Biloxi soybeans.

As they describe in their paper *Growth and composition of Biloxi soybean grown in a controlled environment with radiation from different carbon-arc sources* (Plant Physiology, 1949), the lamps burned 'sunshine carbons'.

This was the tentative beginning of using electric light to stimulate growth of vegetation.

The carbon electrodes were cored with certain materials that beaome incandescent (cerium fluoride, for example) thereby increasing the energy in the visible spectrum, in particular towards the blue-violet part.

They found that by combining the arc lamps with incandescent lighting, a sturdier plant developed because the radiation then also provided near infra-red energy. The 'sunshine carbons' peaked at 280mμ (millimicrons or 10^{-9}m), and chlorophyll has maximum absorption at that wavelength.

High-intensity discharge (HID) lamps have sometimes been used in combination with incandescent lighting to provide longer wavelengths. The discharge lamps sometimes use phosphor-coated mercury.

Fluorescent lamps are still being used, such as the slimline T5. However, developments in LED technology is bringing great advantages to greenhouse horticulture.

Despite the advances, replacing the sun is no simple thing. Table 1 shows a spectral break-up of the colours in sunlight.

LIGHT QUANTA, NOT LUX

The physics of Albert Einstein and Max Planck in the equation $E=\boldsymbol{hc/\lambda}$ underpins atomic interaction with light – as particles.

Light quanta (packets of light, each with a specific E energy according to its wavelength λ and travelling at the speed of light c) are absorbed, and that energy is used (photosynthesis) for taking up carbon dioxide from the atmosphere. This, together with water in the plant, splits the water into oxygen and hydrogen, with the latter forming carbohydrates in the plant.

The interesting thing about these quanta is that each one that is absorbed is responsible for knocking off an electron (part of the chemical process). So rather than thinking in lux (light as a continuous electromagnetic wave motion) we conceive it as particles of energy.

Rather than describing the light output in lumens or lux, a rather unfamiliar term is used for horticultural purposes: the mol and micromol. But there is no need to study chemistry. These units indicate that it is light quanta as described that do the 'business'. The shorter the wavelength, the higher the energy of a light quantum. A violet colour quantum packs more punch than a green one, and so on, as energy diminishes the more the wavelength moves towards red and then to infra-red.

So what is a mol? In chemistry it is the weight in grams of 6 x 1,023 atoms of whatever element you care to

BY
PHIL
KREVELD

COLOUR REGION	WAVELENGTH (Mμ)
Violet	380 - 435
Blue	435 - 500
Cyan	500 - 520
Green	520 - 565
Yellow	565 - 590
Orange	590 - 625
Red	625 - 740

TABLE 1: The perfect lamp would be able to completely mimic the spectral distribution of sunlight. In practice no single lamp will suffice, and that also applies to LEDs.

choose. Because a light quantum can 'do something' to an atom in order to make a reaction take place, it is a good idea to skip lumens and lux, and to use the same 'quantity number' for light quanta.

Thus 1 mol of light quanta (in some narrowly defined wavelength range) is equal to 6 x 1,023 quanta, each one of which basically can help a single photosynthesis reaction to happen. The micromol is one millionth of 6 x 1,023 (6 x 1,017) or still a very, very large number. From a greenhouse aspect. people are interested in the number of quanta per sec per square metre.

IMPORTANCE OF COLOUR

What finally happens in a plant leaf depends on the spectral absorbance, and that is determined by plant pigments such as chlorophyll, the characteristic green colour.

However, there are also the yellow, orange and red colours of other pigments such as carotenes, xanthophylls, etc.

In Figure 1 the typical response curves for LEDs are shown as a contrast to high pressure sodium (HPS) vapour lamps. Note: a nanometre is also a mμ (milli-micron)

The yellow curve indicates the HPS spectral response, and the LED curves are shown in admixtures of red/blue light for 100% red (red trace), 85% red-15% blue (mauve trace), and 70% red-30% blue (blue trace). The total quantum flux emitted is identical for all curves at 70 micro mols/sec/m^2. The strong advantage for the use of LEDs in horticultural applications is the flexibility available in spectrum distribution to suit particular plant varieties.

COMING OF AGE

LEDs began to be used for horticulture several decades ago.

One of the first practical applications was the growing of lettuce using red LEDs augmented by blue fluorescent tubes. Using red light alone had the effect of elongating seedlings. In general, longer wavelengths tend to elongate plant stems and thicken them.

However, the experimentation required to produce satisfactory results defies simple rules; rather each plant species demands careful evaluation of colour mixtures.

A distinction must be made between greenhouse environments and entirely artificial lighting.

Photo-periodic lighting (to induce flowering out of season) supplemented by natural daylight involves different demands, and a great deal of scientific literature deals with 'light recipes'.

It has resulted in the development of highly specialised LEDs such as the ORBITEC 'light engine' – red, blue, green LED cells and photo-diodes for feedback and control purposes. This includes detection of spaces between plants and switching off needless illumination.

Much higher efficiency compared with other forms of lighting (for LEDs it's about 80%) means less heat dissipation. Some radiated heat is often required for sturdy plant growth but it must be carefully controlled. The relative coolness of LEDs allows them to be employed as intra-canopy light sources. This can be an advantage when tall plants are grown.

TAILORING

Careful selection of LED lighting is required due to the large variety of applications

Practical issues include dissipation of heat that is not always unwanted but generally requires venting to control temperature.

There are several suppliers, and it's no surprise that development of LED technology is encouraged in colder climes.

Philips is a leading supplier and promotes products with high efficacy. Efficacy is specified as μmol/J (joule). The joule is of course the watt-second, which brings the specification back to μmol/sec/watt.

The practical embodiment of an LED illumination system requires several features, including a thermal design to extract heat and an optical design that maximises light availability.

Integrating driver circuitry also simplifies installation, and modules should be capable of being plugged into the mains.

In the case of Philips products, the shape of the modules has been chosen to match standard 40x40mm C-profiles. With the accompanying brackets, installing a module is a matter of seconds. Installation time is further reduced by routing mains wires through the module, allowing for cable-free installation.

What of the future? The Advanced Life Support Crops Group at the NASA Specialised Centre of Research and Training in Advanced Life Support (the ALS NSCORT) and the Orbital Technologies Corporation (ORBITEC) have engaged in a collaborative research project.

This has led to the development of efficient, reconfigurable LED lighting systems that will support crop growth in a crewed space habitat. The LED arrays were based on light sources using printed circuit red and blue LEDs, individually tuneable for a range of photo-synthetic photon fluxes and plant responses.

In 1962, when Nick Holonyak at GE invented the first LED (emitting infra-red radiation), who could have imagined that one day the technology would play such an important part in food production? ■

OFF TO THE RACES FOR GORDON MCKAY

A VICTORIAN CONTRACTOR HAS PUT ITS EXPERIENCE TO GOOD USE BY LIGHTING UP A REGIONAL RACE TRACK. PAUL SKELTON REPORTS.

Australia is a gambling nation. As a country, we spend around $18 billion each year trying to land that elusive big win. That's around $1,500 per person.

For me, it's the horses; that's what I was raised watching – I think I placed my first bet when I was about seven.

But more than racing, I love technology. And over the 25-odd years since I placed my first bet, there have been a lot of developments in the technology that makes racing possible.

Recently, the team from Gordon McKay Electrical Services designed and installed a new lighting management system at Victoria's Pakenham Racing Club that had to meet the stringent requirements of riders and horses, viewing patrons, and local and external TV broadcasting during the running of night races.

"Controlled spill lighting to viewing areas provides a soft and warming effect with zero glare, allowing patrons trackside access without shadow obstruction," says Gordon McKay operations manager Andrew Sargent.

"At the jump, horses and jockey colours can be easily distinguished. Focused lighting on the course proper allows the eyes to fully fix on the race with the 56 lighting masts vanishing into the background.

"As the horses enter the turn, enhanced lighting builds the excitement of the cheering patrons all the way to the finishing post, where back lighting and shadow control lighting allow the colour of a horse's nose to determine a photo finish.

"This experience of trackside racing is also felt by the thousands of punters located around the world with TV broadcast-quality lighting providing clarity and sharpness to their viewing from the Hong Kong Jockey Club, the local TAB or the comfort of their own lounge."

The requirement to light two race tracks using the existing power network, which was incapable of handling the increased capacity, challenged the Gordon McKay team to develop a solution that wouldn't impact the overall project cost.

The original project brief asked for a centrally-located network power compound to be built to house the required network equipment and one essential power generator with an option to provide an additional 2,000kVA generator to power the complete site should the need arise.

With budget restraints a major factor in the project's success, Gordon McKay offered an alternative solution that would not only create considerable project savings but also incorporate any future requirements.

Specifically, the team offered to split the centrally-located compound into two compounds, each located at the extremes of the race course. This thinking allowed commonly available generator sets to be incorporated into the works at a similar value to the original concept.

Coupled with use of today's high speed network solutions, the dual compound approach allows the club seamless control of both locations from one central location.

"With initial tender figures far exceeding the original budget figures Racing Victoria and the Pakenham Racing Club, they sort to reduce the scope of works to ensure the future of the proposed lighting project.

"But final tender submissions based

Controlled spill lighting to viewing areas provides a soft, warming effect with zero glare.

Gordon McKay proposed the decentralisation of the power compound from one large, centrally-located compound to two smaller compounds at each end of the race course.

on a reduced scope were also unable to bring the project's overall costs within the required budget and would inhibit the projects approval.

"Gordon McKay was then approached by Racing Victoria to review the proposed scope and make recommendations that would help reduce the project's overall costs. Calling upon our past experience with the racing industry and applying innovative thinking on how the race course was to be operated, Gordon McKay was able to provide an alternative to the base offer that reduced the overall projected cost by around 40% while having no effect on the final result."

This was achieved by:

- Altering minor cosmetic details, such as changing the lighting mast structure to a standard 16-side mast;
- Decentralisation of the power compound from one large, centrally-located compound to two smaller compounds located at each end of the race course. This reduced the cost of the generators and greatly reduced the length and size of cabling to be installed; and,
- Providing local control panels, which allowed changing from Astroturf to a real grass surface at each mast and reduced the requirement to install individual feeder cables.

Being awarded the project after the 2016 racing season calendar was published challenged Gordon McKay with an extremely tight seven-month construction period.

"The development of fork-mounted cable stands allowed cable installation to progress at a greatly increased rate while reducing the risk of having exposed trenches through the unpredictable Victorian winter/spring weather, and similarly reducing exposure to horses and jockeys at race meetings and during daily track use."

In all, 56 lighting masts supporting 1,190 light fittings powered by four generators, 58 control panels and 150,000m of cable was installed and fully commissioned three weeks early.

"The two tracks are now illuminated from 56 steel lighting masts ranging in height from 12m to 40m, supporting 1,190 2kW floodlights which equals 2.38MW of lighting.

"4km of trenching and 150,000m of electrical cable is powered by four diesel generators capable of supplying 2.75MW."

All of this is centrally controlled by course officials.

The Gordon McKay team identify a new device called the Active Reactor as a major factor in getting this job completed on budget and ahead of schedule.

Developed in Australia, the Active Reactor was designed to enable the efficient control and operation of high intensity discharge (HID) lamps. The device uses a microchip and electronics to control the starting and running of 150W to 2,000W high pressure sodium and metal halide lamps commonly used in street lighting, floodlighting, industrial and sports lighting.

It also delivers substantial energy savings, greenhouse gas reductions and lamp life extension when used with HID lamps.

"The device, which incorporates a dimming capability, allows track officials full control over the lighting system via a computer-based SCADA control system, including the ability to dim the lights to 60% of the design level before, in-between and at the conclusion of races to save energy."

Unlike other construction sites, minor details mattered a great deal in this project. For example, a loose cable tie or a scrap of insulation tape could spook a horse with horrifying results. It was important to constantly be reminded of this fact.

As project manager Rob Morris put it: "Faced with what seemed to be a near impossible challenge created by an extremely tight budget and tighter construction period, confirmed that good pre-project planning, innovative thinking in how the works were to be executed and the willingness of the client, suppliers and subcontractors to fully collaborate in a responsive and accessible manner can transform what appears to be unachievable into achievable with results exceeding expectations." ■

> **Gordon McKay**
> **www.gmckay.com.au**

SETTING A NEW STANDARD

WITH ACCESS TO A GLOBAL MARKET IT IS VERY EASY FOR SUPPLIERS TO TAKE PRODUCTS AND COMPONENTS AND QUICKLY ADAPT THEM TO SUIT OUR LOCAL MARKET. THE RESULT IS USUALLY CHEAP AND LESS THAN SATISFACTORY. SOME, HOWEVER, TAKE A DIFFERENT ROUTE AND DESIGN, INNOVATE AND MANUFACTURE THEIR PRODUCT RANGE LOCALLY. WITH OVER 100 YEARS COMBINED LOCAL KNOWLEDGE ECD HAS THE EXPERIENCE AND THE KNOW-HOW TO MAKE ITS PRODUCT RANGE PERFECTLY SUITABLE TO THE AUSTRALIAN MARKET WITH THE PERFORMANCE AND QUALITY WE COME TO EXPECT.

ECD is a company that is focused on outstanding customer service, founded on the back of locally based (Australian), market leading product design and innovation. ECD challenges itself by using a policy of continuous improvement, bringing these values to its customer base through its broad range of cable management and distribution products.

The range of cable management products is primarily focused on the commercial, medical, manufacturing, retail and infrastructure projects, however it can be equally at home in residential and other developments. The product range provides a means of accessing power, data, voice and the ever increasing need for audio visual outlets in virtually any location within a building space.

ECD now offers the latest evolution of its ever popular range of Floor Outlet Boxes. Building on a strong history of the most flexible and simple floor outlet boxes, it introduces the latest design in safety, the 'PROTECTOR' Series.

The PROTECTOR Series features the industry first CableShield™ Frame assembly with non-conductive edge to prevent cables being guillotined or damaged.

A common issue arising from the use of other stainless steel floor boxes is the risk of cables being damaged through the miss-use of the floor box. Typically, plugging leads into the sockets inside the floor box but failing to route these cables out of the cable exit correctly can instantly cause damage as the sharp edges on the lid cut through. The Protector Series with the 'CableShield™ Frame' prevents this damage.

Other features include a soft-close lid, a large capacity cable exit flap and a retainer for cable management.

The solid stainless steel components have a No.4 linished finish for an exceptional appearance and robust performance.

Being leaders in innovation and design, ECD has made the range suitable for Category 6A and 7A data cabling and for AV outlets including VGA, HDMI, USB etc, with generous bend radius capacity (75mm deep), this is sure to be pleasing to technicians installing data and AV equipment.

ECD strives for simplicity with all of its products and this range is no different. Designed to take standard outlet plates (two, four or six); installation is easy with the use of any of the commercially available sockets. ECD can also make a custom outlet mounting bracket to suit your project.

The range of floor boxes by ECD is modular. With stainless steel lids interchangeable with plastic, deep recessed stainless or brass and heavy duty load rated to suit varied floor finishes and conditions. There is an optional cam lock if required. All floor boxes are supplied with a temporary construction lid.

When safety matters, always specify and use the PROTECTOR Series.

ECD can provide a wide range of custom solutions for your project. This can be as simple as a special colour or finish applied to one of its products or a custom, fully engineered and coordinated product made specifically for a project.

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THE 'PROTECTOR' SERIES

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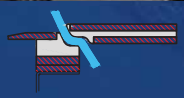

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Suits 2 No. switchplates

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SYDNEY **MELBOURNE** **BRISBANE** **PERTH**

WHERE KNOWLEDGE IS POWER

THE ROLLOUT OF AN ENERGY EFFICIENCY EDUCATION PROGRAM IN RURAL NT LOOKS TO 'DEMYSTIFY' POWER CONSUMPTION TO THE INDIGENOUS POPULATION. PAUL SKELTON REPORTS.

In the wide expanse of the Northern Territory, small indigenous communities are quite a common feature of the landscape.

Around 20 years ago, many of these remote communities shifted from having power provided as a government service to having meters installed and the people paying for power, which was being delivered across small diesel-powered mini grids. However, this change may not have been fully understood by many residents at the time and subsequently they have quite often suffered power outages simply by poor consumption habits.

Recently, a consortium partnership led by power, water and sewerage services provider, Power and Water Corporation (PWC), completed an extensive energy efficiency education program in six remote communities in East Arnhem Land.

The Manymak Energy Efficiency Project, or the Dharray Manymakkung Pawaw Ga Gapuw project as it was known locally, was designed to help local communities to improve energy and water efficiency outcomes as well as building capacity within those communities.

It was one of 20 projects across Australia to receive funding through the Federal Government's Low Income Energy Efficiency Program (LIEEP), which was established to provide grants to trial approaches to improve the energy efficiency of low income households and enable them to better manage their energy use.

"From very early on in the project we were told that if we wanted to educate people in these communities about water and power consumption, it needed be done in the right way, by their own people and in the local language for it to mean anything," says PWC's remote operations manager of demand management Sam Latz.

"In these communities there are a lot of people living quite traditionally, with varying levels of education in English. They don't necessarily subscribe to the Western ways of thinking about the world and when coupled with low levels of English literacy and numeracy, it can be quite difficult for them to understand mainstream government systems and why things have to happen in certain ways.

"Out of this grew the need to recruit and employ local people, to train them to then be able to provide education to their community. That was the cornerstone of this project.

"So we adopted a very respectful approach. We wanted to help residents to make sure they were using their money the best way they could. We weren't telling them how to spend their money; we just wanted to make sure they were getting the best value on their power costs."

Launching in Milingimbi, the project also rolled out into Galiwinku, Gapuwiyak, Yirrkala, Gunyangara and Ramingining.

"Many of these communities are actually very water stressed, running off limited water sources, and it costs a lot more money to ship in water than it does

diesel. For that reason, the technology we used was very important to ensuring we delivered a system that would work for local residents," Sam says.

A big part of that came in the form of the BEEBox, an energy display device that was developed specifically for this project.

In total, 250 homes across East Arnhem Land had a BEEBox installed at no charge.

"The unique BEEbox technology was developed by the Centre for Appropriate Technology (CAT) and provides real time feedback to residents about their electricity consumption," Sam says.

"The BEEbox gives householders real time information about their energy use so they can make choices about budgeting and managing their own electricity consumption."

BEEbox stands for 'Bushlight Energy Efficiency box'. It consists of a controller installed at the meter box and the inside display unit which is typically mounted to an internal wall.

"The findings of the project showed that people really appreciated learning about how power works and how much power different appliances use," Sam says.

"Ultimately, power consumption really depended on the appliances people could afford to buy in addition to the number of bedrooms in their home. So the best results came from installing higher efficiency appliances."

But the biggest benefit would appear to have come from workplace training.

"The education and employment were highly valued by residents. Already there are reports that the workers who were part of this project have moved into other positions," Sam says.

"This project gave many a first opportunity to phase into the work force and learn skills in a supportive environment and in their own language.

"Moving forward, we are keen to partner with other organisations that are interested in social outcomes. We can't do this alone."

The Manymak Energy Efficiency Project was delivered by PWC in association with CAT, Charles Darwin University, NT Department of Housing and East Arnhem Regional Council. ■

> **Power and Water Corporation**
> **www.powerwater.com.au**

A NETWORK'S GUARDIAN ANGEL

AS NETWORKS BECOME INCREASINGLY PREVALENT, SECURITY IS GROWING IN IMPORTANCE. PAUL SKELTON LOOKS AT A NEW PRODUCT THAT COULD TRUMP THEM ALL.

It's funny but when someone with 27 years' experience as an IT warrant officer in the US Armed Forces talks to you about network security, you can't help but listen... and get just a little scared.

Dave Putman (pictured) is the vice president and CTO of FireFX. He, along with the company's founder, Larry Allhands, are current serving member of Texas Army National Guard.

Most recently, the company launched a new product called the Network Guardian, which combines all of Larry and Dave's military IT experience into one box that makes the average firewall look, well, pretty poor.

"There is currently a severe lack of what we would consider 'true security' in home networking," Dave says.

"Our idea of true security is based upon our experience in the military securing networks in Afghanistan and Iraq.

"Six years ago we started building media systems as a hobby and having fun with it. Five years ago we started building them to sell.

"Recently, people started to ask us to consult on jobs as far as network security was concerned. One of our integrators actually said they wished they could put us in a box because the AV world doesn't have our level of security training. So we decided to build a system that would, out of the box, allow integrators to benefit from our education and experience."

Dave explains that Network Guardian comes preconfigured so integrators can "secure a house more correctly".

"Security of home networks is as important to me as the security of national secrets," Dave says.

"Of course, it just has to be more affordable because a $5,000 firewall from Cisco at home isn't practical."

The majority of firewalls on the market 'do firewall' really well, he says.

"They feature stateful packet inspection (SPI), which is the current industry standard; they do 'natting' really well; and some do VLAN management. That's it.

"It's like having a security guard at the gate but all he's doing is looking outside to make sure nothing bad comes in without being invited.

"That's the problem with SPI. A lot of people think that all they need is an SPI firewall but there's so much more to true security than that."

Dave explains that in military applications, what's inside the network is just as important as what's on the outside.

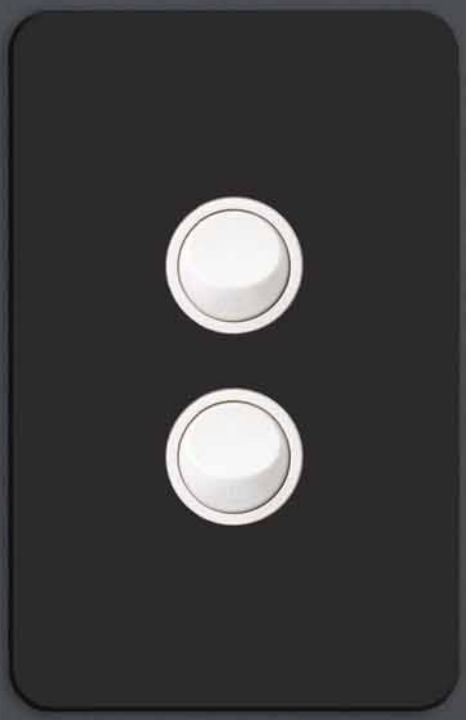
"Generally speaking, every request that originates from inside a network goes through a firewall to get out. When that request returns, an SPI firewall sees that it started inside the network so it lets it back in, even if it's a malware packet or virus.

"With military networks, we monitor both sides of the firewall. We watch the outside for known threats as well as what's happening inside the network. So, if you're on a website and click a link that we know is questionable, we stop it before it ever leaves the firewall.

"Further, if you click a legitimate link but somewhere on the outside of your firewall your connection gets hijacked, when that traffic comes back our active packet inspection will filter out the problems."

The FireFX Network Guardian also features anti-spam, anti-virus and anti-malware filtering. ■

> **Wavetrain**
> **www.wavetrain.com.au**



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TRADING IN SPORT FOR LIFE

Growing up on the Gold Coast, I'm somewhat of a rugby league tragic (by which I mean that despite playing the game for many years as a kid, my game is a tragedy).

Even though I only ever scored one try and was awkwardly taller than everyone else on the field, I still thought that one day might be able to play alongside Dale Shearer and the rest of the Gold Coast Seagulls.

But reality ultimately came calling and in the same year that the Seagulls pulled the plug (1995), I too put an end to my fledgling career at the seasoned age of 11 (I still think 12 would have been the age when everything just clicked, but it was not to be).

I understand what it's like to have a singular focus on playing a game at which so few people will ever be successful. Luckily, I found journalism but so many other players who stick with the game far longer than I did will not adequately prepare for life after the game.

John Hutchinson is out to change that.

John is currently the education, training and employment manager for the National Rugby League (NRL) and has been working in player development since 2000. Recently, he has spearheaded the Australian Apprenticeship Ambassador program, which aims to promote apprenticeships to players as well as the wider community.

"So many of the guys playing in the NRL aren't going to have a very long career. In the junior grades, most won't have a career at all. So it's important that players understand this and plan for life off the field," John says.

Parramatta Eel and apprenticeship ambassador David Gower is a qualified electrician.

"The average playing career is about three to four years. So for us, it's important that the guys have something else going on in their life other than just footy.

"Even if you're lucky enough to become a 'marquee player' who has a career for 10 years, that's not very long. 10 years is nothing. There's a lot of living beyond those 10 years.

"There's a perception out there that footballers have got too much time and too much money. But when you scratch the surface, nothing could be further from the truth.

"The average salary isn't enough to retire on."

Currently, about 25% of players are completing an apprenticeship. A further 25% go to university.

"We would love this number to grow because of the natural fit between league and the trades, but the demands of the sport at the elite level make it quite hard. They need a really sympathetic employer if they're going to be successful."

Interestingly, being an electrician is one of the most popular trades among players.

"The three biggest trades among players are plumbing, electrical and carpentry. When I asked players why these three were so popular, they told me it was because they would never be out of work.

"Players tend to be very pragmatic and very practical. They like things in black and white and they like learning by doing. That's why these trades are a perfect fit.

"We're very much a blue-collar sport. Our guys come from working class

backgrounds and many of their parents have been in trades themselves. So they often have a natural affinity towards trades."

According to John, many of the players who have completed an apprenticeship are quite adamant it has improved their game on the field, too.

"There's discipline in having to get up at a certain time, being on the tools all day and then going to training when you're tired. You have to be pretty tough," he says.

"Vice versa, the discipline they learn playing football carries over into their trade work.

"Playing junior footy is an apprenticeship in itself. You start as a 16-year-old, learn lessons and progress through to the Under 18s, if you're lucky. Then if you're lucky again, you'll go through to the Under 20s.

"If you're really lucky you get to go play with the big boys. Just 9-10% of our current Under 20s cohort, which is around 500 players, will ever make it through the top level."

That means about 450 players will not make it.

Each player in the Under 20s and the NRL are entitled to up $2,000 per annum in financial assistance for TAFE or university courses. John says there are now plans to expand this to state league competitions.

"All these players need is a bit of support and the right kind of support will help them to be successful," he says.

FROM EEL TO ELECTRICIAN

David Gower, 31, has been playing professional rugby league since 2006. Currently playing for the Parramatta Eels, David is a qualified electrician who strongly advocates apprenticeships among the playing group.

"When I finished high school, I really didn't know what I wanted to do. My father and grandfather were builders but carpentry wasn't really for me," he says.

"They suggested the electrical industry. I was always relatively good at school and I enjoyed maths, which is obviously a big part of getting into the electrical industry. I was also lucky that one of my coaches from when I was a young fella owned a contracting company based in Galdesville, which wasn't too far from where I lived.

"Initially I was going to help out as a trades assistant but my former coach suggested coming on as an apprentice.

"I thoroughly enjoyed my time as an apprentice. And the company – Raven Electrical – was fantastic, especially working around my footy commitments."

After two-and-a-half years working with Raven, David packed his bags and moved to the UK for 18 months, to play in the English Super League.

"When I came back, I picked up where I left off at Raven. I transitioned straight back into work. It was fantastic from a development point of view, being a tradesman and having to juggle work and football.

"Being a tradie teaches you discipline and time management skills, and you develop a real hunger to work hard and succeed. I'm really thankful for Raven and my time as an electrician because it made me appreciate hard work and really look forward to the challenge."

During his time on the tools, David was involved in some high profile projects, including the Lane Cove Tunnel, the heritage-listed Transport House in Circular Quay and the Children's Medical Research Institute at the Westmead Children's Hospital.

"I was 25 when I started playing football full time. That was the end of 2010, so I spent a good five years in the trade.

"Nowadays, a lot of guys transition straight into full time football. They don't enter the workforce or study anything that is meaningful.

"In the Parramatta squad right now, just me and Cody Nelson, who is two or three years into an electrical apprenticeship, have a trade behind us. There's a big gap around education for players.

"I find this surprising because with being a tradesman, the hours are good and it's physical work so you would think that a lot of athletes would be interested, but a lot of young kids put all their eggs in one basket."

David says he's sure that the electrical industry will play a big role in his future.

"Being an electrician is fantastic. It's a well-paying job and it's a stable job. And the electrical industry is always going to be around and need skilled workers.

"A lot of other industries are becoming automated and moving away from manual labour. For me, having a trade, even if you ultimately want to do something different, is a fantastic 'fallback'. It will give you skills and life lessons, and more importantly it's something that nobody can ever take away from you.

"If all else fails, you can always get back on the tools and be well paid.

"I thought about giving up the trade after two-and-a-half years, when I moved to the UK, but I know I made the right choice in seeing it through."

Most recently, David completed a Certificate IV in Training and Assessment. His plans for after his football career include the potential of heading back to TAFE to become an electrical trade teacher. ■

TO BID, OR NOT TO BID

MAKING SUBMISSIONS FOR LARGER PROJECTS CAN BE A NOT-SO-TENDER TRAP. BRIAN SEYMOUR OFFERS SAGE ADVICE ON AVOIDING THE PITFALLS.

So many contractors have been sent down the road to the poorhouse by winning tenders that are far too risky.

A considerable number of books, papers and articles have been written on the subject, and it's an ongoing hazard for sub-trades in the construction industry.

On receipt of the tender documents, it is the estimator or contractor's first duty to inspect them, establish viability and consider whether the closing date is realistic.

Some years ago, I was engaged in a multi-million dollar tender involving myriad documents – including more than 100 schedule of rates items, a break-up of prices for individual sub-contractors and details of proposed personnel.

On receipt of the tender documents, it is the estimator's duty to inspect them, establish viability and consider whether the closing date is realistic.

This sort of detail can take an enormous amount of time, but realistically it is secondary to the final tender price. I made every effort to convince the client that this information be supplied by the successful tenderer only.

The competitive tender market always has been a harsh environment, even during the good times. Winning a contract involves so much more than creating an attractively presented submission.

The decision needs to be made well before any take-off begins as to whether you actually want to bid, and this decision should be made immediately after a tender is released. Any delay wastes valuable time and gives your competition an advantage.

There are several crucial questions:

- Are you strong in this style of contract and does it fit your business strategy?
- Are you capable of completing this job within the time schedule?
- Do you have the resources, labour, tools, equipment, infrastructure and finance?
- Is the location within your scope of travel?
- Are you the incumbent contractor?
- Do you know the strengths and weaknesses of your competitors?
- Are your senior staff members committed to this tender?
- Can you securely store materials on site?
- Do you know the head contractor's payment performance?
- Is this project in line with your needs and goals?

Too many contractors believe that the more you tender for, the more you win – but at what cost?

The decision on whether to bid should be strategic. If the opportunity does not support your strategic plan, don't waste your time. You are far better employed putting resources and

BY
BRIAN
SEYMOUR

energy into prospects that are relevant to your core business.

Capacity to complete the job on time is crucial, as the threat of liquidated damages could well put you out of business. Also, consider the ability of your suppliers and sub-contractors to comply with the time frame.

in the beginning when everyone is enthusiastic. But if the project is long term, the enthusiasm can wane and maintaining the workforce becomes a nightmare.

Incumbent contractors have a decided advantage over outsiders, unless they have blotted their copybook. This is

> Winning a contract involves so much more than creating an attractively presented submission.

Many contractors have suffered financial disaster based on the belief that it's easy to pick up the necessary labour. This may be OK when increasing your workforce by 10-20%. However, when temporary, itinerant, or 'loan' workers outnumber permanent staff, efficiency and productivity suffer badly.

Similarly, if you need to hire the tools and equipment for a long-term project it may price you out of the job.

On a larger than normal project the handling of extra workers, co-ordination of materials and equipment, and management of transport can be extremely time consuming. Without trained administration staff, this can all be very costly.

I have seen several contractors winning a major project that required a huge increase in the workforce. They lost thousands of dollars through lack of experience in project management.

Many contractors say they are prepared to travel anywhere, and this is not a big issue if the costs are allowed in the estimate.

However, it may be a totally different matter to transport large items (main switchboards, generators, chillers, etc.) to the site and provide lifting equipment for unloading.

Furthermore, workers may be committed to working on a distant site where you need to know the strengths and weaknesses of your competitors.

Your senior staff members must be committed to the tender and should have the necessary performance record, experience, qualifications and resources.

Being able to provide details of estimate inclusions and exclusions will make the installation team far more efficient. This will also help the project manager to deal with client questions and to know when a request becomes a variation.

On some projects the delivery and storage of materials and equipment is a major issue, especially in urban centres where storage space is almost non-existent and deliveries cannot be made during normal working hours. On the other hand, highly secured industrial sites require meticulous checking of all personnel, material and equipment movements, which can add hundreds of hours to a job.

Many contractors fail to read the payment clause in tender documents. When submitting a progress claim they may discover that payments are made quarterly.

This is not of great concern if the contract is for light and power maintenance involving half an hour per week. However, if it is a sizeable installation with a substantial work team on site, the estimate would need to include a realistic loan interest rate – or you will be financing the project.

It may well be a good reason not to submit a bid.

In conclusion, it is not good business to bid for a project if it will take focus and resources away from your main source of income, which needs to be preserved. You need to consider how any new work will affect the bottom line.

If you decide not to bid on an invited tender, it's a courteous gesture to send a letter to the relevant person stating your reasons, for example:

- Capacity constraints on meeting delivery dates
- A fully committed workforce at this point
- Insufficient time to prepare a quality proposal
- The project is outside your scope of work.

The letter should include the following:

- The tender reference
- A clear statement that you are not submitting a proposal
- The reasons for declining
- A statement of interest regarding future opportunities.

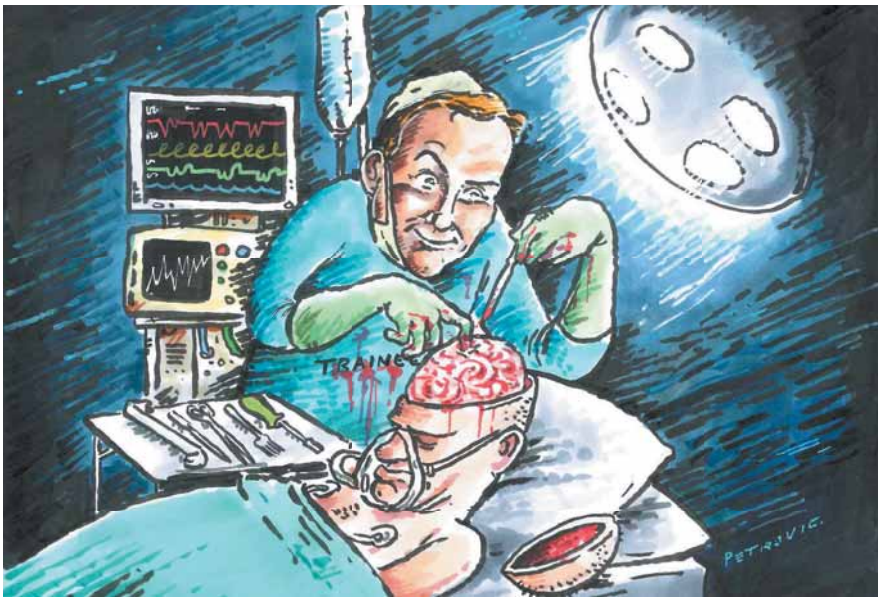
It's good business to send the letter to the tender originator, otherwise repeated 'no bid' decisions may exclude you when the project does suit your work schedule.

Finally, a word of warning about construction developers who want the tender price early. Are they shopping your price around? You need to have a 'bid day' strategy ensuring that there's a closing time and all bids are secure. ■

Industry consultant Brian Seymour, MBE, is the author of Electrical Estimator's Labour Unit Manual, Starting Out, Electrical Contracting in Australia *and* 100 years of Electrical Contracting in Australia. *He conducts regular training programs throughout Australia on behalf of the electrical and air-conditioning sectors.*

LICENCE TO CHANGE

ELECTRICAL CONTRACTORS MUST BE TRAINED IN NEW TECHNOLOGY OR RISK BEING RELEGATED TO A LOWER STATUS. WES MCKNIGHT EXPLAINS.



The training of future tradespeople in our industry has undergone many changes, yet one aspect is constant: progression through to being qualified is based on time.

There are modules and, in some states, 'capstone' assessments (university language for 'final exam'). However, you don't gain a licence in our industry without being an apprentice for a set time.

Over the years, education bureaucracy geniuses (and a former federal employment minister) have railed at me that our industry must move with the times and not become a dinosaur. We should allow entrants to progress through to the final qualification based on their ability to complete modules only – also known as competency-based progression.

Our system is broadly based on the principle that apprenticeship modules be completed in conjunction with on-site experience. This allows apprentices to enhance their knowledge with useful practical experience.

Critics outside the industry will cite other trades and professions that don't tie their training to real-world experience. My response is that there are only three days between a bad haircut and a good one. You could train hairdressers in a classroom only, and not many buildings would burn down if they got something wrong.

Other responses could be: do we allow pilots to learn only in a classroom then give them a licence?; do we allow brain surgeons to practise in a classroom then let them loose on patients unassisted?

Yet there are many potential changes our industry should be open to, and there have been many reviews into the apprenticeship system.

The issues have had substantial government money spent on them over many years. Reports have been generated, and they are probably sitting on someone's desk. Some of the matters are:

- Entry and exit points of the training system.
- Module suitability for industry needs.
- Number of modules.
- Competency-based progression.
- Industry surveys on the suitability of apprenticeship.
- Direct apprenticeships versus group training.
- Reasons for dropping out.

It is our industry. We ought to determine how we train and develop people. No one cares more about our industry and its future than we do. Can government and training bureaucrats really know better?

However, we must accept that our new tradespeople be familiarised with the new technologies they will face in their early careers.

Here is an issue: our licensed people are among the worst for post-apprenticeship training or continuing development. Once we get the licence we generally lean on our training for the rest of our working lives. Can we continue with that mindset?

Last month at the Integrate Expo in Sydney I was struck by how close our electrical contracting industry is becoming to the audio visual and home automation sectors. We need to understand and embrace these other sectors and the technology.

These sectors are no longer on the fringe. There are many specialists, but mainstream electrical contractors need to expand their skills and service offerings.

This brings me to my main point: are we mature enough to allow new technologies

BY
WES
MCKNIGHT

onto the list of elective modules and into our apprenticeships as options for future tradespeople?

This then raises the bigger question, do we ever 'split' or create a second licence? Or, as the experts call it, do we create different channels that ultimately restrict licensed tradespeople to what they have chosen in the elective modules through their apprenticeship?

This idea has been around for ages, and I have some real problems with it. However, if we don't provide our future people with options and other directions we may lose the right to control our future. Bureaucrats will push this change and we won't be in any position to manage the safety aspects.

This is a challenge in other countries, where the electrical contracting industry has stayed in its traditional place and personnel have become a lower class of tradespeople. All they are engaged to do is the front and final connection.

The highest-paid tradespeople or technicians are no longer just electricians. They are multi-licensed and trained in all types of low-voltage systems in addition to traditional electrical work. Ignoring this will cause our trade to be diminished, with a lesser role in all buildings.

WiFi being run over lighting circuits, lights being controlled by WiFi and using 240V cabling infrastructure to run communications are all examples of newer technology merging with our sector. An apprentice being trained in 2016 needs this kind of background.

An open and honest conversation needs to start, again, about training updates and continuing development for our apprentices now and in the future. Wage structures, training costs and access to technology all need to be part of the conversation.

A modern, flexible, tested and trusted system needs to be developed from our current base. Contractors, educators, regulators and technology suppliers need to engage in this process to make sure we retain the safety record of the electrical industry.

Appropriately trained and tested tradespeople should be installing the new systems in Australia – without splintering into hundreds of minor vendor-trained categories.

Our industry must be the installer of choice. ■

CABLING BY THE NUMBERS

TWO INDUSTRY GROUPS HAVE TAKEN STOCK OF HOW THE AUSTRALIAN CABLING INDUSTRY IS TRACKING. BELOW ARE THEIR FINDINGS.

It is often quite difficult to quanitfy an industry, and the cabling sector is no different.

What makes the industry tick? What do cablers consider to be the biggest challenges and opportunities facing their businesses today?

These are important industry questions but there really are no metrics available to let the industry know the issues that the folks on the tools care about most.

Until now.

Earlier this year, the Australian Digital and Telecommunications Industry Association (ADTIA) and cabler registry service TITAB surveyed their membership base, to identify just how they saw the current state of the union.

These are the findings.

WHO ARE YOU?

When participants were asked to describe the activities they performed in their job, the responses included:

- Installation of telecommunications and data cabling;
- Installation of customer premises systems; and equipment; and,
- Integration of new systems and equipment into the telecommunications network.

ROOM FOR IMPROVEMENT

When asked to list three areas they would like to see improved within the industry, the majority of suggestions for improving the industry related to the need for:

- More training opportunities and improved access to training at all levels;
- Strategies to improve standards and methods of disseminating information about changes to standards;
- Increased inspections by the Regulator to ensure licensing requirements and regulations are complied with; and,
- Improved access to employment opportunities and ongoing work.

A STREAMLINED APPROACH

Respondents were asked to describe any ideas or technologies that could be adopted by the industry to streamline work practices. Responses included:

- More research and adoption of new technologies;
- Creation of a standardised Standards app that will help engineers design better networks and make it easier to build and fault find;
- TCA1 and 2 forms to be collected and stored on the web so that subsequent cablers can access them to see what previous work has been done, especially if TCAs onsite can't be found;
- Production of an app for smart devices using the iOS and Android OS to assist with cabling rules, i.e. search facility on wiring rules, cabling rules etc.;
- A bidding site for members to bid on customers work needed;
- Easy access for customers to report on work done by installer (Web or App) to get feedback on good (or not so good) installation practices;
- Availability of a helpdesk for contractors;
- A cloud based resource for installation techniques and ideas, something that installers can collaborate with and access to find what other cablers have done to complete jobs.

> The industry is seeking increased inspections by the Regulator to ensure licensing requirements and regulations are complied with.

FINANCIAL MATTERS

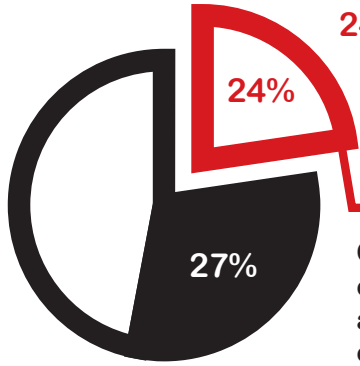
When asked what financial assistance or tax incentives would help in their businesses, the majority of respondents felt that they would benefit from subsidies for tools, training incentives as well as tax breaks such as:

- Tools/Vehicle/Registration/Work clothing subsidies, fuel usage and travel (long distances);
- Tax breaks or training compensation for wages of employees;
- Not having to be a company when you are an individual;
- Corporate tax incentives for standards training; and,
- Streamlined Tax system, too much time spent collecting the Governments GST.

On the following page, we have highlighted further key findings from the report for cablers to use with the hope of further defining their businesses and the industry. ■

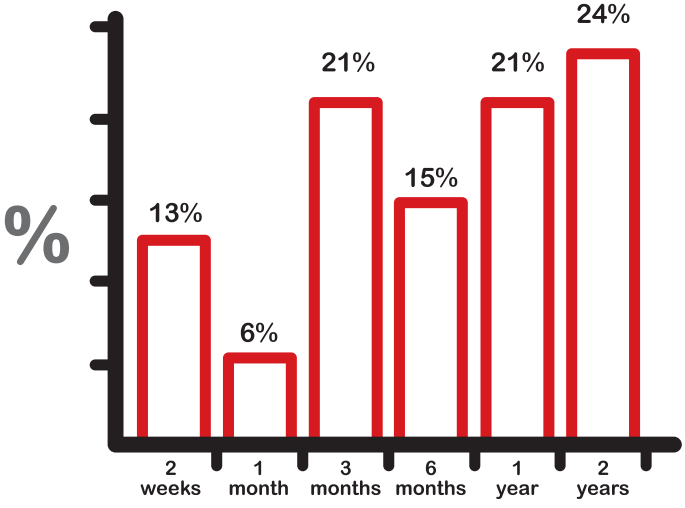
- **ADTIA**
  www.adtia.org.au
- **TITAB**
  www.titab.com.au

100%
of respondents report completion of Open Registration and Copper Jointing.



24% of the self-employed have considered employing a trainee, while 27% have not.

Of the 24% who considered employing a trainee, **63%** would consider taking on a person out of year 12, while **37%** would not.

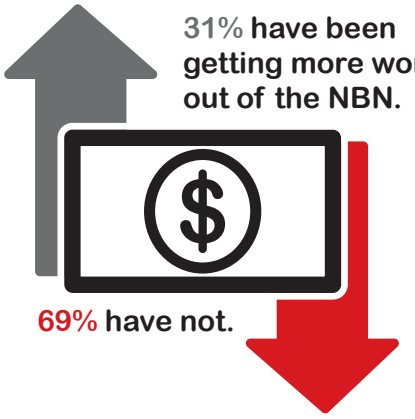


Time until ready to undertake NBN work.

51%
have the capacity to undertake NBN work now.

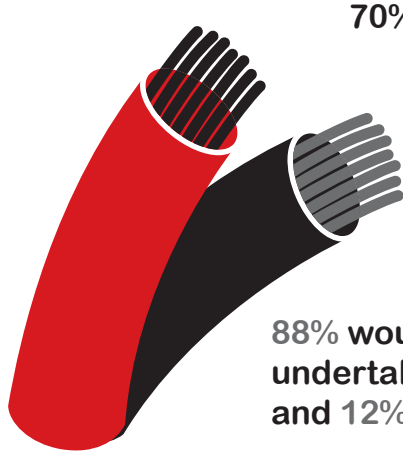
49%
have not.

70% have Mobile Tower.



31% have been getting more work out of the NBN.

69% have not.



88% would consider undertaking NBN work and 12% would not.

GETTING TO THE BOTTOM OF THINGS

NETSCOUT EXPLAINS HOW TO CONQUER THE SIX MOST COMMON ISSUES IN THE ENTERPRISE NETWORK.

Complex and sprawling networks can be difficult to troubleshoot, and network professionals spend approximately 25% of their time troubleshooting.

NETSCOUT director – APAC channels Amit Rao says, "Finding the root cause of network issues is time consuming. If they're intermittent issues, it can seem almost impossible to find and resolve them. However, by taking a methodical approach, it's possible to troubleshoot enterprise network problems."

1. INFRASTRUCTURE PERFORMANCE

End user complaints often signify that there is an infrastructure issue. However, when application servers and infrastructure devices are operating normally, obvious error states can't be located and legacy network monitoring tools report 'green'. Finding the root cause can be challenging.

Possible causes include bad cabling, network congestion, server network adapter issues or DNS issues.

There are four steps to troubleshooting these issues:

- use existing monitoring tools and extract information from SYSLOG receivers.
- check server and network device log files to understand if there are connectivity issues from the NIC side.
- examine WAN links and logs to understand whether traffic-shaping devices or policies are affecting performance.
- check errors including web server, load balancer, and application log errors.

2. NETWORK SERVICES

There are numerous issues that can affect network services, such as DHCP issues or a slow DNS response. Possible causes include misconfigured DHCP or DNS servers, duplicate IP addresses caused by overlapping DHCP scopes, rogue DHCP servers, or users manually assigning static IPs. This can enable a 'man-in-the-middle' attack and create significant security issues.

To troubleshoot, first confirm proper configuration of authorised DHCP servers.

3. PROVE IT'S NOT THE NETWORK

Most of the time, the network is not to blame for performance issues.

People blame the network due to lack of visibility into network operations, not enough bandwidth, network complexity, insufficient network expertise and lack of effective troubleshooting tools.

To troubleshoot, you should use packet captures, gather network data, review dropped packets, check for excessive retries and congestion in capture files. You should also check network device logs and ping to check response times, as well as using tracert to verify that the network path is correct.

4. WIFI AND BYOD THREATS

WiFi networks, combined with bring your own device (BYOD) policies, can create security and performance issues if not managed carefully. These can include chatter, dropped connections, excessive bandwidth issues, and poor device behaviour from users (such as streaming music), congestion. The sheer number of devices can swamp the network.

To troubleshoot, conduct regular WiFi SSID surveys to detect rogue access points and routers. Look up MAC addresses to discover the types of devices attached to networks and implement MAC address filtering if necessary. Also, understand that some devices are well known for causing problems if improperly configured, for example, Apple TV Airplay can badly impact performance.

5. POOR WIFI PERFORMANCE

When the WiFi network is underperforming, network teams should check for frequency interference, rogue routers (such as phones being used as hotspots), misconfigured WiFi routers, and compatibility issues between certain WiFi clients and routers. Even excessive heat can cause strange symptoms.

To troubleshoot, teams should regularly use an SSID scanner to identify rogue routers and APs in infrastructure, remember that strange DHCP behaviour is an indicator of rogue DHCP servers, relocate routers that may be suffering interference due to proximity to EMI sources, and ensure that all WiFi devices are within their designed operating environment.

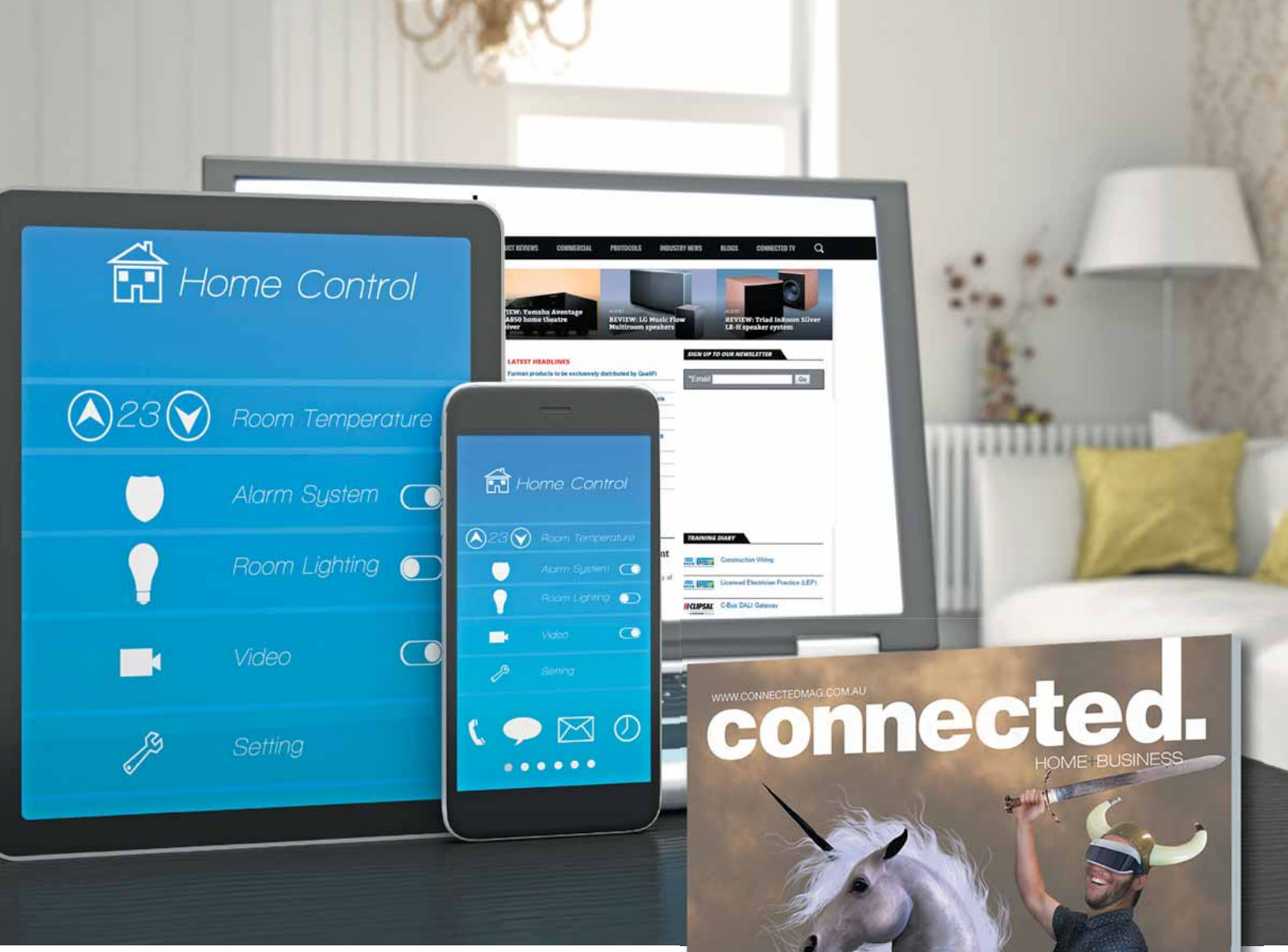
6. INTERMITTENT PERFORMANCE

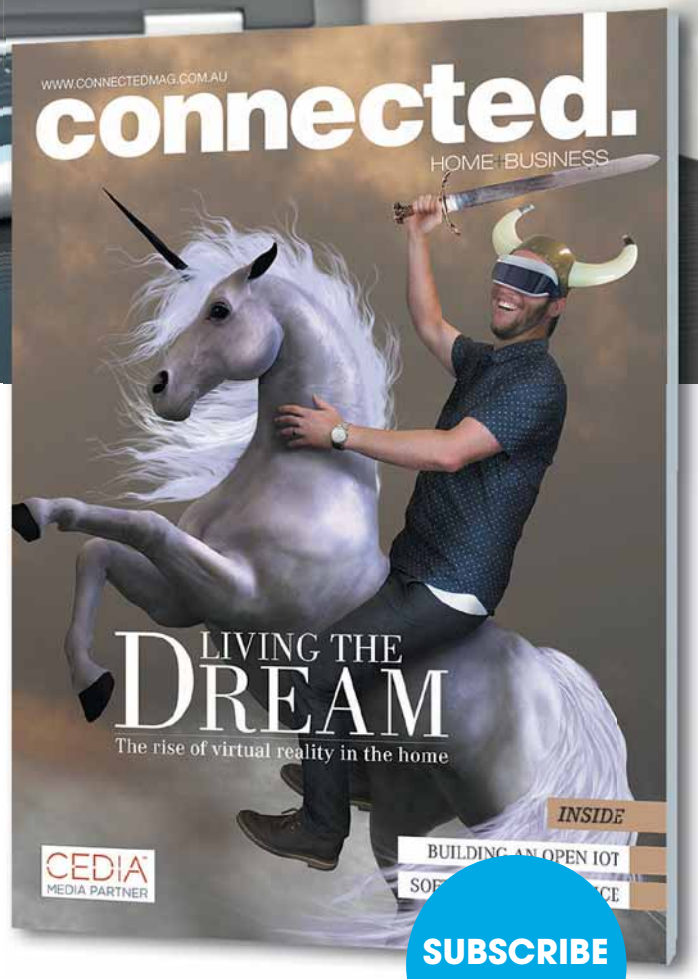
Transient issues can take time and, sometimes, luck to capture, diagnose, and resolve. Causes can include cabling issues, external sources, power fluctuations, hardware failures and excessive heat.

To troubleshoot, rule out logical sources, then look for illogical sources of interference. Track occurrences of the specific performance issue and look for patterns. As always, start at the physical layer, using a cable tester to see if the issue is related to cabling.

Amit says, "Understanding how to troubleshoot the most common issues can reduce the amount of time network professionals spend on issue resolution."

> **NETSCOUT**
> **www.netscout.com**





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A conversation with Standards Australia chief executive Bronwyn Evans

Dr Bronwyn Evans joined Standards Australia as CEO in October 2013. Since then, Standards Australia has put in place a new five-year strategic plan and embarked on a substantial transformation program.

Standards are not new to Bronwyn, who started her career as an engineer in power generation and construction and then moved to a role as a project manager in the electrical team with Standards Australia before leaving to pursue a global career in healthcare working with icons like GE Healthcare and Cochlear Limited. Most recently, Bronwyn was appointed to the governance group of ISO as Vice President Finance from January 2017 for a two year term.

What notable projects are currently underway in the electrical sector?

Bronwyn Evans: There is a lot happening in the sector at the moment, with new technologies and smart systems continually being pushed by industry and government. Our advanced metering committee continues to progress with their program of international IEC adoptions; Part 1 of the invertor standard series AS/NZS 4777, Installation Requirements, will soon be coming online and will join Part 2 which covers the invertor requirements. Our committee on renewable energy power supply systems and equipment is developing a new standard for the safety of energy storage systems connected to inverters (AS/NZS 5139). This project is still in the early stages, however there has been considerable industry interest. The AS/NZS 4755 series on demand response continues to gather momentum and AS/NZS 2067 which covers the installation rules for high voltage installations was recently published. Lastly the Wiring Rules just completed its public commenting milestone, receiving close to 2000 public comments.

Tell us more about AS/NZS 5139 and what kind of impact this might have.

BE: As households look for ways to reduce their energy bills, investing in a storage system is becoming a viable option for many. A storage system allows households to consume and store energy at off-peak periods, resulting in lower costs. It also enables the storage and on-sale of energy from, say, a solar array mounted on a roof. AS/NZS 5139 will provide this growing industry with a set of rules for how these systems can be installed and maintained safely in households. It's critical that these rules are written as more and more of these systems come online.

What were some of the major projects you worked on in the electrical sector in your time as a project manager?

BE: When I was a project manager, I was handed the AS/NZS 3008 series which is a companion standard to the Wiring Rules. AS/NZS 3008 sets out a method for cable selection for designers and installers. It is a key document for Australia's local cable manufacturing industries.

Long runs of copper cabling in electrical installations contribute significantly to the overall cost, and so AS/NZS 3008 provides designers and installers with information on how electrical cables can be selected based on their intended application. It's a useful standard, and it is currently going through a revision.

How has Standards Australia changed since you were a project manager?

BE: Today the organisation is quite different from the one I knew earlier in my career. We have a stronger emphasis on engagement across government and industry. Stakeholders are involved in all that we do, upholding our influential position domestically, regionally and internationally. We work every day to be simpler, faster and better. The biggest example of this is our digital transformation program we commenced this year.

Dr Bronwyn Evans joined Standards Australia as CEO in October 2013.

Tell us about this 'digital transformation'.

BE: It is a major project that aims to turn Standards Australia into the digital standards body needed for the future. We have worked closely with stakeholders to recognise how we can better develop and curate our content for the good of both contributors and users.

Early stages of the project will include the development of a central, searchable content repository. Ultimately we want to be able to connect digitally across the economy making even more of a positive contribution to the Australian economy.

IMPORTANT NOTICE

ARE YOU AN UNREGISTERED CABLER?

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

Not registered yet?

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

That's the law.

Registering is quick and easy

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- advice on training requirements and finding training providers
- specialist cabling (endorsements) recognition
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- informative newsletter and email updates
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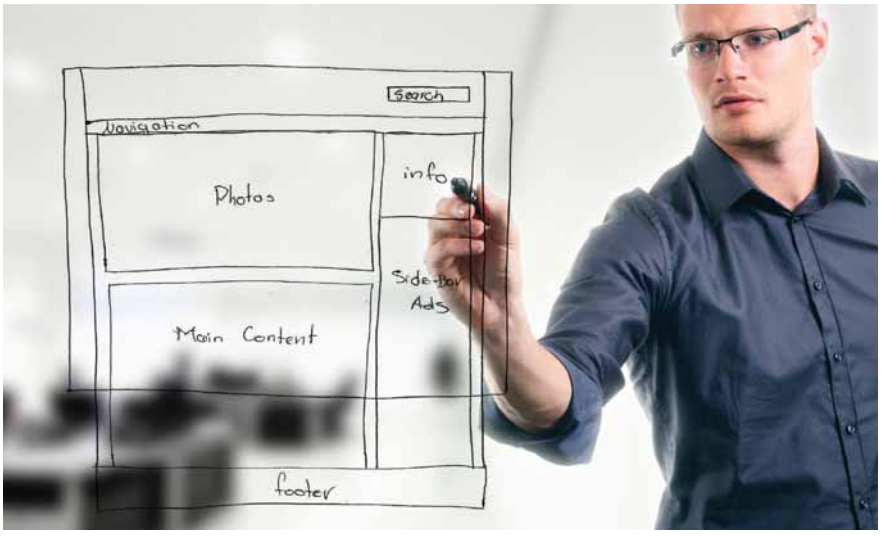
ONLINE, ON SONG

SMALLER ELECTRICAL CONTRACTORS CAN BENEFIT FROM A WEBSITE, WHICH YOU COULD MANAGE YOURSELF OR HIRE A SPECIALIST. OR MAYBE THERE'S A TECH-SAVVY TEENAGER IN THE HOUSE? DAVID HERRES OUTLINES THE TASK.



Technical know-how, ambition and word-of-mouth publicity combine to spell success for independent electricians as well as big contractors.

However, these are only part of the picture. To really prosper, especially in times of economic uncertainty, a continuous supply of new work is needed.

It is the nature of electrical work that local markets eventually become saturated. After all, an electrical service or light fixture will require attention only a finite number of times.

Most electrical infrastructure is relatively stable. Once the installation has been completed, it's time to look for new work.

Like all construction, electrical work is very competitive. Customers look for quality at a good price and when it comes to electricians, they generally do some research rather then hiring the first trunk slammer who happens along.

Electricians have to look for ways of creating and publicising a narrative that will attract new work on an ongoing basis.

Radio and TV advertising are powerful but costly, and the effect is short term.

Much is to be said for an impressive shop and/or retail operation with well-crafted signage and outdoor lighting. (Don't neglect the odd solar array or wind turbine.)

The most cost effective and easiest method is a strong internet presence, as almost everyone is able to go online.

What is needed is a web host, an organisation that maintains your website and makes it constantly available worldwide. There is usually a monthly charge, typically paid a year in advance.

Some web hosting is free, but this usually involves having the host's advertising in your website. You won't get a unique address, or URL, but a sub-domain separated by a forward slash.

In view of the modest price (less than a cup of coffee a day) it's best to go with a full-service web host. There is usually good tech help by email or phone, but you will be responsible for composing and maintaining the website and uploading it to the host.

As long as you pay the bill, the website will be there for all the world to see.

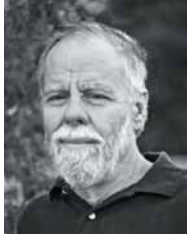
You can compose your own website or hire someone to do it. It all depends on budgetary and time constraints.

A good initial approach is to see what your competitors are doing. Search for electricians in your location.

Electricians' websites tend to have certain elements in common. Invariably there is a home page with the name of the business, clickable list of other pages on the site, contact information and often a photograph of staff.

The website for a small electrical contractor usually contains about eight pages. Within very large bandwidth limits you can add pages, and they are all covered by the hosting fee. Here are some suggested pages based on a survey of many websites:

- **Homepage:** People visit the websites of several local electricians before deciding which of them to contact. The greatest single factor here is the quality of the homepage. It should be visually attractive, informative and user-friendly. At the top there should be comments relative to your business, such as '24/7 Emergency Service', 'Free Estimates', and the like. A list is useful – new construction, lighting, service upgrades, stand-by generators, solar installations, residential, commercial, industrial, electrical repairs, etc.
- **About Us:** A brief company history, with photos of the premises, vehicles, test equipment, staff, etc.
- **Work in progress:** Photos of orderly worksites with staff using specialised equipment.
- **Gallery:** Photos of finished projects, with



BY
DAVID
HERRES

indoor and outdoor lighting and electrical services, entrance panels, finished kitchens, fire alarm systems, telecomms installations, industrial work, etc.

- **Contact Us:** Phone number with hours, mailing address, location and directions to premises. Many customers prefer to make the initial contact by email. If you give an email address, you will receive spam from automated sources. Many commercial websites have forms for prospective customers to submit, with codes that cannot yet be read by machines
- **Financing:** This can be as simple as a referral to a local bank or indicating the credit cards that you accept. You may want to offer financing for established accounts, or 30-day billing. This has risks but may be immensely profitable.

An additional important aspect of website design is search engine optimisation, or SEO. This is part science and part art. Certain elements will make search engines assign a high ranking to the site.

Beside making a website that is attractive and user friendly for prospective customers, you will want high rankings in the search engines.

Most users look at the first couple of pages, so the website proprietor should create pages that meet the search engine criteria for relevance. This is difficult, because relevance algorithms are closely guarded secrets.

However, certain elements of an SEO strategy are either obvious or may be deduced from finished pages including source code for websites that rank high.

Content is all important. It should be accurate and succinct. Avoid gimmicks like cartoon videos and audio files. An electrician's website should be informative and straightforward, not full of hype or bells and whistles. Graphics should not be of too high a resolution, or the page will load very slowly.

High-quality incoming links from busy sites that rank high are valuable in improving your ranking. Also, a good social media presence is a big plus.

SEO specialists advertise their services on the internet, so the choice is whether to hire one or do it yourself. Young people are incredibly tech savvy, so if there is a teenager in the house or neighbourhood, that may be the answer. ■

CUSTOMER LOYALTY

CECELIA HADDAD EXPLAINS HOW TO GAIN CUSTOMER LOYALTY, AND THEN MAINTAIN IT ONCE IT HAS BEEN EARNED.

What is customer loyalty? Officially, loyalty is "a strong feeling of support or allegiance". In business it means more than that (or we would like it to) and we hope that the loyal 'feeling' transcends to behaviour. As a supplier you would welcome loyalty for several reasons – it leads to repeat business, it saves you the time by avoiding having to find new customers to fill the gap and it usually means that a customer will refer you to others. I'm sure many businesses are proud to say they have loyal customers and you want that to continue, right?

However, you may just need to look more carefully at what is motivating your customers to be loyal.

You may think it's the great service you provide, the relationship you have with that customer or your effective marketing campaign but there are other reasons that make customers consistently choose you and some of them aren't about being loyal. It may be that it is going to take too much time and resources for your customers to change suppliers. It may be that you just offer the lowest price. Or it could be that the customer has a great rapport with one of your employees.

These other reasons mean that your 'loyal' relationship with your customer can at any time be in jeopardy. Another supplier may offer something better and provide an easy way for you to switch suppliers (this is very common in the insurance and energy industries, to name a few). If it's low price and a supplier undercuts you, then you have lost that customer. Or what if that favoured employee leaves? The customer may go with them to their next role.

Why am I telling you all this? To reinforce that while you may have loyal customers you cannot afford to rest on your laurels. Below are some tips on how to gain and maintain a loyal customer base and I hope you find them helpful.

GAINING A LOYAL CUSTOMER

TIP 1: PROVIDE AMAZING CUSTOMER SERVICE

Not average, not expected, but beyond expectations. Go the extra mile, do something different, be memorable. I recall hiring a tradie who completely cleaned up the area he worked in after he finished the job. My experience has shown that doesn't happen often.

TIP 2: BE KNOWLEDGEABLE

Know what is happening in the industry, what clients are looking for, keep up-to-date with market trends, what is popular now and anticipate your customers' needs.

TIP 3: EDUCATION AND AWARENESS

Marketing is essential to anyone in business, whether you are a one-home-a-year builder or a major developer. If customers aren't aware of what you do, especially what you do better than others, then how are they expected to choose your company? Don't be afraid to promote your successes or explain new ideas. Added value advice is a big driver in not only demonstrating that you know your stuff but engaging people with your business.

TIP 4: COMMUNICATE

And I mean really communicate. Listen and respond. Understand what the customer wants, don't just give them an off the shelf solution. Take the time to understand their dynamics – family, retirement, is this their first or second home, what have they liked or not liked about previous homes they have lived in and so on. Then come up with a solution that really meets their needs.

BY
CECELIA
HADDAD

MAINTAINING A LOYAL CUSTOMER

TIP 1: BUILD LOYAL EMPLOYEES

How? By training and upskilling them, giving them a real insight into your business and industry and rewarding them appropriately.

TIP 2: PRIORITISE CUSTOMER RETENTION

Don't do the dump and run and wash your hands after the deposit has been taken or the job has been completed. Continue to find ways to engage with that customer. Make contact via a courtesy call one month after a job is complete and check that everything is ok.

TIP 3: MAKE WRONGS RIGHT

If you do something wrong, admit it and fix it – and fast. There is no quality more redeeming than someone who admits they are wrong and takes steps to fix things.

TIP 4: REWARDS GO FAR

If a customer has been referred to you, find out who made the referral and send them a bottle of champagne, a slab or beer or something to say thank you. They won't be expecting it so it has even more impact.

TIP 5: REMEMBER MY NAME

It may be impossible to try to remember everyone you meet or information about them but it's easy to do if you keep some simple records of your customers. For example, do they have children, a dog, birthdays or anniversaries?

I often meet a friend of mine at the same coffee shop once every eight weeks. When we arrive, the waitress always says, "would you like the usual?". They must get 50 customers a day yet they remember us and our order. Impressive!

The best thing about gaining and maintaining customer loyalty is that it doesn't take much time or effort but it does need to be a conscious decision and action – and it's worth it. ■

Cecelia is the director of Marketing Elements, which specialises in PR for the building and environmental sectors. She has over 20 years' experience in the industry and regularly delivers PR courses. She is the chair of the Registered Consultancies Group Committee for PRIA.

BEAM ME UP/DOWN

THERE ARE THREE COMMON FIXED-LINE INTERNET ACCESS TECHNOLOGIES FOR THE HOME. GEORGE GEORGEVITS OUTLINES THE PROS AND CONS OF EACH.

Internet access in the home has become an essential part of daily life.

In all that follows, link speeds are given in bits per second (bps). Some websites mention transfer rates in bytes per second. The two should not be confused: 1 byte per second is roughly equivalent to 10bps.

ADSL

ADSL stands for asymmetric digital subscriber line. It is called asymmetric because the download speed is greater than the upload speed. It operates at much higher frequencies than voice. Filters in the home and at the exchange separate the voice and data traffic.

ADSL operates over what was essentially designed to be a voice-grade cable network. Because it tries to squeeze the last ounce of bandwidth out of this type of cable, it does have some limitations.

For any given signal passing along a cable, the signal loss is directly proportional to the length of the cable and is a rapidly increasing function of frequency.

Crosstalk is another factor that can degrade the signal. Again, it is an increasing function of frequency. As the bit rate for any given type of data signal increases, so must the bandwidth (higher frequencies) increase to transmit it.

For the above reasons, the greater the distance between the end user and the exchange, the slower the maximum achievable ADSL line speed.

Cable quality, number of joints, cable conductor size and the amount of traffic in adjacent cable pairs will also affect the maximum achievable download speed.

For these reasons, most carriers offer a standard service, or ADSL1, and a faster ADSL2+. These variants have different maximum link speeds and reach (maximum distance from residence to exchange).

With ADSL1, the maximum achievable download speed is 8Mbps for locations up to about 2km from the exchange, and 1.5Mbps for locations at about 5km out. Beyond that, the error rate rapidly increases to the point where the link becomes unworkable.

With ADSL2+, maximum theoretical download speeds of about 20Mbps are achievable out to 0.7km, dropping to 12Mbps at 2.5km, 8Mbps at 3km and 1.5Mbps at 5km.

Practical experience has shown that actual speeds achieved are usually much slower than those quoted above. According to one service provider, only about half of ADSL2+ users achieve maximum download speeds in excess of 10Mbps.

HYBRID FIBRE COAXIAL

Hybrid Fibre Coaxial (HFC) is a high-frequency cable network technology that employs both fibre and coaxial cables.

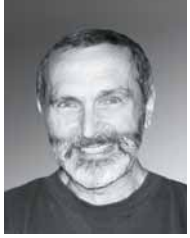
It was originally installed by cable TV operators in metropolitan areas to deliver pay TV to the home (eg: Foxtel).

The network topology employs fibre trunk cables from the head end to optical nodes, where the signal is transferred to coaxial cable.

Coaxial cables are reticulated down each street (with amplification as necessary) in a tree-like topology. Coaxial taps are used to provide service to individual households.

With the spread of the internet in the 1990s, HFC networks were adapted to pass data traffic using a technology called Data Over Cable Service Interface Specifications (DOCSIS).

The DOCSIS Standard has since undergone several revisions, with commensurate increases in link speed. The current version used by Telstra is DOCSIS 3.0. With this version, Telstra offers two types of internet access using its HFC network – a standard service with a maximum download speed of 30Mbps and a 'Boost' service with a maximum



BY
GEORGE
GEORGEVITS

download speed of 100Mbps.

One advantage of HFC networks is that the cable, joints and supporting equipment have been designed to work at high frequencies. Thus although internet access can still be impaired by network and equipment congestion, the other factors that impair ADSL services are not present.

NBN

The NBN is Australia's national open-access communications network that aims is to bring high-speed broadband and telephone services within reach of almost all Australian premises.

It is being rolled out by nbn (formerly NBN Co) and operates under federal legislation, the *National Broadband Network Companies Act 2011*.

The NBN is intended to replace the copper cable network and the services currently provided on it, such as voice, data, and medical and security alarms. It uses a variety of technologies to achieve this goal (mainly fibre, but also HFC, fixed wireless and satellite, where warranted).

Under the legislation, once NBN facilities become available to premises, carriers must use it to provide new fixed-line services. Furthermore, they must progressively migrate copper-line services to it (other than a few exempt services).

It's not a matter of consumers electing to use NBN – there will be no choice.

Whether the NBN is provided via an HFC network or fibre, it is offered wholesale to your internet service provider in five 'speed tiers'. The download/upload speeds in Mbps are 12/1, 25/5, 25/10, 50/20 and 100/40.

Regardless of technological capability, 100/40Mbps is the fastest anyone can get from the NBN at present.

The NBN currently uses DOCSIS 3.0, but it will adopt DOCSIS 3.1 as the standard for all of its HFC networks some time in 2017. This technology is capable of much higher speeds: up to 10Gbps downstream and 1Gbps upstream.

If you are fortunate enough to have the NBN's fibre to the home version, the potential bandwidth is very high: 10Gbps, and much higher in future. The catch is that, regardless of the technology, really high-speed access may not be offered to you. If it is, you will certainly have to pay for it. ■

SMARTER SOLAR

A START-UP WHICH SPUN OUT OF CSIRO RESEARCH IS PRODUCING AUSTRALIA'S FIRST EVER SOLAR PANELS WITH AN INTEGRATED BATTERY AND INTELLIGENT TECHNOLOGY. THE SYSTEM CAN DELIVER HOUSEHOLDS AN 80% ENERGY SAVING. JOE YOUNG REPORTS.

As Australia's energy consumption and pricing continues to grow, the demand for distributed energy technologies grows with it.

In an Australian first, renewable energy tech start-up, Evergen has launched an intelligent home energy management system which, compared with existing domestic solar and battery solutions, is expected to deliver an additional 20% energy saving.

So how does it work?

The technology gathers data on household power consumption patterns and analyses local weather reports, then combines both sets of data to determine and use the most efficient source of energy, whether it be solar, battery or grid.

This way the system is less likely to over-store power or unnecessarily use power from the grid.

Users also have control over which energy source the system draws power from, but this is not recommended.

According to Evergen chief executive Dr Glenn Platt, the system's ability to store power and intelligently source energy can save households "60-80% on energy costs".

And with less over-storing of power, he says the "lifetime of the system is longer than standard solar battery systems".

Every installed Evergen system can be remotely monitored and managed at the Evergen office. Not only does this give the research team access to a lot of data to work with for ongoing development, it also plays a vital role in the system's maintenance, enabling many system issues to be rectified remotely.

The technology was developed by CSIRO, in partnership with AMP Capital. Evergen was granted exclusive usage and distribution rights to roll out the technology.

Today, the start-up is doing limited releases of the system as the company is managing scale. The units are undergoing rigorous safety and performance testing in anticipation of a full commercial release in January 2017.

Glenn says the system costs no more than for what you would buy a standard solar panel and battery unit.

"But with Evergen systems, you get the intelligent control functionality as well," he says.

As technology development aims to enable societies to become less reliant on non-renewable resources, the integration of solar, battery storage and smart technology can prove to be a game-changer.

With our abundance of sun, Australia is a prime candidate to be a leader in this technology with pioneers like Evergen and the CSIRO leading the way.

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A word from the CEO

Summer is now upon us and as 2016 draws to a close, it's timely to reflect on the year that's past, the issues that continue to face the electrical contracting industry and what we can expect for 2017.

As you may be aware, NECA has been calling on the Senate to ratify two pieces of legislation that we believe will benefit Australia's electrical contractors – the re-introduction of the Australian Building and Construction Commission (ABCC) and the establishment of the Registered Organisations Commission. NECA believes that both measures would deliver a range of benefits for our sector such as lower levels of industrial action and lost work days, increased transparency and governance through stronger regulatory oversight and standards for public officers, increased penalties for engagement in coercion and unlawful behaviour, lower construction costs and ultimately, more jobs.

Similarly, reform of the Vocational Education and Training sector has been another key theme for NECA. Sadly, we have all heard and read about the stories and scandals that have plagued the quality of VET training and the failures of policy that has led to concerns with the VET FEE-HELP and training colleges signing up students with offers of free laptops. The future role of the Australian Skills and Qualifications Authority (ASQA) in overseeing the training standards and quality remains critical and we look forward to further announcements from the Government that help to restore credibility and confidence.

Apprenticeship training has always been a key part of NECA's DNA and following on from our successful work last year with the Energy Industry Apprentice Progression Management System Project, the Federal Government has announced the establishment of the Alternative Delivery Pilot program to further support the delivery of entry level and qualified trades people into the labour market. The pilots are designed to learn more about opportunities and barriers

to increased industry usage, enhance skills development and the acceptance and validation of alternative apprenticeship training delivery arrangements. NECA has been selected by the Government to deliver this program on behalf of the electrical and communications sector. Further information about the program can be found at https://www.australianapprenticeships.gov.au/alt-del-pilots

An important part of our ongoing advocacy work with the Federal Government was the release of our 2016 Policy Statement in June. Whilst this may seem like a particularly dry part of what we do, I believe it's important for any member-focussed organisation to be advocating and articulating the concerns and views of its members. Our statement refreshes and builds upon last year's initial version, adding new policy themes including Renewable Energy, Security of Payments, Building and Contents Insurance, Competency Based Wage Progression and Home Safety and Energy Audits. NECA's 2016 Policy Statement may be viewed at http://neca.asn.au/content/our-policies.

In July, the Tasmanian Government introduced Continuous Professional Development (CPD) for occupational license holders, meaning that Electrical Contractors are now required to maintain and develop their skills through ongoing learning activities. The Government has allowed an initial two-year window for licensees to familiarise themselves with the CPD scheme. During this time, licensees will be required to familiarise themselves with the scheme and undertake further CPD course studies but will not have to accrue any CPD points. Once the CPD scheme comes into full effect from 1 July 2018, licensees will need to accrue 12 CPD points per annum or 36 CPD points (on the basis of one point, per hour over a three-year licence).

NECA has worked closely with the Tasmanian Government to finalise the details of the CPD scheme and as the peak industry body for the state's electrical contractors, was selected as the Facilitator for the delivery of the program. The CPD scheme was launched in Launceston and Hobart by the Minister for Building and Construction, the Hon. Guy Barnett MP and provides Tasmania's electrical contractors with a strong opportunity to strengthen their skills and activities across the state. For more information about the Tasmanian CPD scheme for electrical contractors, please visit http://neca.asn.au/tas/tas_home

Following our very successful South African conference, NECA is pleased to advise that we will be celebrating our Centenary conference back on home soil, at the Sheraton Mirage Port Douglas Resort in tropical North Queensland from 14-17 July 2017. The 100 year event will be another great opportunity to learn more about our industry and to network with fellow representatives, members and industry supporters, right on the doorstep of one of the seven wonders of the natural world, the Great Barrier Reef, and the Daintree Rainforest - Australia's largest continuous area of tropical rainforest. NECA will have further details for this event in the not too distant future and I am looking forward to seeing you in Tropical North Queensland next July. ■

Best regards,
Suresh Manickam

The electrical contracting industry biennial research, 2017 study

As we go to print the Market Monitor 2017 questionnaire is being finalised, and will be available on NECA's website www.neca.asn.au from mid-December 2016 through to mid-February 2017.

Given the overwhelming support we have had from the industry in making this an online study, 2017 will follow the same format. But to make it even easier for you we will break it down into three, or possibly four, modules. That way you can do each module separately if that's easier for you timewise, and the system will prompt you to continue in order that we get your complete feedback. Again as with the last study, Market Monitor is open to business owners, business administrators/purchase officers, employed qualified electricians and apprentices. And you don't have to be a NECA member to participate.

In 2015 we had over 1,500 responses and some very interesting findings. Based on feedback from respondents in 2015, and the broader industry, the next study will focus on:

- industry trends
- the purchasing process
- price v quality
- the role of digital and online
- non-compliant products
- specialisations and training needs
- better understanding the next generation (including apprentices)
- better understanding the end-user/consumer.

All respondents will be invited to go into a draw with 10 great prices! So do check the NECA website or any of the four national wholesalers' websites (MMEM, L&H, Rexel or CNW) to enter.

Finalists for the 2016 National Excellence Awards in Canberra

Here are the 2016 state winners, and by the time your receive your copy of Electrical Connection we will have our 11 category winners – who will be profiled in the next issue.

Absolute Cabling Systems
Voice/Data (ACT)

Affinity Electrical Technologies
Domestic Residence (ACT)

Argus Technologies Pty Ltd
Domestic Residence (VIC)

Austin Power Enterprises
Small Contracting Business (WA)

Automated Innovation
Small Contracting Business (NSW)

Barnwell Cambridge Pty Ltd
Commercial – Medium Project (NSW)

Baylec Electrical Pty Ltd
Domestic Residence (QLD)

Blue Star Pacific Pty Ltd
Lighting (QLD)
Commercial – Small Project (QLD)
Commercial – Medium Project (QLD)

BREC
Commercial - Small Project (VIC)

C.J. Pearce
Industrial – Small Project (VIC)

Contact Group
Commercial – Medium Project (TAS)

Cousins Electrics
Domestic Residence (WA)

CPS National
Energy Efficiency & Environment (WA)

Deacam Pty Ltd
Energy Efficiency & Environment (VIC)

Degree C
Commercial – Small Project (TAS)

DESA Australia
Voice/Data (NSW)
Commercial – Medium Project (VIC)

Downer
Industrial – Medium Project (WA)
Industrial – Large Project (WA)
Commercial – Large Project (VIC)

EMU Energy
Small Contracting Business (ACT)

Fredon
Commercial – Medium Project (ACT)
Energy Efficiency & Environment (QLD)
Industrial – Medium Project(QLD)
Commercial – Medium Project (WA)

Gordon McKay Pty Ltd
Lighting (VIC)
Industrial – Medium Project (VIC)

Heyday Group
Lighting (NSW)
Commercial – Large Project (NSW)

Insight Electrical Technology
Commercial - Small Project (WA)

Kerfoot
Industrial – Small Project (NSW)
Commercial – Small Project (NSW)

Klimate Solutions
Energy Efficiency & Environment (TAS)
Industrial - Small Project (TAS)
Voice/Data (TAS)

Mainpower Electrics Pty Ltd
Domestic Residence (NSW)

Martin Donnelly
Energy Efficiency & Environment (ACT)

MGC Solutions
Voice/Data (WA)

MIMP Connecting Solutions
Voice Data (SA)

Network Electrical Solutions
Commercial – Small Project (ACT)

Nilsen
Commercial – Large Project (QLD)
Industrial – Small Project (WA)
Commercial – Large Project (WA)

PJ O'Connor Electrical Pty Ltd
Industrial – Medium Project (SA)

Programmed Electrical Technologies
Energy Efficiency & Environment (SA)
Commercial – Small Project (SA)
Voice/Data (VIC, QLD)

RBD Electrical & Instrumentation
Industrial – Medium Project (TAS)

Recips
Small Contracting Business (VIC)

Shepherd Electrical
Commercial – Large Project (ACT)
Lighting (ACT)
Industrial – Small Project (ACT)
Industrial – Medium Project (ACT)

Star Group
Energy Efficiency & Environment (NSW)

Tyrone Electrical Services
Commercial – Medium Project (SA)

ACRS holds rate as competitors increase

The Australian Cabler Registration Service (ACRS) is a not-for-profit organisation owned by NECA. It was formed to provide registration services to electrical contractors undertaking communications cabling work across Australia. ACRS is accredited by the Australian Communications and Media Authority (ACMA).

We understand that most contractors are inundated with paperwork and so we strive to make the registration process as simple and efficient as possible. ACRS is proud to provide a high-quality registration service to cablers at a lower cost than our four registrar competitors. Plus we provide a regular industry newsletter and member updates.

To qualify for registration, applicants need to meet the current ACMA competency requirements.

Full details can be emailed or posted upon request and are available on the ACRS website.

NBN requirements

Anyone working on the NBN network must be accredited prior to commencing work. NBN accreditation requirements for undertaking work on its HFC network will also require that people hold an open registration with two additional competencies: Structured and Coaxial. Accreditation can be verified by scanning the registration card and sending to the NBN portal: https://enable.nbnco.com.au/default.aspx.

For experienced cablers with OPEN CPR qualifications there may also be a requirement for industry-recognised specialised competency units. This was mandated by the ACMA in July 2014 for cabling work that involves one of the specialised skills. ACRS can provide a list of training providers who offer competency based training, and once qualification and assessing is completed cablers will be provided with a Statement of Attainment.

Registered cablers can also add a specialised competency or upgrade their registration at renewal time, at no extra cost.

For more information call the ACRS hotline on 1300 667771 or email: enquiries@acrs.com.au.

Tasmania introduces Continuous Professional Development (CPD) for Electrical Contractors

The Tasmanian Government has taken the bold move of introducing Continuous Professional Development (CPD) for Building Practitioners and Occupational Licence Holders, including the state's Electrical Contractors. The initiative commenced on July 1st this year, and thereby requires Electrical Contractors operating in Tasmania to maintain and develop their skills through ongoing learning. This learning may relate to technical and practical skills, business competencies, laws affecting the industry or personal and professional development.

The Government has allowed an initial, two-year window for licensees to familiarise themselves with the CPD scheme. During this time, licensees will be required to familiarise themselves with the scheme and undertake further CPD course studies but will not have to accrue any CPD points.

Once the CPD scheme comes into full effect from 1 July 2018, licensees will need to accrue 12 CPD points per annum or 36 CPD points (on the basis of one point, per hour over a 3 year licence). From this time, Electrical Contractors will need to report their CPD when they apply to renew their licence. Licenses will not be renewed without the satisfactory accrual of CPD points.

NECA is assisting the Tasmanian Government in finalising the details of the CPD scheme and, as the peak industry body for the state's electrical contractors, has been selected as the Facilitator for the delivery of the program.

For more information about the Tasmanian CPD scheme for electrical contractors, please visit http://neca.asn.au/tas/tas_home.

national electrical and communications association

1916-2016

Celebrating 100 years and beyond...

Over the next 12 months we will be celebrating our centenary. Our first chapter opened its doors to members in 1916, in Victoria. And the first President was appointed in 1917. Over the next two decades we opened our doors to members in all states and territories across Australia.

Our celebrations officially kick-off on 1 July – as we head into a new financial year, and the first major event will be the Victorian Excellence Awards.

The story of NECA's evolution has been captured in a wonderful book written by Brian Seymour – a NECA Life Member, and prolific writer on industry developments. It charts our history and reminds us of just how much has changed over the past century. We are very proud of our history and our contribution to the industry. And we look forward to the next 100 years with great anticipation.

We hope you will join us in our celebrations over the next 12 months – which will culminate with our 2017 Industry Conference Gala Dinner.

To find out more visit www.neca.asn.au/100years

NECA ACT
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NECA QLD
Ph: 07 3276 7950

NECA SA/NT
Ph: (08) 8272 2966

NECA TAS
Ph: (03) 6234 3464

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Ph: (03) 9645 5533

NECA WA
Ph: (08) 6241 6100

NECA NATIONAL
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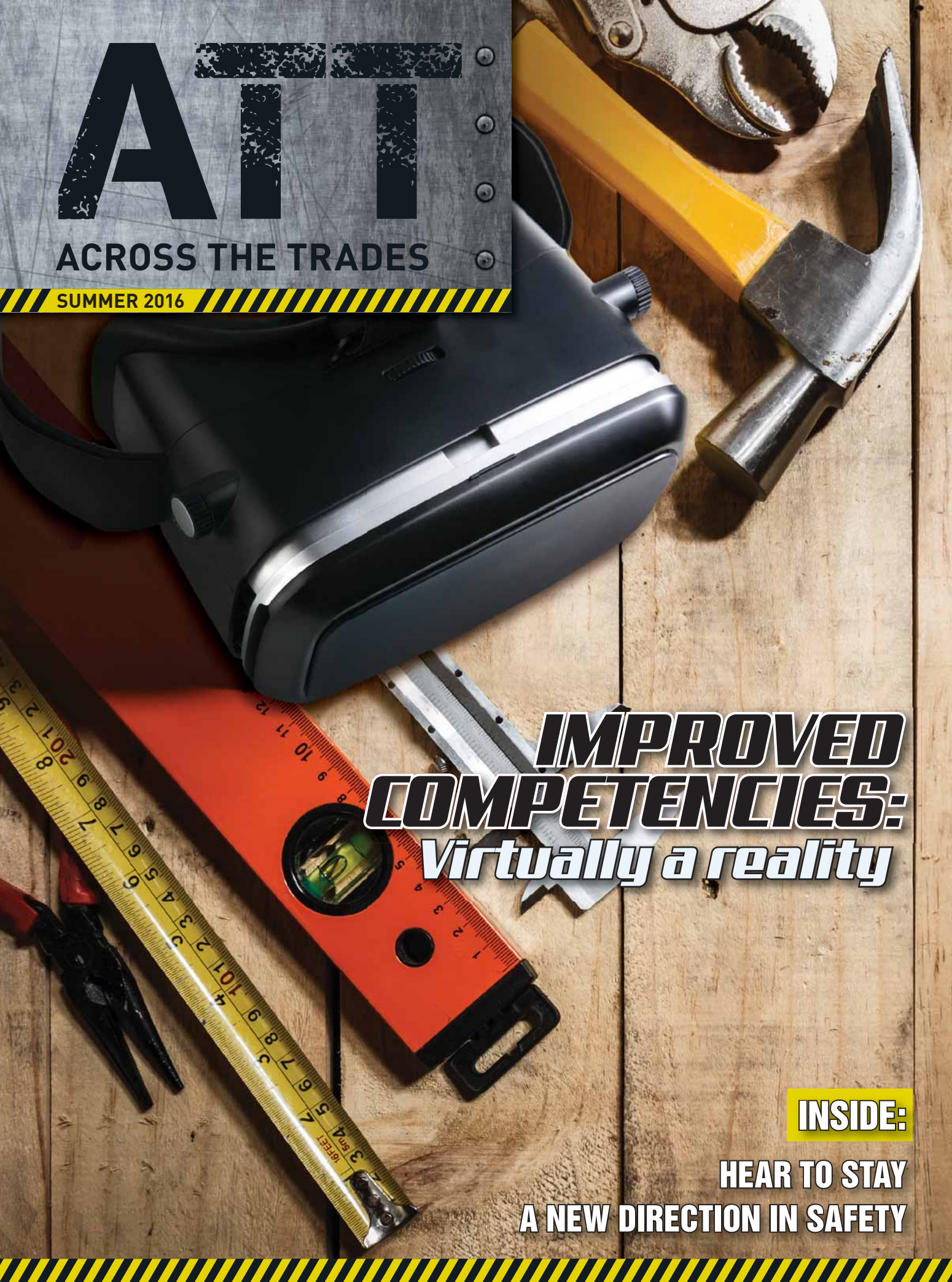

IMPROVED COMPETENCIES: Virtually a reality

INSIDE:

HEAR TO STAY
A NEW DIRECTION IN SAFETY

A VIRTUAL REALITY CHECK

As new technologies come to play an increasingly large role in the construction industry, **Jacob Harris** discovers how virtual reality can be used to improve competency training.

If you asked an average building contractor what white cards and virtual reality (VR) have in common, you'd likely get some pretty weird looks. But this may all be about to change as the technology makes its presence felt in an increasing number of applications.

The Situation Engine is an innovation that uses immersive virtual environments to deliver practical learning experiences to individuals and groups. It was the brain-child of Professor Sidney Newton and Russell Lowe from the built environment faculty at The University of New South Wales (UNSW).

"It was originally developed to help students better understand construction technology but we could also see a strong opportunity for teaching health and safety on construction sites. So we formed a company to consult and develop the system technologies for white card induction along with a whole range of different health and safety training applications in industry," Sidney says.

Because the user's experience is extremely realistic, the Situation Engine makes it possible to exploit the known benefits of situational learning (learning by 'doing' as opposed to conveying knowledge and facts) without having to physically go on site.

Instead of being given a specific problem to solve or project to complete, students are placed in a 'situation' where problems arise organically through engagement with the program. In this way there is no pre-defined start or finish point.

The Situation Engine uses a particular kind of 'first-person shooter' (FPS) video game engine. This renders moving, photo-realistic scenes in real-time 3D that are accompanied by surround-sound and tactile feedback for the user. When engaged in a 'situation', the user is represented as an avatar that is able to move around in the virtual space (a simulation of a construction site for example) and interact with the objects and other users within that space.

> "If you see an accident on site, you remember it and change your behaviour accordingly."

When it comes to health and safety training, the goal of trainers is to change people's behaviour and practices as opposed to just teaching technical information – this is where

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situational learning is most effective. But in order to do this effectively, it's important that what a trainee experiences is as realistic and as close to the situation they'd find on site as possible.

"The idea is that if you see an accident on site, you remember it and you change your behaviour accordingly. And so the realism in the immersion is important if you're trying to change those behavioural aspects. You need to make it feel much more like a lived experience than simply a realistic rendering of a detail. It's an amazingly compelling experience – provided it's as realistic as possible," Sidney says.

Until recently, creating avatar-like realism within renderings required extremely large computing facilities and so wasn't available to the average PC user. But the advent of VR technologies has seen video games really come to the fore.

"Organisations now give this technology away for free and you're able to run and create visual realism within a laptop-level computer. And then consider the location-based sound that's now possible, haptic feedback (recreating the sense of touch by applying forces, vibrations to the user) and the ability to physically move through a virtual space – all these immersive qualities are adding to how convincing and how compelling the virtual experience is compared to an actual experience."

A big draw card for the technology in applications like white card training is its ability to assess competencies far more proficiently than the methods currently being used.

"White card training is currently assessed with a multiple choice, check-box response to fairly obvious, contrived scenarios. I think it's a good example of how little good it does to test competency in this way.

"To have someone walk onto a construction site and actually identify potential hazards and so on, not knowing what those hazards might be to begin with, would vastly improve a competency test. Participants would have to forensically analyse a situation rather than tick a box on one of five choices – four of which are obviously false with only

one making any sense," Sidney says.

While VR-based white card training might still sound a bit left-of-centre, VR technology is developing incredibly rapidly and the amount of international investment taking place is a good indicator of just how massive many key players expect it to be.

"A couple of years ago Facebook bought into a company for 2 billion dollars to develop headsets for the Oculus rift. Samsung has also invested heavily in their Gear VR and are now giving them away with their phones and Apple's next big device is also going to be a headset."

In keeping with this trend, Amazon has just bought a gaming technology and they're now giving it away for free (previously it would have cost about a million dollars to get a licence to develop something using their tech). According to Sidney, they're doing this on the understanding that there are going to be a lot of people developing content and they want to be the primary market for the exchange of that content.

"There's an incredible amount of investment going into VR technologies at the moment and a lot of uptake because the big players see this as a general commodity – the same as how you might view your TV. This isn't just for gamers and computer geeks, these companies are saying VR technology is something that everyone will be using," Sidney says.

> "This is not a wave of technology, this is a continuing tidal shift."

"The uptake in construction is not great at the moment but it's a conservative industry and people tend to want to wait and see what the wave provides. But this is not a wave of technology; this is a continuing tidal shift. There's no point waiting to see where it goes before you decide how you're going to respond to the technology because this is the start of a transition, a change, and there's not an end point to wait for."

NewtonLowe
www.newtonlowe.com

TIPS

YOUR OBLIGATIONS AS A SMALL BUSINESS OWNER

Running a small business can feel like walking through a minefield if you're not properly prepared. Below, **John Corias** of m.a.s accountants outlines your obligations as an employer.

Starting up and successfully running a small business can certainly be overwhelming at times and it is of the utmost importance that you get things right from the very beginning. Your employees are one of your greatest assets, vital to the growth and prosperity of your business. To make the most of this valuable resource, you must ensure that you are fulfilling your responsibilities and moral obligations as an employer. With much to consider, including a myriad of statutory and reporting regulations, it can certainly seem like a minefield at times. To avoid any issues arising with the Fair Work Ombudsman, here is a brief guide to get you on the right track.

NATIONAL EMPLOYMENT STANDARDS (NES)

(Set forward by the Fair Work Act 2009)

From 1 January 2010, the NES has provided a safety net for all employees covered by the National Workplace Relations System. Basically, NES is a guide that underpins modern awards, enterprise agreements (EAs) and employment contracts. You can add extra terms or entitlements to awards and EAs, but you cannot remove or reduce an employee's rights under the NES.

(NB. Some NES don't apply to casual employees).

There are 10 NES which include:

- Maximum weekly hours of work – 38 hours per week, plus reasonable additional hours
- Requests for flexible working arrangements
- Unpaid parental leave and related entitlements
- Annual leave – four weeks paid leave per year, plus an extra week for some shift workers

- Personal/carer's leave and compassionate leave
- Community service leave - unpaid leave for voluntary activities and jury service
- Long service leave (LSL)
- Public holidays – a paid day off on public holidays, except where reasonably requested to work
- Notice of termination of employment and redundancy pay
- Ensuring you provide the Fair Work information statement

It is also important you look at the relevant, modern awards which also commenced January 1, 2010 and cover most workplaces. These can be found at the Fair Work Ombudsman's website (see bottom of page).

Recently we have found some great accounting program add-ons which allow you to seamlessly integrate your accounting software with the relevant award, rostering, times clocks and payroll. As a small business owner, it's certainly worth looking into these programs, to make your life easier and allow you to focus on growing your business.

SUPERANNUATION GUARANTEE

Superannuation has been getting more than its fair share of media lately and we don't expect this to abate any time soon. As an employer your obligations are simple.

- All employers regardless of size must contribute 9.5% superannuation on behalf of their employees
- Super obligations should be paid on a quarterly basis
- Super contributions must now be processed through a registered clearing house such as the Small Business Superannuation Clearing House (SBSCH), to ensure compulsory and voluntary contributions are allocated accordingly

ACCOUNTING FOR ENTITLEMENTS

You now know what your responsibilities are but remember that it is of equal importance that your balance sheet reflects your true obligations. It is important that pay templates are setup immaculately, so that all leave types accrue correctly from the moment you hire each employee.

These days, small businesses have the benefit of a choice of wonderful cloud based programs for you to track your leave and superannuation obligations with ease.

For many business owners, it's easy to fall into the trap of believing you have a relatively healthy cash flow – that is until you suddenly realise that last quarter's super is outstanding and your manager is taking four weeks holidays and you will have to pay overtime or employ an additional staff member!

By allocating entitlements correctly from day one, you will keep yourself out of trouble down the track. Ideally, businesses will open up a separate account so that money can be put aside for obligations and although this may not be possible during the set-up phase, it's certainly something to keep in mind.

POSITIVE VIBES

Finally, remember to look after your staff and check in with them on a regular basis. Although employees essentially go to work for the financial benefits, don't underestimate the intrinsic rewards your staff will respond to. Being treated well, a pat on the back or even an early mark can go a long way to keeping your staff motivated and engaged. Ultimately, a positive working environment will be reflected in the level of service provided to your customers and your bottom line. ▲

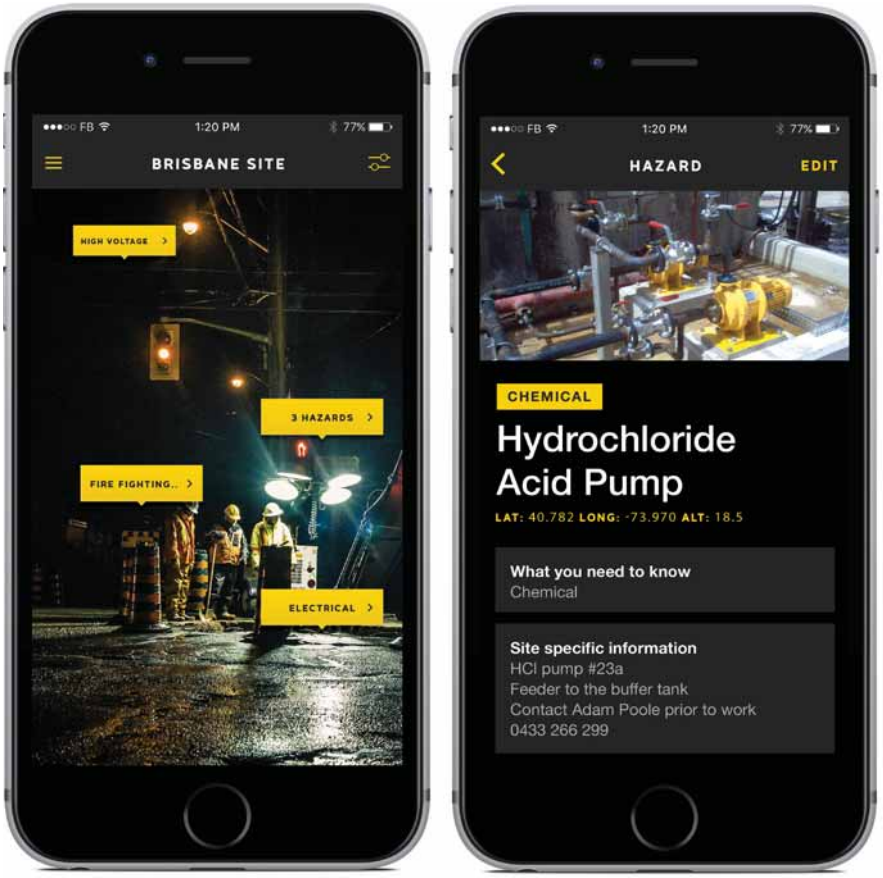
John Corias is a Senior Partner at m.a.s accountants, who have been servicing Australian small business accounting needs for over 50 years.

m.a.s accountants
www.masaccountants.com.au

Fair Work Ombudsman
www.fairwork.gov.au

ENCOMPASSING SAFETY

Adam Poole has designed a safety app that uses augmented reality to overlay information onto actual hazards. He caught up with **Jacob Harris** to explain.



Adam Poole worked in health and safety for about eight years in heavy industry, construction and the like and got tired of the rigmarole workers would have to go through every morning just to get on site.

"I saw a lot of the guys before they started work in the morning. They would have to go through so much crap – paperwork and inductions and list registers and all this stuff and, in my experience, a lot of them were just doing it because they had to – it's wasn't meaningful and they weren't taking anything away from it," says Adam.

This gave Adam the idea to take all the information contained in inductions etc. to site – where workers actually need it as opposed to in an office somewhere – and so the Safety Compass app was born.

"As it developed, we found that we could build-in the ability to make information available in real time. Sites change every day, every hour in some cases – cranes come and go, chemical deliveries are made – and those paper based systems don't cater for that.

"Once we decided to make it real time, we thought an interesting way to get the guys to actually use it would be to create an augmented reality (AR) view. So when a user holds up the phone, it opens up your camera and all the relevant information actually floats above or in line with the specific hazards. So if you were looking at a chemical tank for example, it would say 'this is a hydrochloric acid tank, here's everything inside, here's your safety data sheets, here's how to operate it, turn it off, shut it down' – all that kind of stuff."

The app is generic enough that it can be updated by a site supervisor or a team leader with the right level of access – according to Adam, it's just a matter of entering some basic info into the phone. Safety Compass walks the user through what to do and information can be added, edited or deleted as they go. The app is then updated within about a minute of the information being entered. So as soon as something happens on site – whether it's planned or reactive – a user can let everyone around them know.

"People don't like 'take five's' and all those sort of pre-start checks, and the app works in with that fact. So instead of workers doing a take five and sticking it in their pocket, they can enter that information into the app and instantly share it with everyone on site.

"It's for the front-line guys, the guys that are on the tools, as opposed the managers, because unfortunately they're the ones who are getting hurt."

While the app is fully functional in its current version, Adam and his team have a fairly extensive list of features they'll be adding to it in the near future. For example, iBeacon functionality for use underground or where there's no phone reception and also a messenger platform to inform workers of severe weather events and the like.

"We invoice users on a monthly basis and that can be month by month or it can be for six or 12 months etc. That allows big jobs like plant shutdowns to be catered for. So if you've got a site with 100 guys on it normally and then you have 1000 contractors come in, we just invoice for the time the contractors are there and using it so you don't have to pay the higher rate all the time," says Adam.

Safety Compass
www.thesafetycompass.com.au

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Have another look. The judges did.

2015 DELIVERY MAGAZINE SMALL VAN OF THE YEAR

2016 DELIVERY MAGAZINE SMALL VAN OF THE YEAR

2015 DELIVERY MAGAZINE MEDIUM VAN OF THE YEAR

2016 DELIVERY MAGAZINE MEDIUM VAN OF THE YEAR

For the second year in a row, the judges for Delivery Magazine's 'Van of the year' awards liked what they saw. "Renault Kangoo is a great little van. It's comfortable, it's quiet, it steers, it turns. It's well equipped too."

And "After driving the Renault Trafic around Delivery's test route, I was very tempted to just keep going and take this awesome little load carrier home."
Now you should take a look. Take a test drive at your nearest Renault dealer.

renault.com.au

LADDER RACK

Rhino-Rack
www.rhinorack.com.au
At 1.5m, Rhino-Rack's Multi Slide Extension Ladder Rack can still carry long ladders, and features all the bells and whistles that Rhino-Rack's other ladder racks do. This includes side rails that prevent lateral movement, as well as the innovative rear strap, which reduces excess rope and straps, and means you only need the one strap to secure the ladder to the rack.

The ladder rack system is fully OH&S compliant and has been rigorously crash-tested across all trades to ensure that the product is as tough as it gets.

COMPACT BOLT CUTTER

HKP
www.apextoolgroup.com.au
HKP have designed a brand new compact bolt cutter (CBC) that combats user fatigue by reducing force requirements, and all whilst serving your every bolt cutting need.

The CBC requires 50% less cutting effort compared to a pair of standard lineman's pliers. For greater efficiency and less strain, the recessed throat-notch clasps materials closer to the joint. And the heavy-duty spring return facilitates a measured cutting experience for high production applications.

The CBC can cut through materials such as copper, vinyl, steel and aluminum (up to 6mm). So be it fencing (4mm), wire (6mm) or chain (4mm), the CBC will keep up with your workload.

LED LANTERN

Dolphin Eveready
www.dolphintorches.com
Dolphin Eveready has introduced the new Dolphin LED Lantern. It features new technology, ergonomic design and four powerful LEDs offering 200 lumens of light output, meaning it shines twice as brightly as the previous model.

The new Dolphin LED lantern maintains the brand's core features of being tough, waterproof and floatable, and offers a lighting solution when working in areas where light is restricted. The new Dolphin LED lantern design uses high quality LEDs that deliver a light output of 200 lumens, with a beam distance of 250m, as well as a wider beam width. In addition, it offers a runtime of 65hrs.

ROTATION LASER

Bosch
www.bosch-pt.com.au
The Bosch GRL500 HV 500m Outdoor Rotary Red Laser is the first rotation laser with theft protection for all levelling work. It features an alarm that is triggered if the GRL 500 HV is moved without the LR 50 Professional Remote Control Receiver during operation.

Advantages include: Simultaneous charging; a calibration reminder; a slope function so the user can enter slope values directly using the LR 50 professional keypad; line control; an anti-drift system that prevents levelling errors in the event of shocks or vibrations; sleep mode; relative height display and a centre line button that automatically aligns the laser beam with the centre of the receiver and measures the slope value.

2-WAY RADIO SERIES

Uniden
www.uniden.com.au
UHF 2-way radios are known to be one of the most reliable ways to stay in touch with family and friends when there is little to no mobile phone coverage.

Whether it is work or leisure, the new one watt UH810S and two watt UH820S series of 2-way radios from Uniden are designed to last.

Built rugged for harsh Australian conditions, the Titanium series is one of the most durable and easy-to-use communication tools on the market. The technology offers reliable communication with access to 80 UHF channels, and more than a 9km and 13km distance for the UH810S and UH820S series, respectively.

TIME LAPSE CAMERA

Brinno
www.brinno.com
The Brinno Time Lapse Video Construction Camera is an effortless way to record any construction project. The camera produces a time lapse video recorded at the rate you want, and played back at the rate you want when the project is done.

No professional photographer is needed to setup and operate or relocate the construction camera – any worker will be able to get the job done. The camera delivers proprietary 'instant video' which means you can play the time lapse video on the spot once filming is completed. No huge files to transfer, no video editing or even post processing.

TAPE MEASURE

Lufkin
www.lufkintool.com
A tape measure is a tradie's best friend, and Lufkin's Trade MX makes the perfect companion. Ticking all the boxes a tape measure should, the Trade MX will be the hero of any tool belt.
Ergonomically designed to fit the contour of your hand, the Trade MX feels like an extension of the body. Innovative construction of the internal components means that the compact body of the Trade MX fits snugly in the palm and features a co-moulded grip and top lock button make for easy operation.Gone are the days of wrestling a rusted old tape measure that jams more often than it doesn't!

CONSTRUCTION SITE RADIO

Festool
www.festool.com.au
Festool is extending its "PowerSelect" battery-powered product range with the new SYSROCK BR 10 construction site radio. It offers impressive, high-quality sound, is compact and lightweight, and has a Bluetooth interface as well as an integrated hands-free function.

This means it is compatible with a wide range of smart phones and is ideal as an attractive and unobtrusive companion on the construction site and in the workshop. With characteristically high quality standards, Festool has also designed its new SYSROCK with the particular needs of tradespeople in mind.

UNIVERSAL FIRE EXTINGUISHER BRACKET

The Bracketeer
www.thebracketeer.com

Car fires are far more common than most people realise. While statistics aren't readily available in Australia, the U.S. reported 174,000 car vehicle fires last year, resulting in 445 deaths, 1,550 injuries and $1.2 billion in damages. If Australia has 8% of the vehicles on the road the numbers are still frightening.

If you have ever witnessed a car fire, you will know that they take hold quickly and ferociously – if an extinguisher is not readily available, the likelihood is that the vehicle and its contents will be burnt to the ground before the fire brigade can arrive. And what if someone is trapped in the vehicle? That could just be the world's worst nightmare.

The trouble is, most drivers don't carry a fire extinguisher because they don't think they'll ever need it, or don't have a way to easily mount it.

Southern Californian resident and Australian ex-pat Simon Wehr decided to do something about this by inventing a universal fire extinguisher bracket that fits almost every vehicle.

"After personally putting out four car fires in my lifetime, I have been an advocate for having fire extinguishers in every vehicle. I built a one-off fire extinguisher bracket for my own car and shared the plans on a forum for others to copy. The next thing I knew I had people wanting to buy them and so the business was born," said Simon.

The bracket is compatible with a wide range of models and makes including BMW, Chrysler, Ferrari, Ford, Holden, Hyundai, Jeep, Mazda, McLaren, Mercedes Benz, Pontiac, Porsche, Subaru, Toyota, Volvo, Volkswagen and more.

It is perfect for fleet vehicles and vans, performance vehicles, family cars, 4x4's, emergency services vehicles, or anyone wanting the added peace of mind of having a fire extinguisher within easy reach.

The bracket simply clamps onto the front or rear of the seat rails and is secured firmly using set screws. For vehicles with a traditional bolt-on seat frame design, it is inverted and secured through holes onto the factory mounting bolts.

The design provides lateral adjustment of between 330mm and 465mm to ensure compatibility with almost any seat rail width.

The cradle supplied with the fire extinguisher can then be bolted onto the bracket in over thirty different mounting combinations, ensuring the most convenient and appropriate location is always achieved.

Whether you are driving around with thousands of dollars worth of equipment in the back of your ute or van or simply taking a weekend drive with the family, having a fire extinguisher securely mounted within easy reach may just be the best decision you ever make.

CORDLESS TOOL RANGE

Dewalt
www.dewalt.com.au

XR Flexvolt is a range of 54V power tools that offers runtime and performance that has never been seen before - for the first time, professional tradesmen can reliably undertake heavy-duty construction applications without the need for mains power.

This innovation means that you can have 54V power across a whole range of tools without the inconvenience of a cable. Dewalt XR Flexvolt is the only battery on the market that can switch from 54V to 18V, making it backward-compatible with your existing XR power tools.

RECHARGEABLE TORCH RANGE

Ledlenser
www.ledlenser.com.au

Working on commercial and industrial job sites, it is paramount to have the correct lighting when engaging in the task at hand. Ledlenser has released the economic and ecological i-Series of commercial torches and headlamps, designed specifically for the industrial professionals of the world.

The torch range features the i6R, i7R, i9R and i9R-Iron, which are German engineered to be precise by expertly bundling the light that they produce. This is thanks to the impressive homogeneous and defocused light cone – which forms part of the Advanced Focus System(AFS). AFS combines both the lens and reflector to unite the advantages of both systems, to provide you with the best of both worlds.

WHAT'S IN THE BOX?

Keeping hold of tax receipts and business expenses, then sorting through them all come tax time, is the bane of many-a-tradie's existence. Enter Shoeboxed: an app that organises your paperwork for you.

Shoeboxed Australia is an ATO-registered company that enables tradies and other small business owners to keep track of their business paperwork instead of keeping them in a drawer somewhere or, as the name implies, a shoebox.

Users can choose to physically post their receipts in, use the mobile app to take a photo and log the receipt or forward emailed documents into their account.

"Shoeboxed is a way of getting small-business paperwork and putting it online. It can be anything from paper documents you've received, emails, or pictures taken on your mobile phone. We then store that online and organise it for you. We are the only product of this kind that is registered with the ATO and fully tax compliant," says Shoeboxed Australia founder and chief executive Simon Foster.

"Tradies can take a picture with their phone while they're on the go so they won't lose those recepts or forget about them. Shoeboxed documents don't fade and it's dealt with there and then – you're not looking at the end of the year with a literal shoebox full of documents that you have to then give to your accountant, or your spouse, who's going to sit there for a couple of days typing it all in."

Documents are digitised through an Optical Character Recognition (OCR) process to extract the data. The data is then verified by workers in the company's Sydney office to ensure its accuracy.

"We do all our own data entry and we use people, not computer algorithms, to do it. The reason for that is when you extract information from documents using technology it gets you to about 85% accuracy. In order to use it for financial records you need to be more accurate than that, as close to 100% as you can possibly get, and there's no alternative to using people. That means we either need to ask the customer to do it – and our experience with small businesses is they don't have time to do that and they don't want to do that – or we employ people. We do it on-shore in our offices in Sydney. We use long-term unemployed people on federal government grants to enable us to keep it on-shore – it's not going offshore, so you can keep control of it here."

Shoeboxed has been in Australia for almost six years and originally came out in the US about 10 years ago. Half way through 2015 Simon and co. separated from their US colleagues by buying the business out so they could focus entirely on Australia and New Zealand. According to Simon, the move has allowed Shoeboxed Australia to make sure they're handling the unique tax and compliance requirements of Australian businesses.

"If you have a lot of documents you want to sort and organise for tax compliance, if you've had issues with people losing documents, if are behind on your tax returns and BAS filing or just want to be more efficient and go paperless – we can help."

Shoeboxed is charged on a monthly basis and has a range of plans from individual to executive and offers free training and certification for accountants and bookkeepers on their software.

Shoeboxed
www.shoeboxed.com.au

TIPS

HEAR TODAY, GONE TOMORROW

Anyone who's ever completed an induction knows workers should be wearing personal protective equipment when on site. But according to audiologist **Ross Dineen,** rates of hearing damage are still alarmingly high in the construction industry.

According to figures released by Australian audiologist Dr Ross Dineen, who has studied hearing loss and tinnitus in the construction industry extensively, construction workers regularly experience noise levels up to six times the legal exposure limit and up to 75% are developing tinnitus or permanent hearing loss as a result of their job.

Dineen and his colleagues studied noise exposure levels in construction and analysed the way personal protective equipment (PPE) and protective approaches are used.

"We measured the real-time exposure to noise and found the total dose [of sound] over the working day averaged over six times the legal exposure limit. Based on hearing tests as well as feedback from family and friends we found that over 75% of construction workers were experiencing hearing and communication problems," Dineen said.

Although the original study took place some years ago, Dineen said little has changed since his research and that noise induced hearing loss (NIHL) and tinnitus remain a serious issue in construction.

"There's nothing really being done to address it," he said.

Reluctance to wearing PPE is a major cause of hearing loss in construction, according to Dineen, who said that hearing damage was compounding because as damage increases, so too does reluctance to

wearing hearing protection.

"If you have a pre-existing hearing injury, conventional hearing protection can reduce the ability to hear speech and warning sounds. This means many workers are not inclined to wear hearing protection at all. We conducted some focus groups asking why people were engaging in these behaviours and their immediate concern was being well enough to go home that night [as opposed to the cumulative effects of hearing damage]," Dineen said.

With this in mind, he stressed the importance of preventing hearing loss early.

"The issue is to get people before they have injured their hearing – when they can still hear while wearing conventional ear protection," he said.

Access to the right class of hearing protection will also to encourage use. Ear plugs with lower decibel ratings, which provide hearing protection while still allowing wearers to hear background noises, can be a good option when the highest rating isn't required.

"Class 5 (the highest level of hearing protection) is not always the best solution. There are different designs for different ratings and uses which should be matched to the application and risk," says product development manager of Pro Choice Safety Gear Brad Rodgers.

Tinnitus, the clinical term for ringing, whistling or hissing in one or both ears, is a common symptom of hearing damage. This is not actually a 'sound' but, according to Dineen, is the noise of the auditory system as the brain tries to adjust for the hearing damage.

"Tinnitus, initially is a warning sign that hearing damage is occurring," Dineen said, adding that it is usually also combined with muffled hearing.

"Your ear is dampening to try and protect itself. If you're constantly working in a loud environment, that hearing loss doesn't come back.

"Symptoms of long term Tinnitus also include intolerance to some noises. Everyday sounds that you could previous tolerate such as putting a cup on the bench or putting a saucepan in the sink becomes an unpleasant experience," Dineen said

Training and education is critical to ensuring workers can self-diagnose when hearing damage is occurring and therefore take appropriate protective measures.

"It's really important that workers can identify the initial symptoms of hearing damage... recognition is often low until they get feedback from friends or family," he said, adding that loud televisions or asking people to repeat themselves were obvious signs.

He suggested workers use the car radio for self-testing their hearing post-shift as a simple method to test for short-term hearing loss.

Step 1: When driving home after work, set the car radio at a 'comfortable' volume while driving home so that you have a comparison point the next morning.

Step 2: When driving to work the next day, if the volume is no longer 'comfortable' (e.g. it is too loud), it is an indication of short-term hearing damage the day before. ▲

> "Training and education is critical to ensuring workers can self-diagnose."

ProChoice Safety Gear
www.prochoice.com.au

HOLDEN COLORADO

Holden is confident its heavily upgraded Colorado ute will now take the fight up to the top-selling Toyota HiLux and Ford Ranger in the ultra-competitive one-tonne utility segment, touting significant Australian engineering work on the Thai-built workhorse.

Local engineers have focused on improving refinement and driveability with a range of chassis changes, including the introduction of electric power steering (with a faster steering rack and fewer turns lock-to-lock), digressive front and rear shock absorbers, a thicker front stabiliser bar and revised spring rates.

Among the measures to reduce noise, vibration and harshness (NVH), Holden engineers have shifted the balance shaft on the 2.8L turbo-diesel engine, revised the engine and transmission mounts, developed an 'engine acoustic pack' homing in on the injectors, metal timing cover and oil pan, and, not least of all, they've slotted in a new 'central pendulum absorber' (CPA) automatic transmission torque converter.

Billed as a first for the one-tonne ute segment, CPA-type torque converters are more commonly found on high-end diesel passenger cars. According to Holden, the benefits include major NVH benefits and improved driveability and fuel economy.

Manual versions of the Colorado also now have a new final drive ratio, which is said to improve drive quality (particularly while towing), while rounding out the engineering effort is a variety of detail changes to reduce wind noise, a revised traction and stability control system (including hill descent control) and new tyres bringing improved low-rolling resistance, wet weather grip and ride comfort.

Importantly, the Colorado – which is still available in single, extended and dual cab body styles across LS, LT, LTZ and Z71 grades – also brings new levels of safety equipment, including a rear-view camera as standard on all pick-up models (cab chassis versions have it as an option) and, on selected models, advanced systems such as forward collision alert, lane departure warning, front and rear park assist and tyre pressure monitoring.

A driver's knee airbag is also now on board, bringing the total airbag count up to seven.

Styling changes are apparent both inside and out, cabin comfort has gone up a notch and a host of new accessories have been developed for the vehicle. However, the other key area in which Colorado has lifted its game is with infotainment technology.

This comes courtesy of a new MyLink system delivered through a colour touch screen and featuring DAB+ digital radio, Apple CarPlay and Android Auto connectivity and embedded satellite navigation and voice recognition.

Functionality and screen size (7" or 8") varies according to the model variant, but there is no doubt that – any way you look at it – the Holden-based workhorse has taken a major step forward.

There is even now a remote window activation feature that allows the owner to lower the windows from outside the vehicle via the key fob.

One of the only areas in which Colorado hasn't changed is engine performance, with the 2.8l Duramax donk continuing to develop 147kW of power and 500Nm of torque in the auto – detuned to 440Nm in the manual.

It does, however, now meet the Euro 5 emissions standard required of all new vehicles from November 1.

Holden
www.holden.com.au

FORD RANGER

Having closed its Australian manufacturing operations on October 7, Ford has begun a new era in which it is now heavily reliant on the locally developed but fully imported Ranger one-tonne ute – a model that now accounts for about half of the company's sales volume here.

You can hardly blame the Blue Oval for banking heavily on a vehicle that Australian buyers have clearly welcomed – Ranger is now closing in on the previously dominant Toyota HiLux at the top of the sales charts, particularly in the 4x4 class – and Ford has moved to bolster its position with a significant 2017 model year update.

Advanced technology is at the heart of the latest upgrade, which is headlined by the introduction of the new-generation Sync3 infotainment system on high-end XLT and Wildtrak models.

Sync3 brings improved performance, more 'conversational' voice recognition, an intuitive smart phone-like 8.0" touch screen (enabling 'pinch and swipe' capability, for example), improved graphic user interface over the previous Sync2 system and, not least of all, Apple CarPlay and Android Auto connectivity which includes the ability to access Apple Siri and Google Now.

Wildtrak also now offers a broad range of driver-assist safety technology as standard equipment, including adaptive cruise control with forward collision alert, driver fatigue detection, automatic high beam control, lane keep assist and lane departure warning.

At the lower end, a rear-view camera and reverse parking sensors become standard across most of the range – the exceptions being XL Plus and cab chassis variants – while the 4x4 XL Super Cab Chassis 3.2L variant is now available with an automatic transmission (six-speed) for the first time.

The latter model, which uses a 147kW/470Nm 3.2L five-cylinder turbo-diesel engine, was previously only available with a six-speed manual gearbox.

The XLT, which combined with Wildtrak now accounts for almost two-thirds of all Ranger sales, also now has striking black fog lamp bezels and adds front parking sensors to its comprehensive list of standard equipment, while XLS picks up a second key fob.

Rounding out the changes are tweaks to the exterior colour palette (new shades of black and grey) and a minor powertrain upgrade to meet the new Euro 5 emissions standard that applies from November 1 in Australia.

As well as the 3.2 five-pot diesel, Ranger is powered by a 118kW/385Nm 2.2L four-cylinder diesel – also with the choice of six-speed manual or automatic transmission.

As well as the two diesel engines and transmissions, the comprehensive range spans single, extended and double cab bodies, pick-up and cab chassis rear ends, 4x2 and 4x4 drivelines and various model grades including XL, XL Plus, XLS, XLT and Wildtrak. Hi-Rider variants are also offered on 4x2 XL and XLT. ▲

Ford
www.ford.com.au

RANGER SPECIAL EDITION

Just as Holden was launching its huge upgrade for Colorado, Ford weighed in with a Ranger 4x4 XLS Special Edition that is said to include $4900 worth of factory accessories for an additional $2500 over the regular 3.2L five-cylinder diesel-powered double cab on which it is based.

Priced from $49,990 drive-away with a six-speed manual gearbox, or $52,190 d/a with a six-speed auto, the Special Edition is based on the MY17 series and includes a sports bar, tow bar, side steps and bed and tailgate liners

GREAT WALL STEED

Chinese brand Great Wall Motors has made a comeback to the Australian marketplace with the launch of its new-generation one-tonne utility – now known as the Steed – which is pitched squarely at budget-conscious tradespeople.

Three variants are available at launch: a 4x2 petrol priced from $25,990 plus on-road costs, a 4x2 diesel from $27,990 and a 4x4 diesel from $30,990 – although for a limited time the company is offering all three with drive-away pricing and with $1000 taken from the RRP.

There is no automatic gearbox available and the only body style at launch is a dual cab utility with a boxed rear end.

Value for money is a key selling point, with standard safety equipment in the single-spec Steed running to six airbags (including full-length side curtain airbags), Bosch-developed electronic stability control, hill-start assist, a tyre pressure monitoring system, automatic headlights/wipers, daytime running lamps and front fog lamps, rear parking sensors, and ABS brakes with electronic brake-force distribution and brake assist.

Creature comforts include Comfort-Tek faux leather upholstery, heated front seats, six-way electric-adjustable driver's seat, cruise control, six-speaker stereo with radio/CD/MP5 functionality and Bluetooth phone connectivity, USB/aux ports, a multi-function leather-wrapped steering wheel, auto-dimming rear-view mirror, electric windows/mirrors and climate control air-conditioning.

The Steed is also fitted standard with side steps, a stainless-steel sports bar, fully lined cargo bed and 16" alloy wheels (with a full-size steel spare) shod with 235/70-section tyres.

The petrol engine is a 2.4L '4G69S4N' unit developing 100kW of power at 5250rpm and 205Nm of torque at 2500rpm. It drives the rear wheels through a five-speed manual gearbox and official figures indicate combined-cycle fuel consumption of 12.4L per 100km.

The oil-burner is a 2.0L 'GW4D20B' common-rail turbo-diesel producing 110kW at 4000rpm and 310Nm from 1800-2800rpm, working in tandem with a six-speed manual transmission and capable of fuel economy of 9.0L/100km on the combined test cycle. The 4x4 includes a BorgWarner-sourced transfer case.

Compared to the previous V-series ute sold here, Great Wall's new-generation workhorse is 305mm longer at 5345mm – the new front grille design is responsible for 150mm – and 30mm higher at 1760mm (ground clearance is 171mm), while maximum width is 1800mm.

The tray is now 155mm longer at 1545mm, and measures 1460mm wide and 480mm deep. The Steed's payload is squarely at the one-tonne mark (between 1010kg and 1022kg, depending on the variant) while a braked towing capacity of up to 2000kg is available. Typical workhorse ute underpinnings include a ladder-frame chassis, independent double wishbone front suspension and a solid axle with leaf springs at the rear.

The range is backed by a three-year/100,000km warranty and three years' roadside assistance, with a national retail network of around 50 dealers at last count. ▲

Great Wall Motors
www.greatwallmotors.com.au

TOYOTA HIACE

Toyota has upgraded its diesel-powered HiAce work van as stricter regulations come into force in Australia.

From November 1, all new vehicles designated 'light-duty' – including work vans and utes – must comply with the Euro 5 emissions standard. Both petrol and diesel engines are affected, with diesel vehicles required to meet a particle limit.

As a result, several manufacturers have been working on upgrades of their workhorse fleets.

For Toyota's top-selling HiAce – which is sold as a long-wheelbase (LWB) van, five-seat LWB crew van and Super LWB van – the petrol-powered versions were upgraded to Euro 5 early last year, when the company also added extra safety equipment such as electronic stability control, brake assist, hill-start assist and an emergency stop signal that automatically engages when severe braking force is applied.

Now, the 3.0L '1KD-FTV' four-cylinder turbo-diesel engine has received attention to bring it up to speed, including a recalibration and the addition of a particulate filter offering a choice of manual or automatic regeneration.

There is no change to output – 100kW of power at 3400rpm and 300Nm of torque at 1200rpm – and the transmission choice is still five-speed manual as standard or four-speed automatic for an extra $2550.

Toyota claims fuel economy improvements of up to 4.6% have been achieved on the official urban cycle, depending on the variant. The biggest gains around town – where the HiAce naturally performs most of its duties – were achieved with the manual LWB crew van and Super LWB van, both of which return 10.3L per 100km.

That said, the benchmark combined-cycle rating, which considers outer-urban conditions and takes an average of the two, sees the fuel consumption figure largely unchanged – or marginally higher than before. This ranges from 8.1L/100km on the LWB van manual to 9.2L/100km on the Super LWB auto.

For comparison, the 2.7L '2TR-FE' four-cylinder petrol produces 118kW at 5200rpm and 243Nm at 4000rpm, driving through a five-speed manual or six-sped auto. It returns between 9.8L/100km and 10.5L/100km on the combined cycle, while urban figures can be as high as 13.3L/100km (LWB van manual).

Toyota also now offers the choice of steel panel on the left-hand side (rather than a window) for the white automatic LWB diesel van, responding to customers who preferred to forego the added visibility offered by the window for the extra privacy and security brought with a panel.

HiAce pricing recently increased by 2.0%, with the Australian subsidiary blaming currency movements as forcing its hand. Pricing starts from $33,650 plus on-road costs for the LWB petrol manual van, topping out at $48,440 for the Super LWB diesel auto. ▲

Toyota
www.toyota.com.au

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www.metalpecker.com

VOLKSWAGEN COMMERCIAL VEHICLES

With no fewer 79 variants at last count across its Caddy, Transporter and Crafter van and cab chassis model lines, Volkswagen Group Australia claims to offer an unrivalled breadth of choice for tradespeople – and also reckons it offers the best value in the marketplace.

In announcing 2017 model year updates and revised pricing for its light-commercial vans, the German brand's local director of commercial vehicles, Carlos Santos, declared that VW's diverse range "can't be beaten on value".

"Other brands might offer cheaper white tin entrants, but when you get into the meat of the ranges – the vehicles that people who have to drive them really want – we win both on sticker price and equipment," he said.

Across all model lines, the MY17 upgrades include improved USB connectivity for an iPhone and a general audio upgrade with App Connect.

The Caddy compact van gains new exterior colours and standard fitment of Climatronic air-conditioning with an anti-allergen filter, as seen on VW's passenger car range.

'Runner' editions of Transporter and Crafter – based on MY16 vehicles and available while stocks last – are also available, while drive-away pricing deals are offered on selected models for vehicles purchased before the end of the year.

As seen previously on Caddy, the Runner editions pack in plenty of value although are typically limited to specific model variants and configurations such as manual transmission, white exterior paint and no real scope for adding optional extras.

The Transporter Runner is based on the entry level SWB TDI250 van with a five-speed manual gearbox, priced from $32,990 drive-away. The 2.0L diesel engine produces 75kW/250Nm and offers mileage of 7.0L/100km on the official combined cycle, while the cargo area has a 5.8m^3 load capacity, accessed via a sliding door on the passenger's side and a rear tailgate.

Standard safety equipment runs to four airbags, electronic traction/stability control, ABS brakes (with brake assist), hill-start assist, driver fatigue detection and reverse parking sensors.

The Crafter Runner editions are based on the 35 Van in TDI300 MWB and TDI340 LWB guise, both with a six-speed manual gearbox and drive-away pricing from $39,990 and $46,990 respectively. Both use a 2.0L diesel engine, producing 80kW/300Nm in the TDI300 and 105kW/340Nm in TDI340, while cargo capacity of up to 9.0m^3 is available in the MWB and 14.0m^3 in the LWB version.

VW has also boosted its Amarok one-tonne utility, offering a reduced price of $38,990 for the TDI400 4Motion dual cab manual – a significant reduction on the regular RRP of $42,990 plus on-road costs.

Volkswagen Commercial
www.volkswagen-commercial.com.au

VOLKSWAGEN CRAFTER

Volkswagen has revealed its new-generation Crafter van in Europe ahead of its launch in Australia in the second half of next year.

Local specifications are still to be announced, but Volkswagen Group Australia has confirmed that a comprehensive line-up is under consideration for the redesigned large van series, which has emerged with the biggest-ever range for the nameplate spanning four power outputs based on VW's Euro 6-compliant 2.0L 'EA288 Nutz' diesel engine, manual or automatic transmission, three drivelines (front, rear or 4Motion all-wheel drive), three vehicle lengths and three roof heights.

Cab chassis variants will also form part of the Australian line-up.

The German manufacturer says its engineers accompanied a large number of customers – including tradespeople – on their commercial vehicle rounds during the development phase of the new Polish-built Crafter, analysing issues such as manoeuvrability through muddy building sites, problems associated with inner-city traffic congestion and accidents caused by driver fatigue on long trips.

The new 2.0 TDI engine is said to have been developed specifically for the new Crafter and its commercial applications, with the outputs starting at 75kW at the entry level, rising to 90kW, 103kW and, with a twin-turbo version, 130kW.

VW says the combination of the new engine and a more aerodynamic exterior design (now with a slippery 0.33Cd drag coefficient) hands the Crafter the lowest fuel consumption and emissions figures in its class.

It also claims reduced ownership costs stemming from lower maintenance and repair bills anticipated from the new powertrain, and touches on various other areas of improvement such as cargo capacity, packaging and overall dimensions, which in turn have benefited vehicle manoeuvrability and handling.

Electro-mechanical steering has been adopted – a first for this segment, according to VW – while various electronic driver-assist systems debut on the new Crafter, including electronic stability control with trailer stabilisation, a trailer manoeuvring assistant, adaptive cruise control, post-collision braking and a side-wind compensation system, among others.

Front, side and head-protecting airbags are provided, along with a reversing camera, park distance monitor, rear traffic alert system and high-spec lighting that runs to LED headlights, cornering lights and a new 'light assist' system.

The current Crafter range is offered in Australia with three lengths (MWB, LWB and LWB with overhang), three roof heights (standard, high and super-high), three powertrains (2.0 TDI in 80kW single turbo and 105/120kW in bi-turbo form) but just a single transmission (six-speed manual) driving the rear wheels only. There are also two GVMs available: 3550kg and 4490kg. ▲

Volkswagen Commercial
www.volkswagen-commercial.com.au

ISUZU N SERIES & HINO 300 SERIES

Australia's market-leading truck brand Isuzu has introduced a significant update for its light-duty N Series, offering new model variants, extra equipment and the introduction of its third-generation automated manual transmission with torque converter (TC-AMT).

Electronic stability control also becomes available on the 4x2 NQR model for the first time – completing its rollout across the full 4x2 range – while the entire on-road N Series range is now fitted standard with a variety of safety equipment including an anti-slip regulator, hill-start assist and ABS brakes with electronic brake-force distribution.

There is also broader application of its 3.0L '4JJ1' four-cylinder diesel engine which, as the industry moves towards lower-displacement engines, will now power models up to 6.5t GVM across the N Series range.

Fitted to all AMT models with the 150PS (110kW) 3.0L 4JJ1 engine, the new TC-AMT gearbox was calibrated to suit Australian driving conditions and, according to Isuzu, offers including improved shift quality, lower fuel consumption, a kick-down feature (to assist when exiting roundabouts, for example) and a more 'car-like' experience with a P-position shift level which engages a new park pawl and gear at the rear of the transmission.

This car-like feel extends to other areas in the cabin, such as extra amenities including a new overhead console security net.

Six new variants join the N Series ranks, including an NNR 65-150 MWB in manual and AMT guise, both powered by the 4JJ1 engine and rated at 6500kg GVM, as well as an NNR 55/45-150. The latter is rated at 5500kg GVM but has the option to lower to 4500kg for compatibility with a car licence. It also has larger rear disc brakes than the lesser-rated models and the new TC-AMT gearbox. ▲

Isuzu
isuzu.com.au

HINO 300 SERIES

Hino has created a significant point of difference to its competitors by offering a reversing camera across its 300 Series range – a move it claims has made it the first light-duty truck series with the important safety feature fitted standard.

The Japanese brand says the factory approved camera is fully compliant with all Australian Design Rules, is waterproof and offers wide-view high-definition vision. It is also enabled for infrared night vision and has the added benefit of a built-in microphone.

This enables the driver to reverse "with confidence and safety", Hino says, with the live video and sound feed displayed on the touch screen multimedia unit. A "near 360-degree view" of the vehicles surroundings is now provided, adding to the forward field of vision (aided by narrow front pillars) and large exterior mirrors with integrated convex spotter mirrors.

A vast range of variants make up the 300 Series – 67 at last count – spanning various wheelbase lengths, single and crew cab body styles, standard and wide cab configurations, 4.0L and 5.0L turbo-diesel drivetrains (including hybrid) and 'built-to-go' models such as TradeAce, WorkAce, SteelAce and Tipper.

Hino
www.hino.com.au

CLIPSAL BY SCHNEIDER ELECTRIC
WWW.CLIPSAL.COM/TRAINING

C-BUS BASIC

This entry level training course is designed for consultants, electrical contractors, system integrators and partners who wish to learn how to install and program C-Bus systems. The C-Bus Basic course will equip trainees with the skills to work with C-Bus products and become involved with the concept of commercial and residential automation. It is also the first step towards becoming an Approved Installer.

Start date	End date	Location
21/11/2016	23/11/2016	Brisbane
28/11/2016	30/11/2016	Melbourne
05/12/2016	07/12/2016	Rocklea

C-BUS LEARNING PATHWAY A (C-BUS BASIC + TOUCH SCREEN)

The Learning Pathway A is a training course that will provide an entry level for consultants, electrical contractors, system integrators and partners who wish to learn how to design, install and program a C-Bus system including C-Bus Touch Screen.

Start date	End date	Location
21/11/2016	25/11/2016	Brisbane
28/11/2016	02/12/2016	Melbourne
05/12/2016	09/12/2016	Rocklea

C-BUS LOGIC

The C-Bus Logic training course is designed for consultants, electrical contractors and system integrators who wish to learn how to program the C-Bus Logic Engine located in C-Bus Touch Screen or C-Bus Pascal Automation Controller (PAC).

Start date	End date	Location
16/11/2016	17/11/2016	Perth

C-BUS TOUCH SCREEN

This training course is designed for consultants, electrical contractors and system integrators who wish to learn how to program C-Bus Touch Screens.

Start date	End date	Location
24/11/2016	25/11/2016	Brisbane
01/12/2016	02/12/2016	Melbourne
08/12/2016	09/12/2016	Rocklea

CONEXT XW+ AND SW/SW+ INVERTER/CHARGERS FOR OFF-GRID APPLICATIONS

The Conext XW Inverter/Chargers course will equip the attendee with the skills to design off-grid systems, program the inverter charger, fault find and maintain off-grid and battery backed energy storage systems used in conjunction with external generators and solar charge controllers.

Start date	End date	Location
06/12/2016	07/12/2016	Brisbane

DALICONTROL SIMPLE WIZARD

This training course is designed for electrical contractors and system integrators who wish to learn the installation and commissioning of a DALI system using user-friendly Simple Wizard software.

Start date	End date	Location
16/11/2016	16/11/2016	Brisbane

ECOXPERT - PRACTICAL ENERGY AUDIT

This training course will ensure that an EcoXpert can undertake an energy audit step by step and can generate an energy audit report.

Start date	End date	Location
23/11/2016	24/11/2016	Melbourne
29/11/2016	30/11/2016	Brisbane

ECOXPERT - SELLING AND NEGOTIATION

This course is designed to help you develop the fundamental skills and techniques required to more effectively meet your customer's needs.

Start date	End date	Location
17/11/2016	17/11/2016	Adelaide
24/11/2016	24/11/2016	Perth

PUSH BY SCHNEIDER ELECTRIC
WWW.CLIPSAL.COM/TRAINING

PUSH CONTROLS - CORE PRINCIPLES

The Push Control Core Principles training course is an entry level training course designed for electrical contractors and apprentices who wish to learn how to install and program Push Controls products.

Start date	End date	Location
22/11/2016	23/11/2016	Perth
29/11/2016	30/11/2016	Brisbane
05/12/2016	06/12/2016	Sydney

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

CHECKING AND TESTING AN ELECTRICAL INSTALLATION

This non-endorsed course provides licensed electricians and final year apprentice electrical mechanics and electrical fitters with knowledge to visually inspect and test a LV electrical installation in compliance with the requirements of AS/NZS 3000.

Start date	End date	Location
16/11/2016	16/11/2016	Jandakot
17/11/2016	17/11/2016	Joondalup
23/11/2016	23/11/2016	Jandakot
07/12/2016	07/12/2016	Jandakot
09/12/2016	09/12/2016	Jandakot
14/12/2016	14/12/2016	Joondalup
14/12/2016	14/12/2016	Jandakot

ELECTRICAL CONTRACTOR TRAINING PROGRAM (ECTP)

This EnergySafety WA-approved course satisfies the Electrical Contractor Training Program (ECTP) and provides licensed electricians with the training, skills and knowledge rquired to identify, investigate and apply statutory and legislative requirements, manage jobs and operate a business, and inspect and test electrical installations according to regulatory requirements.

Start date	End date	Location
28/11/2016	02/12/2016	Joondalup
03/12/2016	15/12/2016	Joondalup
12/12/2016	16/12/2016	Jandakot

HIGH VOLTAGE SWITCHING SYSTEMS OPERATIONS COURSE

This industry-endorsed course, derived from the UEP12 Electricity Supply Industry-Generator Sector Training Package and the UET12 Transmission, Distribution and Rail Sector Training Package, is intended for electrical workers and electrical engineers working with HV switchgear in industrial facilities and networks.

Start date	End date	Location
21/11/2016	25/11/2016	Jandakot
28/11/2016	02/12/2016	Jandakot
12/12/2016	16/12/2016	Jandakot

10146NAT COURSE IN ELECTRICIAN - MINIMUM AUSTRALIAN CONTEXT GAP TRAINING

This course provides the Minimum Australian Context Gap training to holders of an Offshore Technical Skills Record (OTSR) for the UEE308011 Certificate III in Electrotechnology Electrician qualification.

Start date	End date	Location
05/12/2016	09/12/2016	Joondalup

UEENEEF102A INSTALL AND MAINTAIN CABLING FOR MULTIPLE ACCESS TO TELECOMMUNICATION SERVICES (OPEN CABLER REGISTRATION)

This nationally-endorsed course provides applicants with the training, skills and knowledge required to achieve ACMA Open Cabler Registration.

Start date	End date	Location
10/12/2016	15/12/2016	Joondalup

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

UEENEEF104A INSTALL AND MODIFY PERFORMANCE DATA COMMUNICATION COPPER CABLING (CATEGORY 5/6/7 STRUCTURED AND COAXIAL CABLING)

	Start date	End date	Location
This nationally-endorsed course is an extension of the ACMA Open Cabler Registration Training Requirements course and provides open cablers with the training, skills and knowledge required to correctly install terminate category 5/6/7 structured and coaxial cabling.	16/12/2016	17/12/2016	Joondalup

RESTRICTED ELECTRICAL LICENCE (REL) COURSE (DISCONNECT & RECONNECT TO 1,000V)

	Start date	End date	Location
This course provides eligible persons with the training, skills and knowledge required to apply for a Restricted Electrical Licence. The full time course is structured to include both theoretical and practical training. The College's training facilities allow for skills to be practiced in a simulated workplace environment. This course is designed for those persons who regularly need to perform electrical work that is associated with a primary work function or activity.	05/12/2016	09/12/2016	Joondalup

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

UEE11 SUSTAINABLE—DESIGNER, INSTALLER OF GRID CONNECTED PHOTOVOLTAIC SYSTEMS SKILL SET

	Start date	End date	Location
This skill set provides licensed electricians with the training to design, install, set-up, test, fault find, repair and maintain grid connected photovoltaic systems and associated equipment.	14/12/2016	18/12/2016	Joondalup

UEE20111 CERTIFICATE II IN SPLIT AIR-CONDITIONING AND HEAT PUMP SYSTEMS

	Start date	End date	Location
This nationally endorsed qualification provides participants with the training and knowledge to install, commission and de-commission single head split air conditioning and heat pump systems to a prescribed routine, where the maximum plant capacity for each system does not exceed 18kWr. It includes wall hung, floor, and ceiling suspended, cassette and ducted fan coil split and water heating heat pump systems.	21/11/2016	25/11/2016	Melbourne

COLLEGE OF ELECTRICAL TRAINING (RTO 2394)
WWW.CET.ASN.AU

UEENEEF105A INSTALL AND MODIFY OPTICAL FIBRE PERFORMANCE DATA COMMUNICATION (OPTICAL FIBRE CABLING COURSE)

This nationally endorsed course is an extension of the ACMA Open Cabler Registration Training Requirements Course, and provides applicants with the training, skills and knowledge to correctly install and terminate Optical Fibre Cabling.

Start date	End date	Location
25/11/2016	26/11/2016	Joondalup

LEGRAND
WWW.LEGRAND.COM.AU

LEGRAND MYHOME AUTOMATION TRAINING - KIT SOLUTION

During this hands-on, one-day course you will learn the capabilities of a MyHOME system, how to program a MyHOME Kit and how to sell a MyHOME kit to your customers.

Start date	End date	Location
21/11/2016	21/11/2016	Knoxfield

LEGRAND MYHOME AUTOMATION TRAINING - FULL SOLUTION

During this hands-on, two-day course you will learn the capabilities of a MyHOME system, how to program a MyHOME system and how to sell a MyHOME system to your customers.

Start date	End date	Location
22/11/2016	23/11/2016	Knoxfield

BTICINO INTERCOM SYSTEMS TRAINING - 2 WIRE AND D45

During this hands-on, two-day course you will learn the capabilities of a MyHOME system, how to program a MyHOME system and how to sell a MyHOME system to your customers.

Start date	End date	Location
24/11/2016	25/11/2016	Knoxfield

NECA EDUCATION & CAREERS
WWW.NECAEDUCATION.COM.AU

ESTIMATING ELECTROTECHNOLOGY PROJECTS - FUNDAMENTALS STAGE 1

Estimating is a key component in establishing a successful contracting business. Knowing what to charge is only part of the equation. Knowing how long a job will take and what is involved in developing a quotation for a job is critical. This course reviews the methods and procedures commonly used in estimating plus more.

Start date	End date	Location
28/11/2016	28/11/2016	Carlton North

GRID CONNECT

This course provides licensed electricans with the skills to design, install, set-up, test, fault find, repair and maintain grid conencted photovoltaic systems and the associated equipment

Start date	End date	Location
21/11/2016	25/11/2016	Carlton North

NECA EDUCATION & CAREERS
WWW.NECAEDUCATION.COM.AU

LICENSED ELECTRICAN THEORY (LET)

Brush up on your knowledge before you go for your electrical licence. This component prepares you for the LET component plus you can book your assessment at the same time.

Start date	End date	Location
05/12/2016	08/12/2016	Carlton North

LICENSED ELECTRICIAN PRACTICE (LEP)

Brush up on your knowledge before you go for your electrical licence. This component prepares you for the LEP component plus you can book your assessment at the same time.

Start date	End date	Location
23/11/2016	25/11/2016	Carlton North
12/12/2016	14/12/2016	Carlton North

NCC (BCA) LIGHTING

If you are working in the commercial or construction fields or are involved with lighting projects this course is a must for you. Working with the National Construction Code (NCC) and especially understanding the impacts of section J6 on energy efficiency requirements is critical.

Start date	End date	Location
17/11/2016	24/11/2016	Carlton North

REGISTERED ELECTRICAL CONTRACTOR (BUSINESS)

If you want to start your own electrical contractor business then this course is for you. The course sets out the knowledge and skills required to ensure regulatory, technical, occupational and workplace relation requirements are met in conducting a contracting business.

Start date	End date	Location
21/11/2016	24/11/2016	Carlton North

SAFE WORK PRACTICE (SWP)

Brush up on your knowledge before you go for your electrical licence. This component prepares you for the SWP component plus you can book your assessment at the same time.

Start date	End date	Location
21/11/2016	21/11/2016	Carlton North
28/11/2016	28/11/2016	Carlton North
02/12/2016	02/12/2016	Carlton North
15/12/2016	15/12/2016	Carlton North

COMPETENCY TRAINING
WWW.COMPETENCYTRAINING.COM.AU

HAZARDOUS AREAS CLASSIFICATION

With this course, students have the opportunity to complete the Hazardous Area Classification course if the full Hazardous Area Classification and Design course is not required. This is an advanced course, intended for electrical workers, technicians, engineers and senior engineers involved only in Hazardous Area Classification. It covers Hazardous Area Classification procedures and techniques for potentially explosive gas/vapour atmospheres and combustible dust atmospheres.

Start date	End date	Location
21/11/2016	23/11/2016	Auckland
28/11/2016	30/11/2016	Brisbane
05/12/2016	07/12/2016	Brisbane

COMPETENCY TRAINING
WWW.COMPETENCYTRAINING.COM.AU

CERTIFICATE IV - ELECTRICAL INSTRUMENTATION

This course is the full Certificate IV Hazardous Areas – Electrical. Comprised of two components, the five day Installation and Maintenance of Electrical Equipment in Hazardous Areas course (or proof of equivalent competencies) plus the completion of an RPL kit (Recognition of Prior Learning). This course is derived from the UEE11 Electrotechnology Training package and contains nationally recognised units of competency.

Start date	End date	Location
05/12/2016	09/12/2016	Brisbane

HAZARDOUS AREAS CLASSIFICATION AND DESIGN

This advanced course is intended for electrical workers, technicians, engineers and senior engineers involved only in area classification for electrical equipment in hazardous areas. It covers hazardous area classification procedures and techniques for both gas/vapour installations and for combustible dusts, including the proper methods for documenting the classification. Participants complete several classification tasks using real world input data during the training.

Start date	End date	Location
21/11/2016	25/11/2016	Auckland
28/11/2016	02/12/2016	Brisbane
05/12/2016	09/12/2016	Adelaide

COMPETENCY TRAINING
WWW.COMPETENCYTRAINING.COM.AU

HIGH VOLTAGE SWITCHING OPERATIONS - REFRESHER

This course is intended for electrical workers and engineers working with HV switchgear in industrial facilities and networks. This course highlights relevant changes in standards and legislation, and revisits the site's specific HVIA procedures, including switching officer responsibilities, access, test and work permit issuing and recipient duties. It is for personnel who are already authorised switching officers and is recommended every two years.

Start date	End date	Location
01/12/2016	02/12/2016	Perth
01/12/2016	02/12/2016	Melbourne
08/12/2016	09/12/2016	Melbourne

HIGH VOLTAGE SWITCHING OPERATIONS

This course is intended for electrical workers and engineers working with HV switchgear in industrial facilities and networks. Emphasis is placed on practical switching exercises, performed either at our facilities or on the customer's own HV equipment. Participants are also taught switching theory and the responsibilities of permit users and recipients.

Start date	End date	Location
21/11/2016	25/11/2016	Perth
21/11/2016	25/11/2016	Brisbane
28/11/2016	02/12/2016	Perth
05/12/2016	09/12/2016	Melbourne
12/12/2016	16/12/2016	Perth
12/12/2016	16/12/2016	Brisbane

TRADESTUFF

THE ONLINE STORE FOR TRADIES

AS/NZS 3000:2007 The Wiring Rules (includes Amendment 1:2009 and Amendment 2:2012)

For electricians, the Wiring Rules are probably your most valuable tool, designed to protect you, your customers and their property – and every electrician in Australia and New Zealand is urged to familiarise themselves with the this Standard and its associated Amendments. Part 1 of this document provides uniform essential elements that constitute the minimum regulatory requirements for a safe electrical installation. Part 2 provides installation practices that achieve certainty of compliance with the essential safety requirements of Part 1. Recognised as the benchmark for safe and efficient electrical installations, this is one of the most widely used Standards in Australia and has played an important role in reducing the incidences of electrical mishaps and injuries.

$229.00 Spiral bound.....CODE 431s

Electrical Principles for the Electrical Trades

Volume 1 & 2

Volume 1:
Ideal for electrical apprentices, the 6th edition of *Electrical Principles for the Electrical Trades* is the first volume of a two-volume set. Written by two TAFE/VET teachers, the book looks at the fundamental knowledge required to become a successful electrician. A portion of the proceeds from this book will go to WorldSkills Australia.

Volume 2:
Volume 2 of *Electrical Principles for the Electrical Trades* explores the electrical applications of the principles learned in Volume 1. This is an excellent learning resource for electrical apprentices and teachers, as well as being a suitable long-term reference for tradespeople. A portion of the proceeds from this book will go to WorldSkills Australia.

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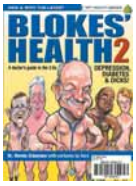
Blokes' Health 2 – Depression, Diabetes and Dicks!



Following in the footsteps of Dr Bernie Crimmins original best-seller, Blokes' Health: comes Blokes Health 2. We all want to live as long and as healthy as we can, with good quality of life. In this book Dr Bernie Crimmins outlines the main health problems that affect males and gives some simple advice on how to prevent, or detect early, those particular diseases which may lead to an early demise.

$19.95.....CODE 671

Electrical Wiring Practice

Volume 1

Volume 1 of *Electrical Wiring Practice* has been updated to provide guidance in the use of the Australian and New Zealand Wiring Rules, AS/NZS 3000:2007, including the 2009 Amendments. Taking a practical approach, this book employs clear visual tools to illustrate the knowledge and practices required by specified products and the Standards.

$89.95.....CODE 086

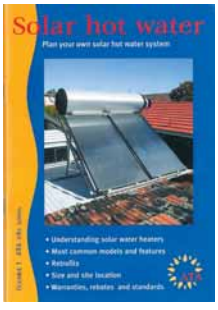
Electrical Wiring Practice

Volume 2

Volume 2 of *Electrical Wiring Practice* has been updated to provide guidance in the use of the Australian and New Zealand Wiring Rules, AS/NZS 3000:2007, including the 2009 Amendments. Taking a practical approach, this book employs clear visual tools to illustrate the knowledge and practices required by specified products and the Standards.

$95.95.....CODE 364

Solar Hot Water



This booklet gives you an understanding of solar hot water heaters and the most common models and their features. It also covers retrofits, size and site locations, including mains pressure versus low pressure, collectors, tanks, boosting and freeze protection, warranties, rebates and Standards.

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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.

$120.00 ..... **CODE 583**

Electrical Installation Standards

AS/NZS 3008.1.2:2010
Selection of cables for alternating voltages up to and including 0.6/1kV

Plus Amendment 1

This Standard specifies current-carrying capacity, voltage drop and short-circuit temperature rise of cables, to provide a method of selection for those types of electric cables and methods of installation that are in common use at working voltages up to and including 0.6/1kV at 50Hz AC. It is applicable to typical Australian installation conditions where the ambient air temperature is 40°C and ambient soil temperature is 25°C.

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AS/NZS 3001:2008
Transportable structures and vehicles including their site supplies

Plus Amendment 1

This Standard sets out requirements for electrical installations associated with transportable structures and vehicles intended for connection to low-voltage AC supply systems (i.e. exceeding 50 V AC but not exceeding 1,000 V AC). For the purposes of this Standard the term transportable structure includes vehicles and structures with or without wheels that are capable of being readily moved from one site to another either under their own motive power or otherwise.

$110.25 ..... **CODE 196**

AS/NZS 3080:2013:
Generic cabling for commercial 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.

$219.95 ..... **CODE 179**

AS/NZS 3012:2010
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.

$150.00 ..... **CODE 345**

AS/NZS 4836:2011
Safe working on or near low-voltage electrical installations and equipment

This Standard outlines the principles and procedures of safe work, organisation and performance on or near low-voltage electrical installations and equipment. It provides a minimum set of procedures, safety requirements and recommendations to manage the hazards associated with electricity, specifically arc blast, arc flash, electric shock and electrocution.

$150.00 ..... **CODE 574**

AS/NZS 3017:2007
Verification guidelines

This Standard provides testing procedures and inspection guidelines to ensure that an electrical installation complies with the requirements of AS/NZS 3000 with regard to the prevention of a fire or preventing a person from receiving an electric shock. It includes tests for earth continuity, insulation resistance, polarity and incorrect circuit connections, fault-loop impedance and operation of residual current devices.

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