

# PLUMBING CONNECTION

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WINTER 2016



## SUCK IT UP

VACUUM TOILETS GO MAINSTREAM



### INSIDE:

AN UPDATE ON NATIONAL GAS  
TECHNICAL REGULATIONS

TIPS FOR SUBMITTING A TENDER

WORLDSKILLS: BUILDING  
FUTURE CAREERS

THE REASONS BEHIND PIPE  
SYSTEM LOSSES

# CONTINUOUS FLOW JUST GOT A LOT BETTER!

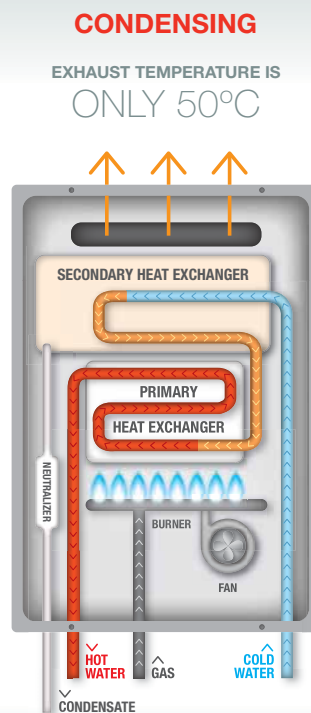
## Dux Condensing Continuous Flow

### The next generation in continuous flow

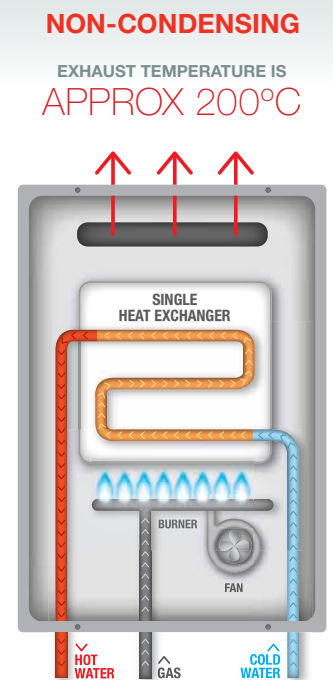
- Next generation delivers over \$1000\* in savings over the 12 year warranted heat exchanger life
- Captures and re-uses circa 150°C of exhaust heat normally wasted, which delivers big energy savings and reduces emissions
- Providing Australian homes with superior technology straight from Noritz, Japan's leading manufacturer of household water heaters
- Features superior condensing technology that boasts over 90% thermal efficiency by capturing additional heat in the secondary heat exchanger
- Compact size and light-weight like traditional continuous flow models
- Inbuilt neutralised condensate tank

\*Running cost savings compared to a 5 star natural gas storage water heater over the 12 year warranty of the heat exchanger.

\* 12 year warranty on heat exchangers including 3 years full parts and labour.



(Condensing technology)  
Thermal efficiency = 90-96%



(Conventional technology)  
Thermal efficiency = 80-84%

NEW



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12  
YEAR  
WARRANTY\*



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# Aztec Australasia

## Continuing to Move in the Right Direction

6

YEARS  
AND STILL

*Running Hot*

Aztec Australasia has now been Operating for 6 years and there seems to be no slowing down. Karl Whitten Managing Director said "the ride so far has been enormous. Starting with our signature range of MasterFlash Roof Flashings in 2010, move forward 6 years and we now specialise in 5 different ranges of products all servicing the plumbing industry. This allows us to enter many market segments including Plumbing, Electrical, Heating, air conditioning and Solar."

In this time Aztec has relocated 3 times to larger premises and they believe that another one isn't too far away. A big part of their success has come from internal beliefs, being Easy to Do Business With, keeping processes simple and most importantly meeting customer's needs.

Karl went on to say, "I would like to take this opportunity to thank all our supporters since day one of this start up business and also the Tradies that have assisted with product development during our testing phase to end up with a quality product to market."



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# Keeping Quality at the Front of our Business

Since Day one Aztec Australasia has had a great Partnering with the Aztec Washer Group out of the USA. This has allowed us to have full access to the production team, development input and the use of all their fully equipped state of the Art Labs in Mexico. This has been a great advantage as any products that we source from around the world can be continually tested for product consistency, ongoing product quality and future enhancement of the product. Our Quality assurance continues to remain at the top end of our business.

## Aztec Continues to Listen and Deliver

### AZTEC STRETCHABLE LINEAR FLASH

Product Code: BGEJSLF10G

Aztec Stretchable Linear Flash is the newest product to the range, coming in a number of lengths from 1 meter to 10 meters and 275mm wide, we are sure we'll be able to accommodate most applications. The linear flash is suitable for the following applications: • **Corrugated Metal Roofs** • **Large Round Pipes** • **Large Square Vents** • **Transition/Parapet Walls** • **Stepped Roofs**  
Aztec has introduced this product to the range to make applications easier for the customer, with the extra stretch in the flashing the fit becomes more accurate. Aztec Provides a 25 year Warranty with our Stretchable Linear Flash. Our EDPM rubber compound is UV, Ozone resistant and completely paintable!



### FIX-A-FLASH

Product Code: MFSFIXB

Fix-a-Flash is the optimal Flashing for most metal Roofing applications as it covers a pipe size range of 0mm to 381mm and has a large base size of 495mm which makes it the perfect flashing for wood to gas heater conversions. The Fix-a-Flash is available in EPDM rubber or Silicone compound meaning it can cover temperatures from -55° to 260°. The base dimension of 495x495mm makes applications for a large pre-existing hole and a small pipe replacement simple!



### GREY AUSSIE CONNECTORS

Grey Aussie Connectors have now landed at Aztec! After many months of planning, we now offer grey or black aussie connectors. Sizes of 32mm to 300mm we have straight PVC to PVC, earthenware to PVC, earthenware to earthenware, reducers and end caps. With our large range of connectors we are able to satisfy our customer's needs.



### AZTEC BOX GUTTER EXPANSION JOINT

Product Code: BGEJ225

Aztec Box Gutter Expansion Joint is 225mm wide and available in various lengths and our EDPM rubber compound is UV, Ozone resistant and completely paintable with regular acrylic paint. Its expandable metal sides make this product is easy to mould to any shape. Aztec Box Gutter Expansion Joint can be used for the following: • **Box Gutter Expansion Joints** • **Corrugated Metal Roofs**  
Aztec's Box Gutter Expansion Joint is designed to expand and contract with your box gutter joint without allowing cracks and leaks. The Flat Design eliminates pooling. Our products are designed to last!



**Aztec**  
**Australasia**  
*Solution Driven*



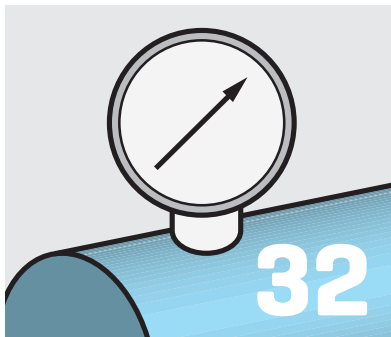
If you are frustrated by a product or have an idea that could make life easier for you feel free to call the Team Aztec Hot Line and one of our Aztec Team members will put you in touch with our product development team. Ph **03 9768 2394** Email [orders@aztecau.com.au](mailto:orders@aztecau.com.au)

Aztec Products can be purchased from Plumbing Outlets across Australia

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Discover how the gasfitting industry works in Victoria and how regulatory responsibility is shared between ESV and the Victorian Building Authority.

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WorldSkills Australia aims to promote trade careers by giving young Aussies opportunities to learn and showcase trade related skills.

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Dr Terry Lucke explains the effects of pipe system losses, the reasons why they occur and how to avoid them.

**40 BUILDING FOR THE FUTURE**

With a vision to expand its reach and training capabilities, two new Plumbing Industry Climate Action Centres are on their way in Victoria's south east and the coastal city of Geelong.

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The ABCB produces a variety of resources to keep you informed and up-to-date with what is happening with the National Construction Code (NCC).

**50 DO YOU NEED A WRITTEN 'PROJECT' CONTRACT?**

It can be easy to avoid writing the details of particular jobs when all you want to do is get in, get the job done and get out... but you shouldn't.

**52 VALVE CONTROL**

In his new column, Russ Dunne of Bermad Water Technologies explains what else there is to know about installing a level control valve in a reservoir building application.

# Plumbtec can pinpoint your plumbing needs...

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When it comes to toilet pans and flushing devices, one size does not fit all. Terry Nguyen explains some of the issues that can occur if the flushing device and toilet pan has not been correctly matched.

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Peter McLennan reflects on the recent World Plumbing Day and asks some questions of the industry and the continual lack of education, at the apprenticeship stage, in backflow prevention.

**70 A SOUND INVESTMENT**

Taking the time to install a well-designed plumbing system has all sorts of paybacks, but no noise is one of the best for everyone involved says John Fennell.

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Whether you like it or not, social media is here to stay. Cecelia Haddad explains how to use it best to your advantage.

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Andy Farrell explains that when it comes to submitting tender letters, it's more than just a game of numbers.



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# SLOW & STEADY WINS THE RACE

I still remember publisher Jeff Patchell explaining the concept of vacuum toilet technology to me for the first time. It was three years ago and I was working on my second edition of this magazine. How time flies, as they say.

Perhaps not so much for the four manufacturers working towards achieving Australia and New Zealand's first standard for vacuum drainage technology though.

It's been a long journey from concept to completion – five years in fact – and countless hours, money and knowledge has gone into the development of the new Standards Australia Technical Standard SA TS 100:2015 *Vacuum WC pans and interface valves intended for use with vacuum drainage systems and designs*.

With that being said, it's important to understand that standards don't just happen by chance. A lot of time and effort goes into their development and it can be an exhaustive process for all involved. In this particular instance, Avac, HI Fraser, Vacuum Toilets Australia and WC Innovations have invested an enormous amount of time and money to make it a reality.

Now that the Deemed-to-Satisfy solutions under the PCA has been published for public comment, the market for vacuum toilets is set to expand beyond the confines of planes, boats and correctional facilities, where vacuum toilets have been installed since the 1960s.

Suppliers expect there to be a higher degree of commercial take up as specifiers acknowledge the benefits that vacuum technology presents and now that they can achieve a WaterMark.

The collaborative effort of all four suppliers, in conjunction with PPI Group and Standards Australia has really opened the doors to vacuum toilets, and if the adoption of the technology in Europe and other places is anything to go by, installation numbers should rise considerably.

While the process began in 2011, managing director RBA Group and chair of committee Marc Buman is confident that the hard work will certainly pay off.

With the expected increase in popularity on the cards, it will pay to familiarise yourself with the technology and understand where its benefits can come into play, particularly in building situations where installing traditional toilets is costly or impractical.

Keep an eye out for training courses provided by suppliers and training organisations in the near future.



Vacuum toilets are set to go mainstream.

## FIRING UP THE GAS INDUSTRY

Traversing the gas industry seems akin to tip toeing your way around a minefield, such is the way it is set up and regulated by various bodies around the country.

We've decided to take on some extra homework and clarify who regulates what in each state, starting with Victoria. Michael Weber from Energy Safe Victoria explains the difference between ESV and the Victorian Building Authority when it comes to gas regulation and who is responsible for the various areas that fall under the gasfitting umbrella.

Michael reveals that in the future gasfitting may come under the wing of the National Construction Code (NCC). This move would support a nationally consistent approach to construction regulation.

The Australian Building Codes Board (ABCB) is currently seeking industry comment regarding whether the technical requirements for on-site gasfitting should be regulated through the National Construction Code (NCC).

Until then, we endeavour to make your journey across the industry that little bit smoother.

Enjoy the read

Justin Felix



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**CECELIA HADDAD**

Cecelia is the director of Marketing Elements, which specialises in PR for the building and environmental sectors. She has over 20 years' experience with many well-known brands in Australia, New Zealand and Southeast Asia.

See **Business Promotion** on page 74.



**RUSS DUNNE**

With 37 years' experience in sales and sales management roles, Russ has a deep knowledge of the technical requirements of pipeline construction and related industry. For the past eight years Russ has played an integral role in BWT's Queensland operations.

See **Valve Control** on page 52.



**ANDY FARRELL**

Andy Farrell has put a lot of work into developing an estimating and management system to make running a plumbing business as simple as possible. He's also made himself available to answer any questions readers might have on estimating.

See **Estimating** on page 78.



**DR TERRY LUCKE**

Dr Terry Lucke is Associate Professor in Hydraulic and Civil Engineering at the University of the Sunshine Coast in Australia. His main teaching areas are Fluid Mechanics, Hydraulics and Road and Drainage Design.

See **Hydraulic Classroom** on page 32.



**PETER MCLENNAN**

Peter McLennan has been involved with Backflow Prevention in Australia since the late 1980s. He is the President of the Backflow Prevention Association of Australia Inc., and Secretary of the Backflow Prevention Association of Australia Inc. Queensland Chapter.

See **Backflow Prevention** on page 66.



**JON PALFREY**

Jon Palfrey is Rheem Australia's Training Manager and also a qualified plumber. He conducts training to plumbers and specifiers across the southern states, covering the latest water heater technology and key water heating issues facing plumbers.

See **Hot Water Clinic** on page 82.

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Over the years, Rinnai Australia has developed a destiny of its own, establishing manufacturing plants locally and refining the product range by listening to our customers, to suit the Australian way of life.

The Rinnai brand is trusted by tradespeople across the country and currently occupies a very strong space in the Australian market. Rinnai is known as an enduring and reliable provider of home appliances and have a reputation for reliable and high quality products.

### Commercial projects

Drawing from over 40 years' experience in the design and manufacture of high efficiency hot water systems, the Rinnai Commercial division has supplied a host of customised solutions for many challenging projects, including designing and supplying the hot water systems that power the Soul apartments in Surfers Paradise and the Sydney Cricket Ground to name a few.

Knowledge gained from these projects shows us that just providing a hot water plant to meet a set delivery requirement is not the only criteria; it must do much more.

### New manufacturing site in Melbourne

Rinnai's growth, particularly in tanks, has led to the establishment of their third manufacturing site in Australia. The Adelaide plant produces commercial, solar and flueing systems; in Melbourne their subsidiary Brivis manufactures ducted gas, evaporative and refrigerated cooling products. Rinnai's new facility located adjacent to Brivis will manufacture next generation hot water systems, heating and cooling products for the Australian and international markets.

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**ENVIRONMENTALLY CONSCIOUS**

Iplex Pipelines was established in Australia in 1938 and over the past seven decades has grown to become a recognised leader in the supply of pipeline products to the water and gas industries. Today the company is a wholly owned division of Fletcher Building Ltd and is among the first companies to publish an Environmental Product Declaration (EPD) in Australia. Rodger Connolly, Iplex National Technical Services Manager explains that the business case for product manufacturers to produce an EPD is quite clear.

"There is a growing market demand for validated environmental credentials of building products, with infrastructure projects, like airports and bridges, worth billions of dollars under the Infrastructure Sustainability Council of Australia (ISCA) rating scheme, 1000 commercial buildings already been rated under the Green Building Council of Australia's (GBCA) Green Star certification scheme and 300 currently under construction.

"EPDs help our customers – builders and developers – seeking to construct environmentally responsible buildings and infrastructure by providing them with information and the evidence they require to claim credit points under the GBCA and ISCA rating systems for their projects."

Examples of investments Iplex has made include power efficient machinery, rainwater harvesting, strategic factory locations and route planning.

"We also insist on sourcing polymer and additives from certified Best Environmental Practice suppliers."

For other companies considering a similar approach, Rodger has the following advice: Keep adequate records of records like water

and power consumption, waste generation, imports, location of your markets and how you distribute to them.

"The process of doing an EPD has highlighted the benefits of doing investments in energy efficiency and recovery, low power lighting etc.; those decisions have become clear cut in our business."

AIRAH's comprehensive technical bulletin on kitchen exhaust fire safety is available online

Understanding and addressing the special fire risks inherent in commercial kitchen ventilation systems has never been more important.

AIRAH has released Fire safety – Kitchen hood exhaust systems, a free online technical bulletin that offers an in-depth look at the special fire risks associated with commercial kitchen ventilation systems.

The bulletin aims to highlight the main fire safety issues, promote a common language, and improve understanding of the risks and resulting responsibilities of all participants in the supply chain, from design and installation through to operation and continuing maintenance.

"Kitchen exhaust systems continue to feature prominently in commercial building fire events," says AIRAH CEO Tony Gleeson. "We have been advised there was \$30 million worth of damage in just five incidents of businesses burning down in 2014. There are simple ways to avoid kitchen fires, and they should be implemented.

"And now, amid recent updates to relevant Australian Standards, as well as recent changes to the maintenance requirements and focus of the NCC, it is more important than ever to help address misunderstandings and misconceptions."

**UPDATE ON NON-CONFORMING PRODUCT**

A paper on strategies to address risks related to non-conforming building products was released at the end of March.

Recognising concerns about risks posed by non-conforming building products, the Building Ministers' Forum (BMF) meeting of 31 July 2015 agreed to a number of actions that included establishing a Senior Officers' Group (SOG) to investigate strategies to minimise the risks to consumers, businesses and the community associated with the failure of building products to conform to relevant laws and regulations, including at the point of import.

The SOG is comprised of senior officers from the Commonwealth, states and territories. It has undertaken investigations and identified a range of strategies that were presented to the BMF at its meeting on 19 February 2016.

The SOG report notes that the issue of non-conforming building products, whether domestically manufactured or imported, is an important and complex challenge of national significance, impacting on the construction, manufacturing, trade (imports) and retail sectors. It can have life safety, health, economic, legal and social consequences.

The Department of Housing and Public Works, Queensland is coordinating feedback on the strategies to address non-conforming building products.



**Queensland  
Government**

Department of Housing  
and Public Works

More information can be found here:  
[www.hpw.qld.gov.au](http://www.hpw.qld.gov.au)

### ASBESTOS PIPE REMOVAL

Water consumers will face a hefty estimated charge of \$8 billion to safely remove asbestos piping being used in Australia, according to the nation's peak water industry body.

About 40,000 kilometres of water pipelines contain asbestos cement that is starting to wear out, the body said.

It is not widely realised that many of Australia's water pipes were made by Australia's biggest asbestos manufacturer, James Hardie.

"Hardies had a number of factories around the country that just made pipes and they were predominantly used by the different water companies around Australia," said lawyer Tanya Segelov, who is a member of the council for the Asbestos Safety and Eradication Agency.

"There are millions and millions of pipes around the country that remain in the ground that are now 50, 60 or 70 years old.

"So water utilities are monitoring how those pipes are working, how they are holding up," the

association's managing director Adam Lovell said.

The pipes are located all over Australia but they are most concentrated in regional areas, where sometimes up to half of all water pipelines are made with asbestos cement.

There is no evidence the pipes can cause cancer by drinking water from them, but there is a potential danger from dust when the pipes are disturbed.

To fix worn-out pipes is a major expense.

"We estimate that just to rehabilitate all of the asbestos cement pipelines out there is in the order of \$8 billion," Mr Lovell said.

"You don't necessarily want to go rushing out and replace it all, either.

"The current standard practice, the safest practice, is to remove sections of the pipeline... rather than trying to repair it on site."

*This piece was originally published at [www.thenewdaily.com.au](http://www.thenewdaily.com.au).*

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# SUCK IT UP

VACUUM TOILET TECHNOLOGY HAS BEEN AROUND FOR DECADES, BUT UNTIL RECENTLY HAS MOSTLY BEEN CONFINED TO USE IN PLANES, BOATS AND CORRECTIONAL FACILITIES IN AUSTRALIA DUE TO A LACK OF STANDARDS AND CODES PERTAINING TO THEIR INSTALLATION. NOW THAT THIS HAS CHANGED IN 2016, THE VACUUM TOILET MARKET IS TIPPED FOR A BRIGHT FUTURE. **JUSTIN FELIX** REPORTS.

If you've ever used the restroom on a plane or boat you would have noticed something a little out of the ordinary with the toilet. That's because they are fitted with vacuum toilets rather than the traditional toilets you have become accustomed to installing in the built environment. Rather than a rapid influx and swirl of water, vacuum toilets use the combined energies of vacuum pressure and gravity for the collection, conveyance and disposal of waste through a piping network that can be routed above ground. Vacuum drainage systems consist of three main components: a vacuum generating station, a conveyance system and individual collection points.

Toilets are connected to a vacuum piping network via a normally closed vacuum interface valve, which acts as a point of separation between constant vacuum pressure in the waste piping network and atmospheric pressure at the toilet bowl. When the flush valve is activated, the controller opens the interface valve. The pressure differential causes air to enter the toilet bowl and pull the waste through the fixture outlet before transporting it into the piping network, routing it to the vacuum centre. The controller also activates the flush water valve for rinse and re-fill of the bowl. The opening and closing of the interface valve is precisely controlled so that all waste is completely removed from the bowl. A flush is completed using less than a litre of water and any odours or bacteria are removed from the bowl.

Vacuum drainage technology is not new and untested by any means and made its name in marine and aeronautical industries in the 1960s. These specific industries had a direct cost involved with carrying large volumes of water for flushing and waste water so an alternative method was required.

Around the same time vacuum technology started to be used by sewage utility companies on land to take sewage from pits of which one or more homes with traditional drainage might drain to.

Sylvania waters in Sydney is an early example, where the topography [flat reclaimed land on the coast with high water table] made traditional drainage very expensive and near impossible. It moved inside Australian buildings in the early 1990s with a specific need in the correctional and retail building market.

For a number of years now several companies have been providing vacuum systems in Australia; however they



Vacuum toilets use the combined energies of vacuum pressure and gravity for the collection of waste.

haven't been able to take their products mainstream due to a lack of a deemed-to-comply AS3500-type code. This also meant vacuum toilets couldn't achieve a WaterMark as there was no code to test them against.

This, in turn, resulted in a degree of resistance toward specifying vacuum solutions in the market, due primarily to the conservative approach by many specifiers, who wouldn't accept them under the Plumbing Code of Australia's alternative solution for installation approval track. This in itself is quite understandable once you consider the sizeable investment required in such a building-wide hydraulic system. ▶



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WaterMark Level 1

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**Jets Vacuum AS**

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the right to use the WaterMark in accordance with the "Procedures for Certification of Plumbing and Drainage Products - WaterMark Technical Specification" and the Plumbing Code of Australia only in respect of the certified product as described in the attached WaterMark Schedule. The Licence is granted subject to the rules governing the Watermark Certification Scheme and the Terms and Conditions for WaterMark Certification.

Evaluated to:

**SA TS 100 Vacuum WC Pans and interface valves intended for use with vacuum drainage systems and designs**

Manufacturer:

**Jets Vacuum AS**

Licence No.: WM-022505

(Certificate of Certification No.: IAPMO-WM-022505-101-R00)

Certified Date: 20 January 2016

Issue Date: 20 January 2016

Expiry Date: 19 January 2021

Chief Executive Officer of the IAPMO Group

This WaterMark certification is for the period indicated herein and is void after the date shown above. Any change in material, manufacturing process, marking or design without having first obtained the approval of IAPMO R&T Oceana, or any evidence of non-compliance with applicable Standards, Specifications or of inferior workmanship, may be deemed sufficient cause for revocation of this certification. Reproduction of or reference to this certificate for advertising purposes may be made only by specific written permission of IAPMO R&T Oceana. Any alteration of this certificate could be grounds for revocation of this certification.

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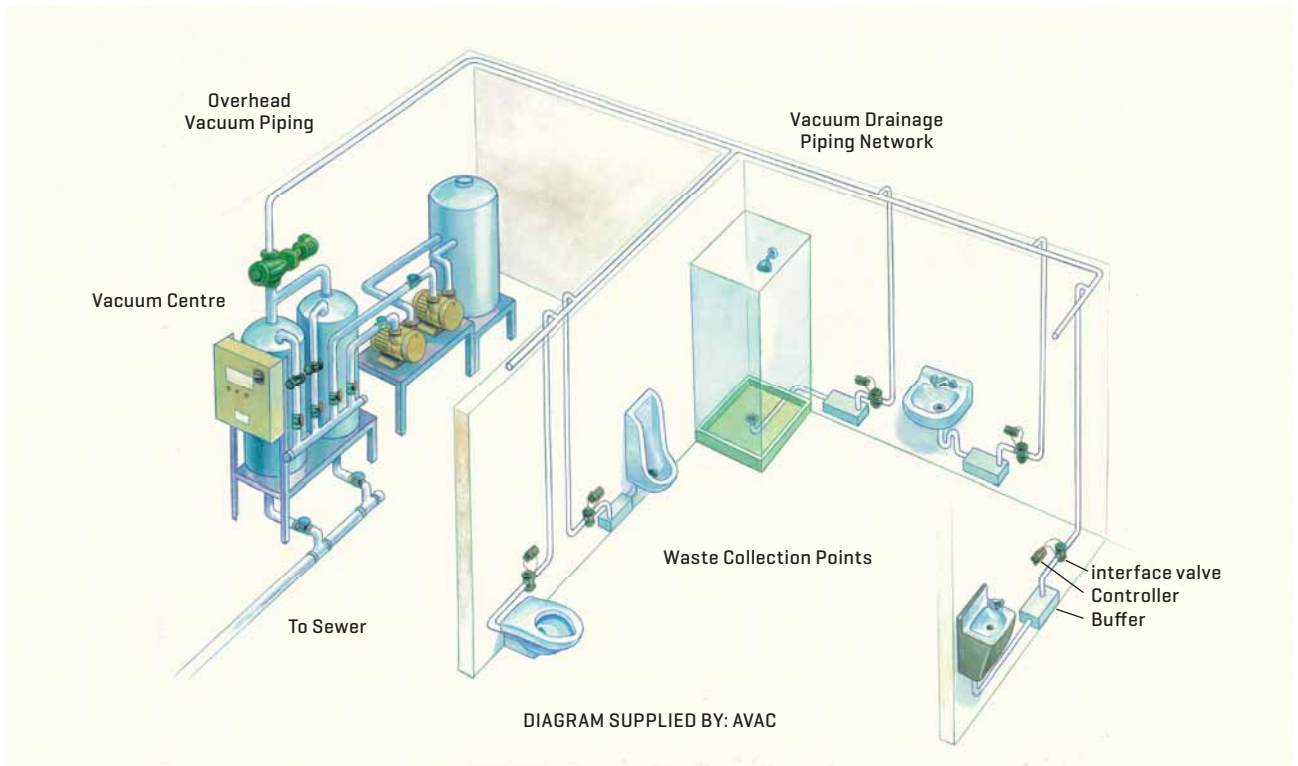


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A typical vacuum toilet network: pressure differential causes air to enter the toilet bowl and pull the waste through the fixture outlet before transporting it into the piping network, routing it to the vacuum centre.

Through hard work, persistence and a lot of time and effort, this has now changed and the tide has begun to shift in favour of the suppliers.

In July 2011 the Plumbing Product Industry Group [PPI] offered to assist with establishing a special interest group to begin drafting a code. The PPI secretariat worked with the special interest group to lodge applications for WaterMark Technical Standards with the Australian Building Codes Board [ABCB] earlier in 2013, while at the same time gaining acceptance from Standards Australia for the funding of a project to publish an installation code for Vacuum Drainage within Buildings.

While it's been a long journey the new Standards Australia Technical Standard SA TS 100:2015 Vacuum WC pans and interface valves intended for use with vacuum drainage

systems and designs has been developed. This is the first Standard for Vacuum Toilet Technology in Australia and NZ and the Installation Standard is not far behind.

We caught up with managing director RBA Group and chair of committee Marc Buman to find out how the development of the Standard came about and what it means for the future of vacuum toilet technology in Australia and the plumbing industry as a whole.

"We now have a code that we can WaterMark our vacuum toilets against and AS3500.2 [Installation Code] for Deemed-to-Satisfy solutions under the PCA has been published for public comment in regards to the addition of vacuum drainage but it's not completely over the line and published as a document," Marc says.

"The committee ran under the umbrella of the PPIG and the special interest group within that, which relates to vacuum drainage, has four companies involved: Avac, HI Fraser, Vacuum Toilets Australia and WC Innovations. We have all been involved from the outset."

It's important to understand that standards don't just happen by chance. A lot of time and effort goes into their development and it can be a long journey for all involved. In this particular instance, the four manufacturers have invested an enormous amount of time and money to make it a reality.

**“ THIS IS THE FIRST STANDARD FOR VACUUM TOILET TECHNOLOGY IN AUSTRALIA AND NZ AND THE INSTALLATION STANDARD IS NOT FAR BEHIND. ”**

“PPIG has helped facilitate the meetings by providing funds for physical spaces to meet; however, we as the manufacturers have all covered the travel costs required to get us all in the same room.

Standards Australia picked up the project and dedicated its own project manager to oversee proceedings; however, all of the drawings and content came from the four interested parties. The journey has spanned five years and hasn't come without challenges.

“I'm optimistic that the challenges we faced won't be as severe for those trying to achieve the same sort of thing because we have pointed out a lot of holes that have evolved with the transition of the WaterMark scheme and the Australian Building Codes Board (ABCB) running the Plumbing Code of Australia (PCA) and the likes.

“We came in with our project early on in that process and faced a lot of challenges that Standards Australia and the ABCB are now aware of. With that in mind, you would assume that if suppliers came along today and made the same sort of applications that we did, Standards and the ABCB would make recommendations and suggestions earlier on in the process,” Marc says.

Now that the Deemed-to-Satisfy solutions under the PCA has been published for public comment, the market for vacuum toilets is set to expand beyond the confines of planes, boats and correctional facilities.

Suppliers expect there to be a higher degree of commercial take up as specifiers acknowledge the benefits that vacuum technology presents. Some of these benefits include, but are not limited to, the following:

- Allows for cheaper building re-use as drainage can go up and around obstructions that may make traditional 1:60 drainage difficult.
- Toilets use less water: between 800ml-2L for a full flush
- Less blockages in environments where deliberate misuse of a drainage system is likely or common such as shopping centres, sports arenas, and correctional centres.
- Centralised plant on large campus sites where there might normally be many pumped wet wells.
- The ability to take drainage up and therefore contain all the services of a single floor within its floor space and negating the need to service one floors drainage in another floors ceiling. This is particularly advantageous ➤



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**IMAGE 1 & 2:** Avac’s training centre exposes new and existing contractors to vacuum toilet technology. **IMAGE 3:** The Pixel Building located at 990 LaTrobe Street, Melbourne.

in retail, where one retailer wants to add drainage points but sits in a shopping centre directly above another tenant such as a bank where there may be security issues.

- Vacuum sewerage systems can be retrofitted to allow additional fixtures to be installed to cope with demand increases.

**A BRIGHT FUTURE**

The collaborative effort of all four suppliers, in conjunction with PPI Group and Standards Australia has really opened the doors to vacuum toilets, and if the adoption of the technology overseas is anything to go by, there should be many more installations around the country over the next few decades. Vacuum Toilets Australia marketing director Carolin Grimm explains that some big projects have already been completed, with more on the horizon.

“Vacuum toilets are an advanced Ecologically Sustainable Design [ESD] that has been in use in multistorey buildings internationally for a number of decades. With the gaining of the first WaterMark for Vacuum Toilets, the benefits of the system can now be fully realised in Australia and New Zealand.

Vacuum Toilets Australia, a Western Australian based company, markets the Norwegian Jets Vacuum Toilet Systems and was the first Australian supplier to achieve the WaterMark.

“We installed a large system in 2009 in the Melbourne Water headquarters at 990 LaTrobe Street in Docklands as well as the Pixel Building where new technologies are showcased. Additionally, we have installed the system into the Historic ‘Legion House’ at 161 Castlereagh Street in Sydney and the event industry has adopted the system across Australia and New Zealand,” Carolin said.

“With ongoing projects in Sydney, Melbourne and Perth, the company is poised for expansion.”

In order for the implementation of vacuum technology to be successful on a broader scale requires plumbers to be up to speed when it comes to best installation practices and as Marc explains, this is a key area for Avac Australia.

“Training is a very important facet. We have a fully set up classroom/hands on environment up in Brisbane. Once the codes are published we’d like to work with the likes of PICAC in Victoria and the Master Plumbers across the country to work on ensuring current and future contractors are exposed to this kind of technology.” ■

**Avac**

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

**Vacuum Toilets Australia**

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

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- MCG, New Perth Stadium



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# AN UPDATE ON NATIONAL GAS TECHNICAL REGULATIONS

WE ASKED TECHNICAL COMMUNICATOR, ENERGY SAFE VICTORIA, **MICHAEL WEBER** TO PROVIDE AN OVERVIEW OF CURRENT AND FUTURE NATIONAL GAS TECHNICAL REGULATIONS AS WELL AS EXPLAIN THE ROLE OF THE GAS TECHNICAL REGULATORS COMMITTEE [GTRC].

## **GAS TECHNICAL REGULATORS COMMITTEE**

ESV, as the technical regulator for Victoria, liaises with technical regulators throughout Australia and New Zealand. As a result of this liaison and the fact that there is no overriding federal legislation for the safe transport and use of gas, the Gas Technical Regulators Committee [GTRC] was formed and considers issues both upstream and downstream of gas supply points.

The GTRC:

- promotes gas safety
- develops a common approach to gas technical and safety activities
- benchmarks best practices
- shares information
- provides a forum and discussion group to facilitate gas industry reform.

## **NATIONAL DATABASE OF CERTIFIED GAS APPLIANCES AND COMPONENTS**

To assist gasfitters in identifying certified gas appliances and components a National Certification Database has been developed by ESV on behalf of the GTRC.

This National Certification Database provides information in relation to certified products as well as the certification status of those products. Gasfitters are now able to confirm that appliances and components are certified before they install them.

The database can be found online at [www.gtrc.gov.au](http://www.gtrc.gov.au). This information is typically on a monthly basis. The recognised certification bodies [AGA, SAI Global, IAPMO, Global-Mark, Vipac] also have their own certification listings that can be referred to via their respective websites which can be found via the GTRC website.

To find a certificate in the various Certification Services databases, enter your search terms in the provided search function space and press 'Go'.

## **SCHEME RULES – GAS TECHNICAL REGULATORS COMMITTEE**

Australian States and Territories administer their respective legislation requiring gas products to be approved before they are offered for sale and use. Scheme Rules



are being developed to provide a framework to ensure consistency for the operation of a certification scheme to certify gas products. These rules allocate responsibility and accountability to the certifying bodies for gas appliance and component approvals so that the process for certifying products is robust, effective and recognised across Australia and New Zealand. The Australian State and Territory Regulatory Authorities, through GTRC members, are responsible for developing and maintaining the necessary details of each component of these rules.

## **NATIONAL GAS COMPLIANCE MARKS**

For some time now both New Zealand and Australia have recognised the need for a common certification badge or label recognised by the retailer, the consumer and the gasfitter. In Australia the badge or label [see above] will be known as the Gas Compliance Mark. It shall be permanently affixed to the gas appliance so that it is clearly visible to the installer and shall remain durable and legible. The GCM may be in the form of a plate, a label or screen printed directly onto the appliance and is an addition to a rating plate or label.

### NATIONAL COMPLIANCE FOR BOATS AND CARAVANS

In addition to a national compliance mark for gas appliances the GTRC is investigating the introduction of a national gasfitting compliance plate for boats and caravans. At present there is no national harmonised compliance plate. This plate will assist the various jurisdictions to easily identify the licensed practitioner responsible for the gas installation work.

### EXPANDING THE NATIONAL CONSTRUCTION CODE TO INCLUDE ON-SITE GASFITTING

In the future gasfitting may come under the wing of the National Construction Code [NCC]. This move would support a nationally consistent approach to construction regulation.

The Australian Building Codes Board [ABCB] is currently seeking industry comment regarding whether the technical requirements for on-site gasfitting should be regulated through the National Construction Code [NCC]. ESV is considering this matter and agrees in principle, although there are some issues to consider.

The ABCB intends that if on-site gasfitting regulation was to be included as part of the NCC, a Gasfitting Code of



In the future gasfitting may come under the wing of the National Construction Code [NCC].

Australia [GCA] would be developed as a stand-alone volume of the NCC that would reference AS/NZS 5601. Each State and Territory would then have the opportunity to 'opt in' and reference the GCA in its legislation. ■

**Gas Technical Regulators Committee**

[www.gtrc.gov.au](http://www.gtrc.gov.au)

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# VICTORIA'S GASFITTING APPROACH: A FLAGSHIP MODEL?

TECHNICAL COMMUNICATOR ENERGY SAFE VICTORIA (ESV) **MICHAEL WEBER** EXPLAINS HOW THE GASFITTING INDUSTRY WORKS IN VICTORIA AND HOW REGULATORY RESPONSIBILITY IS SHARED BETWEEN ESV AND THE VICTORIAN BUILDING AUTHORITY (VBA). IN FUTURE EDITIONS WE'LL TAKE A LOOK AT HOW THINGS WORK IN THE OTHER STATES.

## ENERGY SAFE VICTORIA - TECHNICAL REGULATOR

Victoria traces its gas industry back to the beginnings of Melbourne. By 1892 there were 50 gasworks in existence but not until 1896 was there legislation to regulate this hazardous industry.

Due in part to industrial disputes, and poor coal supplies from NSW, the Gas and Fuel Corporation of Victoria (GFCV) formed in 1951 to exploit the extensive brown coal deposits in Gippsland for coal gas production. A high pressure gas pipeline was installed from the gasification plant at Morwell to supply Melbourne with coal gas. Natural gas was discovered off the Victorian coast in 1965 and by 1970 Victorian households had been converted to natural gas.

By 1997 the GFCV had disaggregated into gas distribution, retail and transmission and the Office of Gas Safety took over the role of the regulator. In 2005 this organisation evolved into Energy Safe Victoria (ESV), and became the regulator for electricity, gas and pipeline safety.

## THE ROLES OF ESV AND THE VICTORIAN BUILDING AUTHORITY

Energy Safe Victoria (ESV) and the Victorian Building Authority (VBA) share dual regulatory responsibility for gas safety within Victoria.

ESV is the independent technical regulator responsible for electricity, gas and pipeline safety. ESV oversees the design, construction and maintenance of electricity, gas and



The use of gas in industrial, commercial and domestic purposes ensures ongoing demand for well-trained gasfitters, able to install and maintain appliances.

pipeline networks and administers the gas acceptance scheme for complex gas installations. It ensures every gas and electrical appliance meets safety and energy efficiency standards before it is sold. ESV administers the licensing and registration system for electricians, but does not license gasfitters. That role is carried out by the VBA.

ESV is heavily involved in community education and gas safety campaigns. Some very successful campaigns include our carbon monoxide/heater servicing campaign, the Look Before You Cook barbeque campaign as well as having a presence at shows such as World Plumbing Day and the Royal Melbourne Show.

The widespread use of gas in Victoria for industrial, commercial and domestic purposes ensures ongoing demand for well-trained gasfitters, able to install and maintain appliances. Control and regulation of gasfitting is shared between ESV and the Victorian Building Authority (VBA). ESV understands that to maintain high levels of gas safety the workforce needs to be adequately trained and as such ESV is passionate about promoting gasfitting training.

ESV investigates gas safety issues and runs community education and safety campaigns. It supports gas professionals by way of providing a technical advice line, safety guides, data and information sheets. ➤





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Class 1a building is a single dwelling being a detached house or one of a group of two or more attached dwellings.

The Victorian Building Authority on the other hand administers the licensing and registration system for plumbers and gasfitters, and administers the self-certification and compliance certificate scheme for plumbing, including standard gas fitting work. This work is subject to auditing to ensure compliance with the prescribed Australian Standards.

The VBA investigates consumer complaints and provides a technical advice line and technical solution sheets.

**STANDARD GAS INSTALLATIONS AND COMPLEX GAS INSTALLATIONS**

There are two sides to gasfitting in Victoria. There is gasfitting for ‘standard’ gas installations, handled by the VBA, where licensed gasfitters ‘self-certify’ that their work complies with all applicable regulations, standards and codes and lodge a Compliance Certificate to the

VBA within five days of completing the installation. The VBA monitors the compliance of self-certified work through random audits and inspections.

Generally plumbing and gasfitting work in domestic and light commercial premises qualifies as ‘standard’ gas installations. All other plumbing and gasfitting work in commercial and public premises, including high rise buildings, schools and hospitals is regarded as ‘complex’ gas installation work.

Gasfitting for ‘complex’ gas installations is handled by ESV. Here licensed gasfitters ‘do not self-certify’ their work but are required to seek acceptance from ESV prior to commissioning the installation. Gasfitters are required to submit a Gas Application to ESV prior to commencing the work and lodge a Compliance Notice with ESV after completion of the installation.

Depending on the assessed risk, of the gas installation, ESV may choose to inspect the installation prior to accepting the installation or audit the installation after acceptance.

If you are installing any Type B appliance, regardless of the building type, the installation is automatically deemed a ‘complex’ gas installation.

Determining whether a gas installation is a ‘standard’ installation or a ‘complex’ installation can be awkward. The criteria below will assist you in deciding whether you have a ‘standard’ gas installation. If your installation is not ‘standard’ then it is automatically considered to be a ‘complex’ gas installation.

**DETERMINING STANDARD GAS INSTALLATIONS**

Based on the Gas Safety Act 1997, and the Gas Safety Regulations 2008, ‘standard’ gas installations are categorised as follows:

- Caravans and mobile homes; privately owned and not used for commercial enterprises.
- Buildings of classes [see explanations below]
  - Class 1a buildings
  - Class 2 buildings that have 5 storeys or less above the ground
  - Class 2 buildings that have more than 5 storeys above the ground if the premises are occupied or have been previously occupied
  - Commercial premises; Class 5 or Class 6 buildings that have 5 storeys or less above the ground.
- As well as the descriptions above the following conditions apply for Standard gas installations:
  - The total gas consumption of the appliances does not exceed 500 megajoules per hour.
  - The maximum metering pressure
    - [a] In the case of an LP Gas installation, the prescribed maximum operating pressure of the second-stage gas pressure regulator associated with that LP Gas installation is 70

kilopascals and the prescribed maximum operating pressure of any subsequent gas pressure regulator associated with that LP Gas installation is 7 kilopascals.

- (b) In any other case, the prescribed maximum metering pressure is 7 kilopascals.
- The prescribed number of gas supply points is less than 5 gas supply points.

#### **BUILDING CLASS**

Building class descriptions for 'standard' installations according to the Building Code of 2016 are:

- Class 1a building is a single dwelling being a detached house or one of a group of two or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace

house, town house or villa unit.

- Class 2 building is a building containing 2 or more sole-occupancy units each being a separate dwelling.
- Class 5 building is an office building used for professional or commercial purposes.
- Class 6 is a shop or other building for the sale of goods by retail or the supply of services direct to the public.
- Remember if your gas installation does not fit into the criteria above then your gas installation is a Complex gas installation and you will need to contact ESV to have the installation accepted.

Even though ESV and the VBA look at gasfitting from different sides their overall goal is to ensure gas installations are safe and regulated.

If you are unsure of your gas installation type contact ESV's Gas Technical Helpline on 1800 652 563.

#### **GASFITTING TRAINING**

Gasfitting as a class of plumbing is open to plumbers and plumbing apprentices with the drive and motivation to undertake the necessary training. Those interested should make application to the VBA. There are a number of TAFE colleges and Registered Training Organisations in Victoria delivering gasfitter training including appliance servicing and conversion work. ■

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# JUMPSTARTING PLUMBING CAREERS

AUSTRALIANS STARTING TRADE APPRENTICESHIPS HAVE DROPPED BY ALMOST 20% SINCE LAST YEAR. WORLDSKILLS AUSTRALIA AIMS TO PROMOTE TRADE CAREERS BY GIVING YOUNG AUSSIES OPPORTUNITIES TO LEARN AND SHOWCASE TRADE RELATED SKILLS AT THE LARGEST TRADE SHOWCASE AND COMPETITION IN AUSTRALIA. **JOE YOUNG** REPORTS.

In early October 500 young apprentices, trainees and students across many trades and professions will descend on Melbourne Showgrounds, each ready to hone and prove their skills in front of over 40,000 spectators at the 2016 WorldSkills Australia national competition.

Among those spectators will be school children considering their future career options who will be given the opportunity to learn more about trades such as plumbing from experienced industry professionals ready to share their knowledge.

To get an idea of the scale of the competition there will be 300 judges, 100 volunteers and \$10 million worth of material including eight tonnes of steel, 10km of cabling, 80 mannequin heads, 600kg of flour and over 3000 flower stems.

But organisers remind us that it isn't just a competition as visitors will have the opportunity to try their hand at over 50 trade and skill-based professions such as vehicle painting, bricklaying, hairdressing, programming, cookery and welding with the Try'a Skill program.

18 plumbing apprentices, trainees and students qualified to partake in this year's national competition by winning events such as a crimping speed test that saw contestants crimping a copper pipe into a specific shape. Competitions were held in regional towns all around the country.

At the national competition contestants will partake in challenges such as the fabrication of a simulated basic bathroom and laundry fit out, including hot, cold and rain water, gas, solar hot water and waste services.

Alternatively they may have to install and commission a hot water system, shower, laundry tub, bayonet fitting and rainwater tank although specifics of the test will be confidential until the competition day.

Here are four young Aussie plumbers that will compete in this year's competition.

## **BRANDON MULDOON, MELBOURNE AUSTRALIA**

21 year old Brandon Muldoon has been interested in plumbing since high school and admits it has lived up to his expectations.

"Because we focus on the maintenance side of plumbing, every single day is different," Brandon says.

"I also like the problem solving that goes hand in hand with



**Brandon Muldoon, Melbourne Australia.**

the maintenance work."

After studying at RMIT he is now employed by Mitchell Shire Plumbing with plans to own his own business and says the license within the plumbing trade gives him a sense of comfort.

"Plumbing will always be needed, as long as humans need water and clean waste disposal plumbers like me will be there."

Brandon is adaptable to the changes in the future of the plumbing industry and is looking forward to seeing where the industry is heading.

"New products and materials change the effect on the environment, time efficiency, availability and costs, just to name a few, so it'll be exciting in the years to come to see how the trade will adapt to this."

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**LEFT:** Luke Brown, Osborne Park Western Australia. **RIGHT:** Michael Yarrow, Brisbane Queensland.

**LUKE BROWN, OSBORNE PARK WA**

During high school Luke Brown loved to see things being built so he knew he wanted to work in the construction industry. After a year working as a building supervisor he decided to get a plumbing qualification from MPA Skills.

Now at 22 he works at MI Plumbing where he mainly works in the commercial plumbing sector.

“There is such scope in commercial plumbing and the scale of it can be exciting. My dream would be in five years’ time to be running my own commercial plumbing business.”

The favourite part of the job for Luke is seeing a happy client during a hand-over.

“It is a great feeling to see the work come together and you can start looking forward to the next job.”

Luke describes the opportunities in the industry as “endless”.

“There is so much change in the industry all the time, new products and systems coming on the market that use water more efficiently, smart water systems, even advances in water treatment.

“The industry is constantly developing and changing and you are learning new things all the time. That is what makes it an exciting industry to work in; there are always opportunities to learn.”

**MICHAEL YARROW, BRISBANE QLD**

Inspired by his father who was a plumber Michael Yarrow decided to try plumbing on work experience in high school and found that he absolutely loved it.

He got his training at SkillsTech in Queensland and at 20 is working at the family business, Yarrow Plumbing services.

His current role in the business is to be a maintenance plumber which Michael loves the problem solving aspect of the job.

Committed to the family business he hopes to one day become a supervisor.

He also believes there are big opportunities facing members of the plumbing industry.

“It’s important to educate the general public and government on the importance of the plumbing industry to the health and wellbeing of the community,” Michael says.

Winners of the events at the national competition will go on to represent Australia as a Skillaroo at the World championship. We wish the boys and the 14 other representatives all the best and will report the results in the summer edition of 2016. ■

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# PIPE SYSTEM LOSSES

DR TERRY LUCKE EXPLAINS PIPE SYSTEM LOSSES, THE REASONS WHY THEY OCCUR AND HOW TO AVOID THEM.

In the last edition I discussed the fundamentals of pressure and related it back to pipe system design using some everyday examples. You may remember I used the term “maximum theoretical pressure” in some of my examples in the last article because there are a number of other factors that will cause pressure losses in pipework systems such as pipe friction and form losses.

Pipe system pressure losses are very important and they can significantly affect expected pipework flowrates and velocities, as well as system performance.

In this issue I will provide a simple explanation of some of the fundamental causes of pressure losses in fluid systems.

There are generally two types of pipe flow: pressurised pipe flow [i.e. water supply systems - Fig. 1a] and open channel pipe flow [e.g. stormwater drainage pipes - Fig. 1b].

The difference between pressurised pipe flow and open-channel flow is in the fundamental mechanism that drives the flow. For open-channel flow, gravity is the only driving force acting on the fluid, i.e. water flows downhill. However, for the flow in pressurised [full-pipe] systems, while gravity may also play a role, the main driving force is likely to be a pressure gradient along the pipe [i.e. the fluid can flow uphill in a pressurised full-pipe system]. For example, in Figure 1a, when the pressure at point [1] is greater than the pressure at point [2], a positive pressure gradient exists which drives the fluid along the pipe from

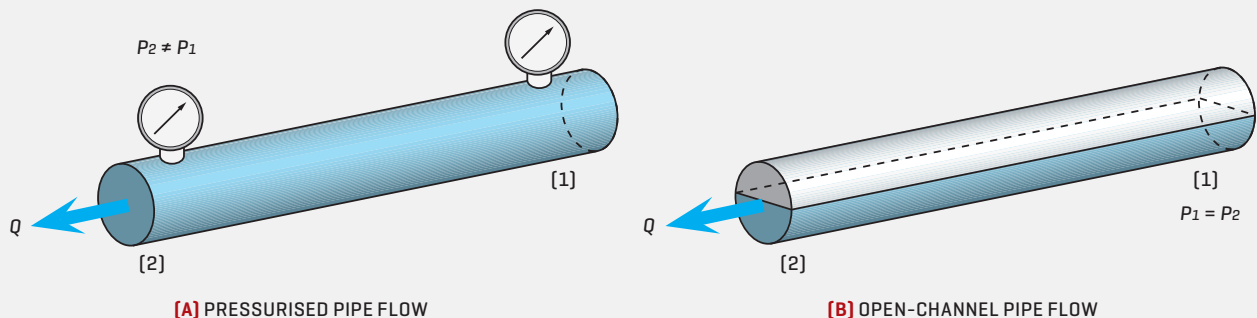
point [1] to point [2]. Importantly, if the pipe is not full [Fig. 1b], it is not possible to maintain this pressure difference [ $P_1 = P_2$ ] so the fluid does not flow [unless it is affected by gravity].

Before we get into pipe pressure losses, I think it is a good time to explain the concepts of hydraulic grade line [HGL] and energy grade line [EGL]. The HGL is a line that can be drawn along a pipe to indicate the elevation to which the fluid would rise if open to atmospheric pressure. This is shown in by the piezometer tubes in Figure 2. It is also the same height that the fountain of water would theoretically raise if you punched a hole in the top of the pipe.

The HGL is an indicator of static pressure and is not affected by the velocity of the fluid. The HGL is also often called the Pressure Head and the units are usually measured in metres height of fluid [m]. In an open-channel, or a partially full pipe, the HGL follows the water surface. The HGL is the most important indicator for designers of stormwater drainage systems because it indicates the water surface levels [and potential overflows] in any of the system components open to the atmosphere [i.e. in gutters or drainage pits]. It also identifies locations of any potentially excessive system pressures.

The energy grade line [EGL] is a line that can be drawn along a pipe indicating the total energy at any point in the pipe. The EGL values generally include the Potential Head, ➤

**FIGURE 1 - DIFFERENT PIPE FLOWS**





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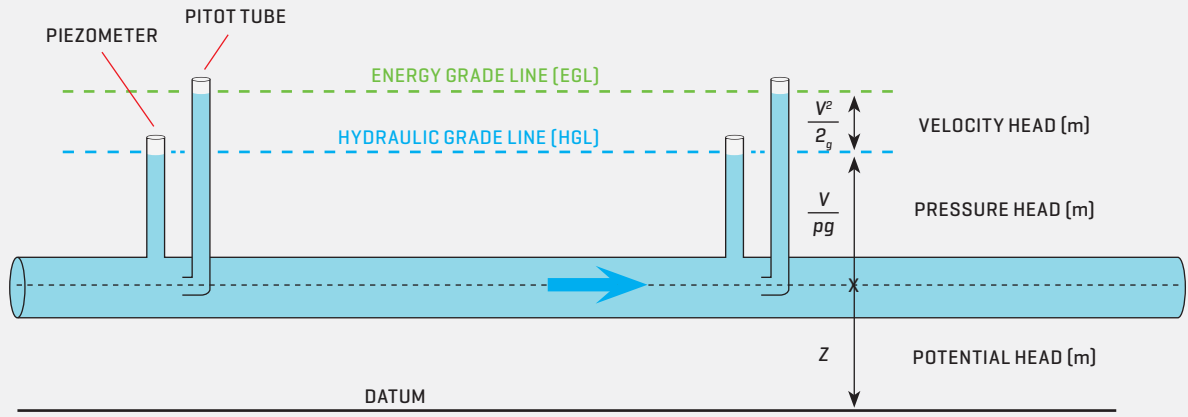
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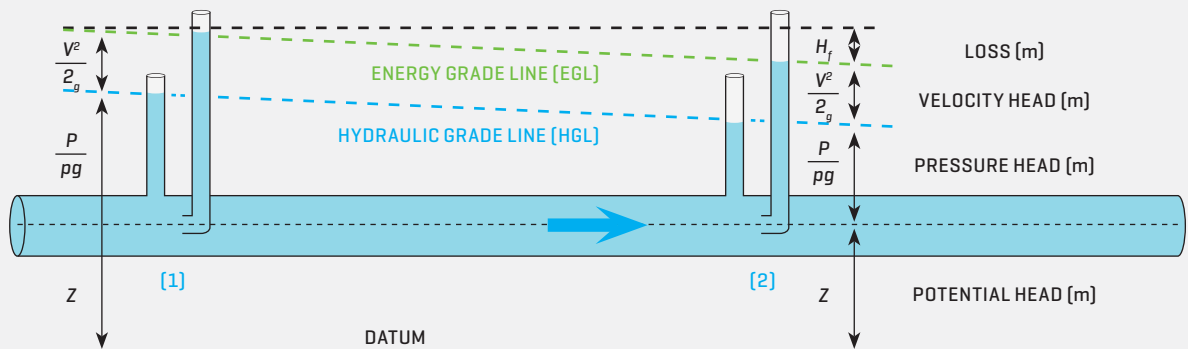
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**FIGURE 2 – HGL AND EGL IN AN IDEAL PIPE SYSTEM**



**FIGURE 3 – HGL AND EGL IN A REAL PIPE SYSTEM INCLUDING FRICTION LOSS**



the Pressure Head and the Velocity Head as shown in Figure 2. Please note that the pipe shown in Figure 2 is an “ideal pipe” which means there are no losses shown in this system [this is impossible in real systems].

**FRICTION LOSSES**

In real pipe systems, fluids lose energy as they move through the pipes. This energy loss [or pressure loss] is caused by a variety of reasons including friction, turbulence through fittings, change of flow direction, heat and noise. When designing common pipe systems, we are usually concerned with two main pressure losses: Friction Losses and Form Losses.

Friction Losses, as the name implies, are caused by friction that is generated between the fluid and the pipe [or channel] walls due to the fluid’s viscosity. While pipes may

look and feel smooth, at a microscopic scale pipe walls are actually quite rough, and they generate a lot of turbulence and friction in the flow. In order to overcome these frictional forces along the walls, the fluid loses significant pressure energy as it moves through the pipe system.

Friction losses are often referred to as “Major Losses” as they generally account for the majority of losses in a typical pipework system. Major losses [usually expressed as  $H_f$ ] for a steady flowrate, in a straight pipe of constant cross-sectional area are generally quite straightforward to calculate.  $H_f$  is usually expressed as a certain value of pressure [or head] loss per metre, i.e. a set proportion of the total flow energy is lost along every metre of pipe. Figure 3 shows how friction losses [ $H_f$ ] reduce both the HGL and the EGL in a straight pipe between points [1] upstream and [2] downstream. ➤

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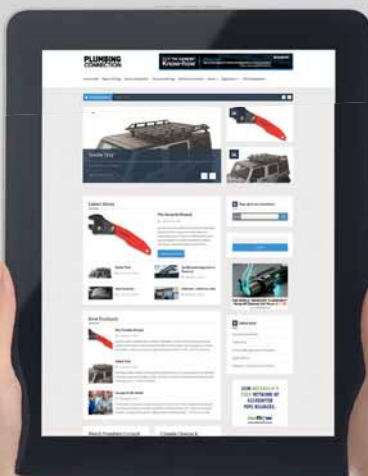
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Typical f values for most practical applications range between about 0.012 and 0.030. Major Losses are not affected by gravity so it doesn't matter how much slope a pipe has, or even if it is vertical.

The main thing affecting Major Losses is the velocity of the flow in the pipe. Major losses are applied to the velocity head of the pipe flow. The velocity head is directly proportion to the velocity squared, so small changes in velocity can result in large increases in pressure loss. The major [friction] loss [ $H_f$ ] in a pipe is calculated using [the Darcy-Wiesbach] Equation 1.

**EQUATION 1**

$$H_f = f \frac{L}{D} \frac{V^2}{2g}$$

where:

- $H_f$  = Major [friction] loss [m]
- f = Pipe friction factor [dimensionless]
- L = Pipe length [m]
- D = Pipe diameter [m]
- V = average pipe flow velocity [m/s]
- g = gravitational force on earth [9.81m/s<sup>2</sup>]

Example 1

Calculate the major headloss [m] in the pipe shown in Figure 3 if it is a Ø150mm, PVC [f = 0.015] pipe, the flowrate [Q] is 65L/s, and the distance between points [1] and [2] is 4.6m.

Solution:

1. First we need to calculate the velocity in the pipe. Velocity equals flowrate divided by pipe area [ $V = Q/A$ ].
2. To calculate velocity, we need the pipe's area:
3. Area =  $\pi D^2/4 = \pi \times 0.15^2 / 4 = 0.0177m^2$
4.  $V = Q/A$ : Velocity =  $Q [0.065 m^3/s] / \text{Area} [0.0177 m^2] = 3.68 m/s$
5. Now insert values into Eq. 1:

$$H_f = f \frac{L}{D} \frac{V^2}{2g} = 0.015 \frac{4.6}{0.15} \frac{3.68^2}{2 \times 9.81} = 0.317 m [317mm]$$

So the major [friction] head loss in the pipe between points [1] and [2] is 0.317m [ans].





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**FORM LOSSES**

The other type of pressure losses in pipe systems are Form Losses. These are often referred to as Minor Losses because in a typical system, these losses are usually much less than friction [Major] losses. Form Losses are caused by the excessive turbulence generated in the fluid when it has to travel through pipe fittings and other components. For example, when a fluid has to travel through a valve, or around a bend, this causes significant turbulence which makes it more difficult for the fluid to flow. This results in the fluid losing pressure [energy].

Fittings and components that cause pressure losses in pipework are generally allocated a form loss coefficient designated as a K factor [Table 1]. To estimate the pressure loss [H<sub>L</sub>] due to a component or fitting, the K factor is also simply applied to the velocity head as shown in Equation 2.

**EQUATION 2**

$$H_L = K \frac{V^2}{2g}$$

where:

H<sub>L</sub> = Minor [form] loss [m]

K = Form loss factor [dimensionless]

V = average pipe flow velocity [m/s]

g = gravitational force on earth [9.81m/s<sup>2</sup>]

**Example 2**

Calculate the headloss [m] through the Ø80mm, 45° PVC bend shown in Figure 4 when the flowrate [Q] is 15 L/s. The K factor for the bend is 0.3.

Solution:

- First we need to calculate the velocity in the pipe [V = Q/A].

**TABLE 1 – TYPICAL K FACTORS OF COMMON VALVE AND FITTINGS**

Valve or Fitting	K factor
Globe Valve – Wide open	10
Globe Valve – ½ open	12.5
Gate Valve – Wide Open	0.2
Gate Valve – ¾ Open	0.9
Gate Valve – ½ Open	4.5
Gate Valve – ¼ Open	24
Return bend	2.2
Standard Tee	1.8
45° elbow	0.3
90° elbow	0.9
Ball check valve	4.0

**FIGURE 4 – Ø80MM, 45° PVC BEND**



- Area = πD<sup>2</sup>/4 = π x 0.08<sup>2</sup> / 4 = 0.005 m<sup>2</sup>
- V = Q/A: Velocity = Q [0.015 m<sup>3</sup>/s] / Area [0.005 m<sup>2</sup>] = 3.0 m/s
- Now insert values into Eq. 2:

$$H_L = K \frac{V^2}{2g} = 0.3 \frac{3.0^2}{2 * 9.81} = 0.138 \text{ m [138mm]}$$

So the minor head loss in the elbow = 0.138m [ans].

To calculate the total pressure losses in a pipe system, we simply go through and sum the individual Major and Minor losses in each section. As long as the total pressure driving the system is greater than the total losses, we have flow. If not, we need to either increase system pressure [bigger pump or potential head], reduce Major and Minor losses [better design or larger pipes], or a combination of both.

I hope this article has helped to improve your understanding of pressure losses in pipe systems due to friction and form losses. I have purposely tried to simplify the article as much as possible to make it easier to understand. The underlying fluid mechanics principles are obviously a bit more complicated than this, but not that much. ■

*Please feel free to email me any comments, questions or suggestions at [tlucke@usc.edu.au](mailto:tlucke@usc.edu.au).*

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## BUILDING FOR THE FUTURE

WITH A VISION TO EXPAND ITS REACH AND TRAINING CAPABILITIES, TWO NEW PLUMBING INDUSTRY CLIMATE ACTION CENTRES ARE ON THEIR WAY TO VICTORIA. **JUSTIN FELIX** CAUGHT UP WITH CHIEF EXECUTIVE OFFICER **SHAYNE LA COMBRE** TO FIND OUT WHAT HAS BEEN PLANNED FOR THE TWO SITES.

**F**or a number of years now, the Plumbing Industry Climate Action Centre (PICAC) in Brunswick, Victoria, has been providing integrated education and training programs in advanced areas of plumbing and gasfitting.

PICAC's facilities are second to none and include the Fire Protection Centre of Excellence, the Occupational Health and Safety Centre of Excellence, a demonstration Green Plumbing House, world class reticulated water systems, the newest technology in water and energy efficiency. By its own admission, showcasing the world's very best, leading edge technology means PICAC is training the plumbers of tomorrow, today.

Such has been the success of PICAC in Brunswick, Victoria, that in November 2014 the Andrews Government announced they would look to support the development of two new PICACs in Geelong and Narre Warren in Melbourne's southeast. With the Geelong building now erect and at the fit out stage, we were keen to learn more about the space, the type of training on offer and the scope, if any, for collaboration with local TAFEs.

"The construction itself is completed and is now at the fit out phase. We estimate that we'll be delivering training in Geelong by mid-late this year," chief executive officer Shayne La Combre says.

Many lessons have been learnt while delivering training at Brunswick which helped to shape the design process and space requirements at the new building.

"One of our key learnings since we started is to create teaching spaces that are as flexible as possible. By definition we are a narrow specialist institute – narrow in the sense that we really only focus on plumbing – but having said that, plumbing is such a broad sphere; it includes everything from drainage, with its below ground earthworks, through to high end complex gas fitting with its serious risks. There's a wide array of specialisations in this industry and you can spend a lot of time and money equipping large dedicated areas only to have them sit unused for 85% of the time."

Shayne acknowledges that much of PICAC's learning's have come via its relationship with the US and watching how they instruct in schools that are far bigger than PICAC, ➤





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The construction itself is completed in Geelong and is now at the fit out phase. PICAC estimate that it will be delivering training in the coastal city by mid to late this year.

while solely dedicated to plumbing, there is a very effective use of flexible learning modules and trucks to get training and education to where it is needed.

In some quarters there has been a perception that PICAC came to fruition in order to compete with TAFEs and Shayne was quick to dismiss any thinking of that sort.

“That’s completely wrong. At the end of the day we are the industry, a collaboration of all the key plumbing organisations across Australia [Master Plumbers, Plumbers Union, NFIA, AMCA] so anything that happens in the industry,

in terms of where participant development heads, is no more vital to anyone than us.

“As soon as students finish their training, whether a 16 week or three year course, they head into our industry. Nobody is more concerned about the competency of individuals being trained in plumbing than the industry itself.

“We’re not naive enough to think that we can be all things to all people and partnering with those who have specific skills and abilities, such as TAFE, makes perfect sense to us. The mistake is to think we have any other interest other than trying to develop individuals to the highest possible level we can, per minute and dollar of training investment. The better our return for that, the better off our industry will be, irrespective of where its sourced from” Shayne says.

As part of the planning process for the Geelong site, PICAC has been engaging in meetings with The Gordon Institute of TAFE in Geelong, regarding how the two can complement one another once the centre is open.

“We are looking at ways we can bring specialist, high-tech training to students, whoever they are enrolled with. The volume stuff is obviously their bread and butter and something they’re highly experienced in so we can benefit from that and bring some of that knowledge into our own environment. We would be looking to leverage off our specialisation in more niche areas such as rain water harvesting for example. ➤



One of the biggest lessons PICAC has taken on board is the importance of creating flexible learning spaces.

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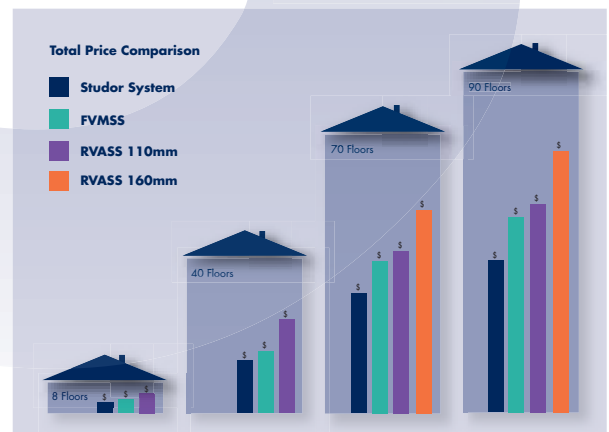
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“While conducting research into the most appropriate areas to open a second centre, our Board was quite surprised by the number of people willing to travel to Geelong over Melbourne to further their studies and engage in training.

“We knew Geelong had its own critical mass to draw upon and not surprising was the fact that students west of there would travel in. What we were surprised to discover was the appeal of Geelong to those who lived east of it. Factors like traffic congestion and density combine to give the coastal city more appeal. People as far east as Hoppers Crossing expressed a preparedness to travel away from the city and if you’ve ever tried to get over the West Gate bridge during peak hour you can understand why. Perhaps the biggest surprise though was the interest shown from people as far around as Bendigo. As it turns out, the catchment into Geelong is a lot bigger than we expected.”

As mentioned above, expansion beyond Geelong is already on the cards as Narre Warren has been earmarked for the next PICAC to be built and is currently in the design stage.

“The south east is a massive corridor,” Shayne says. “Our site is located close to Fountain Gate shopping centre and the local train station. We have established a different

“**ONE OF THE THINGS WE HAVE FOUND TO BE CAUSING AN ISSUE FOR THE INDUSTRY IS THE EXTENT TO WHICH WE, AS A COUNTRY, ARE IMPORTING NEW TECHNOLOGIES.**”

concept altogether for Narre Warren though. We have partnered with IAPMO and are looking to establish a research hub there as well.

“One of the things we have found to be causing an issue for the industry is the extent to which we, as a country, are importing new technologies. There are quite a few barriers to doing that; even with a really good product. This area has had some serious deficiency for some time, with many of the resulting risks falling back on the plumber.

“Looking back to when we first started here at PICAC, uptake of products relating to solar hot water and grey water systems faced big hurdles. While the products and technology were good, there were significant competency gaps in the people who needed to install and maintain them. What we are looking to do in Narre Warren is fly close to a product certification operation to ensure we understand what is emerging and make sure industry training is sufficient and up-to-speed.”



**By its own admission, showcasing the world’s very best, leading edge technology means PICAC is training the plumbers of tomorrow, today.**

These two new PICACs will not only benefit those in the Geelong and south east regions but represent a big win for all in the industry as the continual development and advancement of skills generated at each will further inject a supply of needed tradespersons to support building activity across the country. ■

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# KEEPING UP-TO-DATE WITH THE NATIONAL CONSTRUCTION CODE

THE AUSTRALIAN BUILDING CODES BOARD (ABCB) PRODUCES A VARIETY OF RESOURCES TO KEEP YOU INFORMED AND UP-TO-DATE WITH WHAT IS HAPPENING WITH THE NATIONAL CONSTRUCTION CODE (NCC). WHEN YOU REGISTER FOR THE NCC ONLINE (WWW.ABCB.GOV.AU) YOU WILL HAVE THE OPTION TO OPT-IN TO COMMUNICATIONS WHICH INCLUDES THE AUSTRALIAN BUILDING REGULATION BULLETIN (ABRB).

The ABRB provides technically based information directly relevant to the building and plumbing industry and the community. Hot topics such as NCC changes and amendments are examples of what you will find within this online publication.

Read on for the latest information on NCC changes for 2016.

## NCC 2016 - OVERVIEW OF CHANGES

NCC 2016 brings some significant changes which will affect all users of the code. For readers who have not yet had the opportunity to get across it, this article provides an overview of the most important changes, including new General Provisions for all three Volumes, and major technical changes for both the BCA and PCA.

## THE NEW NCC GENERAL PROVISIONS - ENGENDERING A PERFORMANCE MINDSET

The General Provisions, in Section A of each Volume [Section 1 in Volume Two], describe how the NCC operates; what the mandatory requirements are, and how they are met. In NCC 2016, the General Provisions have been re-written to make the performance-based format easier to understand by clarifying that only the Performance Requirements must be met — using the Deemed-to-Satisfy Provisions is just one option for doing this.

The changes mainly cover Part A0 [Volume Two, Part 1.0] which is now consistent across all three Volumes, and includes simpler descriptions of how the performance-based NCC applies, updated terminology — Alternative Solutions are now called Performance Solutions — and a new diagram to help understand the NCC compliance structure. See below.

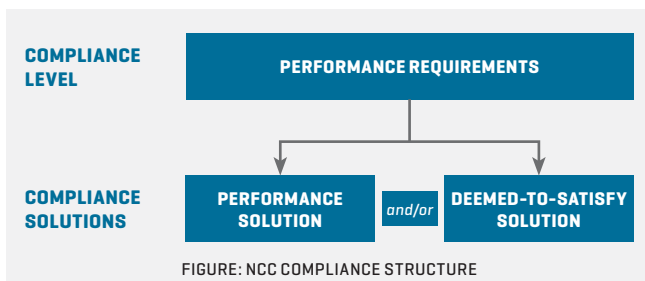


FIGURE: NCC COMPLIANCE STRUCTURE



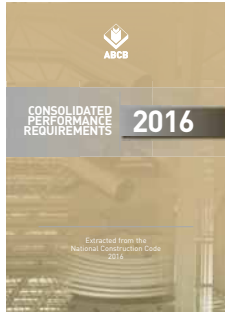
The image shows the cover of the Australian Building Regulation Bulletin (ABRB) for April 2016. The cover features the title 'AUSTRALIAN BUILDING REGULATION BULLETIN' and the large 'ABRB' logo. Below the cover, there is a section titled 'GM'S INTRODUCTION' featuring a photo of Neil Savery, General Manager of ABCB. The text in the introduction discusses the latest edition of the ABRB, which features many of the NCC 2016 changes, and mentions the National Seminar Series. It also highlights the focus on performance and the reform agenda of the ABCB. A small video player icon is visible next to the photo.

The ABRB provides technical information pertaining to the building and plumbing industry.

These changes flow on to the performance 'hierarchies' at the beginning of each Part of the NCC. Also, as part of the focus on performance, the Objectives and Functional Statements for Volume One have been moved to the Guide; in Volumes Two and Three they are now Explanatory Information. This reflects the intention of the Objectives and Functional Statements, which is to provide guidance on the mandatory Performance Requirements.

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Restructuring these parts of the NCC has helped put the focus back on performance, and is a key part of the ABCB's drive to engender a performance mindset and promote innovation throughout the building, construction, and plumbing and drainage sectors.



### **NCC 2016 CONSOLIDATED REQUIREMENTS**

As part of the NCC Suite for 2016, the ABCB has released an updated NCC Consolidated Performance Requirements which includes the new General Provisions and performance hierarchies for all three Volumes.

### **CHANGES AFFECTING VOLUMES ONE AND TWO STRUCTURAL ROBUSTNESS VERIFICATION METHOD**

A new Verification Method for structural robustness has been included as an option for compliance with the NCC. The Verification Method is a consequence of the Quantification of Performance Project. Consistent with other Verification Methods in the NCC, the new Verification Method is not a mandatory component, however may be used to demonstrate compliance with the Performance Requirements, where use of the Deemed-to-Satisfy Provisions may not be appropriate for a particular design. The structural robustness Verification Method complements the structural reliability Verification Method which was introduced into NCC 2015.

### **VENTILATION VERIFICATION METHOD**

The Quantification of Performance project has also developed two new Verification Methods for ventilation. The first is specific to Class 1, 2, 3, 5, 6, 9b or 9c buildings or a Class 4 part of a building. The second Verification Method is specific to carparks and is only included in Volume One. Both Verification Methods consider the amount of outdoor air required to ensure contaminate levels of certain pollutants do not exceed the values specified in the Verification Method.

### **STAIR GOING AND RISERS**

Clarification has been provided for what constitutes as 'constant' for stair going and risers. The amendment acknowledges atmospheric moisture change that affect material dimensions or movement in materials that impact the finished stair dimensions.

### **REFERENCED DOCUMENTS**

A number of new referenced documents including Australian Standards have been adopted for NCC 2016, in addition to a large number of amendments to existing referenced documents. For a consolidated list of the amended referenced documents, refer to the list of amendments at the back of each Volume of the NCC. ➤



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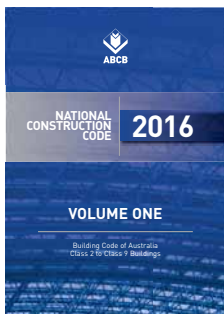
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### CHANGES AFFECTING VOLUME ONE

In addition to the changes listed above which affect Volumes One and Two, there are a number of changes specific to Volume One, including the following:

#### EFFECTIVE HEIGHT

Clarification added to the definition of effective height. The determination of the lowest storey providing direct egress to a road or open space has always been subjective. The defined term now refers to the determination method used to identify the lowest storey included in a calculation of rise in storeys. This simplifies the calculation method and aligns the two calculation methods. Identifying the highest storey remains the same.

#### TIMBER MID-RISE BUILDINGS

New provisions have been included to permit timber mid-rise buildings. Buildings which are Class 2, 3 or 5, sprinkler protected and not more than 25 m effective height can be built from timber provided the new Deemed-to-Satisfy Provisions are followed. This means that timber buildings which were limited to three storeys can potentially be built to eight storeys.

#### GROUP NUMBER DETERMINATION

The group number determination for the fire hazard property provisions now refers to a new referenced standard, AS 5637.1. The new standard contains a process to determine the most appropriate test to undertake for a certain product.

#### CARPARKS

The concession under C3.1 to exempt a vehicle ramp opening to comply with the protection of openings provisions of the Part has been amended. The concession now only applies if the connecting floors comply as a single fire compartment for the purpose of other Deemed-to-Satisfy Provisions in Section C, D and E. This may affect provisions such as E1.5 –Sprinklers.

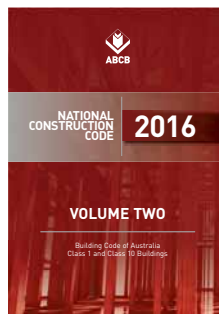
#### VISIBILITY IN AN EMERGENCY

The Quantification of Performance project recognised that EP4.1 was potentially preventing innovation by limiting visibility in an emergency to that provided by lighting only. Therefore ‘lighting’ has been replaced with ‘visibility’ to enable innovation through alternative systems.

#### FARM BUILDINGS AND FARM SHEDS

Provisions for farm buildings and farm sheds have been introduced in a new Part – Part H3. The provisions provide a number of concessions to the Deemed-to-Satisfy Provision

in Sections C, D, E and F. The new Part acknowledges that certain farm buildings may require additional levels of safety than a Class 10a building, however may not require the level of stringency of a Class 7 or 8 building.



### CHANGES AFFECTING VOLUME TWO

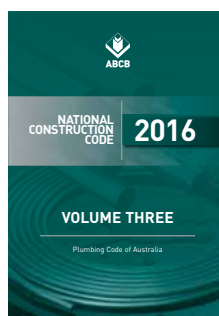
In addition to the changes listed above which affect Volumes One and Two, there are a number of changes specific to Volume Two, including the following:

#### DWELLING ABOVE A NON-APPURTENANT CLASS 10A PRIVATE GARAGE

Prior to NCC 2016, Volume Two did not have specific fire-separation provisions where a private garage was located below a non-appurtenant dwelling. A new provision has been included to require fire-separation for the floor separating the non-appurtenant dwelling and private garage.

#### CLASS 10A SMOKE ALARMS

Where a smoke alarm is installed in a Class 10a private garage and is likely to cause spurious signals (false alarms) an additional option has been included to allow any other alarm deemed suitable in accordance with AS 1670.1 provided smoke alarms are installed elsewhere in the Class 1a building. This option is consistent with similar provisions in Volume One.



### CHANGES AFFECTING VOLUME THREE

#### PCA AND WATERMARK

For 2016, there are two major changes to Volume Three: these are the restructuring of Parts A2 and G1 to implement the improved WaterMark Certification Scheme; and the adoption of the 2015 editions of AS/NZS 3500 Parts 1 to 4 within the PCA Deemed-to-Satisfy Provisions.

#### PARTS A2 AND G1 RESTRUCTURED

The improved WaterMark Certification Scheme – supported by the Building Ministers Forum in July 2015 – will, among other things, create a single level scheme and consolidate the myriad scheme administrative documents into a single source, within the ABCB website. For the PCA, this means that Part A2 now includes at A2.1 a delineation between which products require WaterMark certification and which products are excluded, and at A2.2 separate evidence of suitability requirements for included and excluded products.



Table A2.1 has been removed as its role has been consolidated into the website. Moving these parts of the scheme out of the PCA and onto the website will enable it to better keep pace with the rapid changes in plumbing products technology. For the same reason, the procedural and administrative content from Part G1 has now also been consolidated, meaning that Part of the PCA has also been removed. Explanatory Information has been retained in its place to give a general overview of the scheme.

#### TRANSITIONAL PROVISIONS - WATERMARK

It is important to note that while PCA 2016 will take effect in all States and Territories from 1 May, the improved WaterMark Certification Scheme is not expected to commence until later this year. To cover this, a transitional clause [A2.0] has been included in the PCA to allow the content of Part G1 from 2015 to continue to be used until this time.

#### AS/NZS 3500 PARTS 1 TO 4: 2015 ADOPTION

Since 2011, the PCA has referenced the 2003 editions of AS/NZS 3500 Parts 1 to 4. Following a review by the ABCB, these Standards have now been revised and re-issued by

Standards Australia, with many changes made to improve their suitability for regulatory use and their compatibility with the PCA.

From 1 May 2016, the revised Standards will be adopted by the PCA [see Table A3.1] and as such will be able to be used wherever a PCA Deemed-to-Satisfy Provision refers to the Standard. Importantly, there are some requirements [e.g. flushing volumes] which aren't in the Standard anymore; this does not mean they have been abolished, only that they are now regulated directly through the PCA [e.g. B1.5].

Unlike the 2003 editions, these new Standards are intended only to be used in combination with the content of the PCA, not as stand-alone documents, so from 2016 it's going to be more important than ever to be familiar and up to date with both. ■

Please visit our website at [www.abcb.gov.au](http://www.abcb.gov.au) to register for free online access to the NCC or for more information on any of the above.

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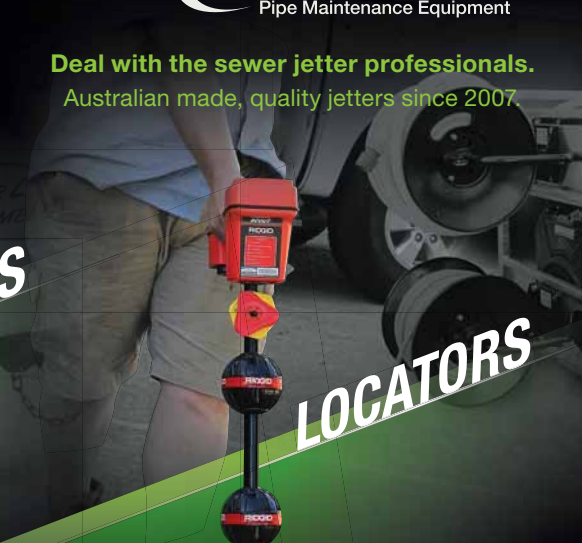
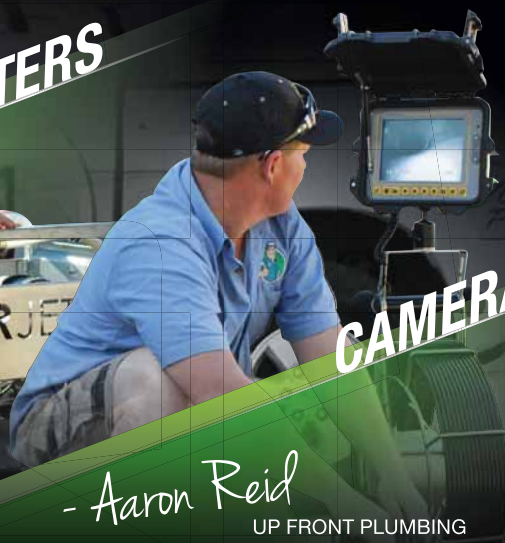
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# DO YOU NEED A WRITTEN 'PROJECT' CONTRACT?

IT CAN BE EASY TO AVOID WRITING THE DETAILS OF PARTICULAR JOBS WHEN ALL YOU WANT TO DO IS GET IN, GET THE JOB DONE AND GET OUT; HOWEVER, AS **PAUL COTT** EXPLAINS, THAT ISN'T THE RIGHT OPTION.

**T**he issue of recording 'project details' in a written form is of little interest to some in the building industry; however, as a builder, the process is in fact critical for a number of reasons.

Of course, generally speaking, with any type of business dealing, at least the key terms of the dealing should be written down to avoid pitfalls down the track, chief among them being avoidance of disputes.

It is a fact of human nature that people will view a situation in a manner favourable to them, and of course, in a dispute involving events that may have occurred some months or even years previously, there is plenty of room for differences of opinion, and memories fade.

These differences of opinion can result in much stress, loss of time, productivity, and of course money.

## ESSENTIAL TO KNOW FOR BUILDERS AND OWNERS

Though a written contract is not actually required in some instances, in others the law requires it.

Broadly speaking, when work is done on a home such as the building of one from 'scratch', including associated work such as landscaping, paving, building of driveways, fences, retaining structures, garages, carports, workshops, pools and spas, demolition or removal of a home, and various other pieces of work such as site work, work to do with plans, and lighting, heating, ventilation, air-conditioning, water supply, sewerage and drainage, the Domestic Building Contracts Act applies to the work.

In addition, importantly, in cases of renovation, repair, alteration, extension or improvement of a home, the Act applies.

The critical consequence of the Act applying (note that as the name suggests, the Act only applies to domestic or home building work) is that in cases of work exceeding \$5000 in value, a written contract is required. Then the contract is termed a 'major domestic building contract'.

A copy of this contract must then be given to the owner within five days of the entry into the contract. A daily (for every day of non-compliance) penalty applies for a builder if this is not done.

Of course, there are works which are not covered, being exceptions to the law, as there often is.

In cases of work involving farm buildings, or work involving



business premises, buildings to house animals, specified design work, work involving the obtaining of foundations data, and transport of a home from one place to another (i.e. removal and transport of a 'transportable' or 'removable' home) the Act's requirements do not apply.

In addition, and commonly, where work is for only one type of work (and there is a long list of included works, such as electrical work, attaching of awnings, balustrades, security screens, and insect screens, glazing works, laying of floor coverings, painting and plastering works, specified types of plumbing work, enclosing a tennis court with a chain link fence, and finally, erection of a pole, antenna, mast, aerial or similar structures) a written contract is not required.

Less commonly, there is an exemption for types of work based on the particular type of premises, where parts of such premises are or can be lived in, such as prisons, schools, universities, and youth and community centres. Finally, works associated with subdivisions are excluded.

Note that it is critical for a builder to not enter into a major domestic contract as described if they are not registered.

There are large penalties for ignoring this requirement – 100 penalty units currently equates to \$15,167, in excess of three times the minimum amount of a major domestic building contract. This amount can increase from year to year.

Such a contract is required to have certain prescribed details which are set out in the Act. The Act should be consulted for these details, failing which, professional advice is recommended.

One of the most important consequences of the Act applying is that work completed must meet certain minimum standards as far as quality of workmanship, materials, suitability and fitness for stated purpose are concerned.

These standards cannot be given or taken away. Inspectors have power to examine and inspect a building site and building works to ensure builders and or ‘subbies’ comply with the Act and with other applicable laws.

In the event of the Act applying, and thus in a case where a written contract must be entered into, the dispute provisions of the Act apply so that in the event of a dispute arising, that dispute can be conciliated or go the state’s Civil and Administrative Tribunal.

### KNOW YOUR ACT

The relative simplicity of the above statements can be misleading as there are often cases ‘at the margins’ where it can be difficult for a builder to know for certain whether he or she needs to enter into a written domestic building contract. Having said that, in most cases it is fairly clear.

As stated above, there can be some pretty serious consequences by builders for non-compliance with these and other parts of the Domestic Building Contracts Act. In cases of doubt, it is best to seek professional advice or seek the assistance of a relevant professional association, such as the HIA. ■

### Contact:

Paul Cott LLB (Hons), Grad Dip Legal Practice, LLM is a Senior Associate Lawyer. Working in commercial litigation for a number of years has seen Paul amass a wealth of knowledge and experience in building and construction litigation which he is willing to share. Paul is also a member of the Building Dispute Practitioners Society.



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# TANK FILLING VALVES IN BUILDING RESERVOIR APPLICATIONS

WHILE MANY BELIEVE THAT SIMPLY INSTALLING A LEVEL CONTROL VALVE IN A RESERVOIR BUILDING APPLICATION WOULD BE A SIMPLE PROCESS, TOO OFTEN THIS IS NOT THE CASE. IN HIS NEW COLUMN, **RUSS DUNNE** OF BERMAD WATER TECHNOLOGIES EXPLAINS WHAT ELSE THERE IS TO KNOW.

**F**or too long most installers see the standard servo type level control valve (modulating horizontal float style) as the answer to all level control installations. While these types of valve do serve a purpose, they are simply limited to an always full tank filling situation where incoming pressures are low and head loss across the valve is minimal.

In this article we'll address tank filling valves that are known as self-acting hydraulically actuated diaphragm control valves and direct acting mechanical valves. These valves require only the pressure of the incoming supply pressure to control water levels and are not reliant on external controls to operate.

## FLOWS

It's important to understand the requirements of water authorities' minimum pressures offerings as this sometimes dictates the size of the valve that can be used. Size a valve too small and you may run the risk of not being able to meet the flow demand when pressures are at their lowest.



The above is a typical installation of mechanical float valves.

A good knowledge of the pressures to be experienced will help the valve manufacturer size the correct valve. Fire and domestic water supply requirements often differ between states and as always codes for both fire domestic water applications should be followed.

## PRESSURES

Taking the above into consideration, it is always right to know the incoming pressures to be experienced during normal operations of the Tank Filling Valves [TFV]. Most incoming pressures are reasonably high and installing valves directly at or near the outlets of pipework to the tank may cause the valve to experience severe cavitations due to high change in pressure ( $\Delta P$ ) across the valve. Cavitations can be caused by either high or low flows with high  $\Delta P$ . In this instance it would be advisable to install a pressure reduction valve upstream of the TFV so as to negate the effect it has on the TFV. The pressure reduction valve will impede on the flow requirements as they modulate to accommodate flows regardless of differing upstream pressure fluctuations.

## VALVE LOCATIONS

While most servo type direct acting float valves get installed at the outlet of the pipework and generally in the tank, modulating self-acting hydraulically actuated diaphragm control valves should be installed external to the tank with control pilots either within or external to the tank. Preferably the valves should be installed in the horizontal upright position at the base of the tank's inlet pipework. They can operate in the vertical ascending position as well.

Locating the TFV and control piloting external to the tanks would be the best option where possible as this will prevent future issues in regards to servicing and replacement. If the control valve and piloting are external to the tank this will also negate the safety requirements of entering tanks during and post construction.

## VALVES SELECTION V APPLICATION DOMESTIC FEED RESERVOIRS

When considering valves for this application, there are two common types of control: valves with bi level or modulating level control. They can either be in altitude pilot or float ➤

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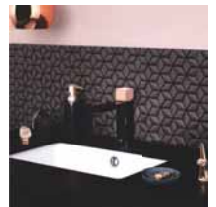
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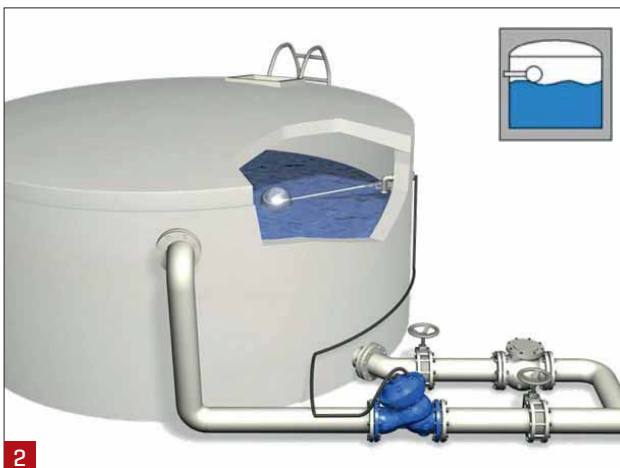
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pilot configurations. Bi level control valves offer more reliability in this application due to the fact they are only either in the open or closed position and aren't continuously working when low flow demand times are experienced. The valves close at pre-set high level position and open once the low position is reached. The altitude pilot or bi level float pilot can be installed external to the tank which would negate the need to enter the tank. They guarantee a high turnover of water in the tank thus keeping water supply refreshed.

Where always-full type reservoirs are required to keep pressures to maximum, modulating altitude or horizontal pilot controls are the best options. This type of valve and pilot combination are more commonly used on fire tank applications. Using a TFV with altitude pilot control will negate the use of the pilot and make for easier installation and future maintenance.



**IMAGE 1:** Typical bi level install with external float pilot.

**IMAGE 2:** Typical modulating level control valve with internal mounted float pilot.

### **FIRE WATER TANKS**

Generally fire tanks will always remain in a full capacity state so as to provide water in the event of a fire. Modulating pilot or altitude control valves are used in these instances as any reduction in the water level will almost immediately be refilled. The issue for some states of Australia is evaporation of the water level which may cause the valves to modulate open for very small flows and long term this is not healthy for the valve. Again, cavitations may occur at low flows, reducing the life span of the valve.

The common thread in overcoming the evaporation issue is to use a small 20/25mm modulating servo type float valve to maintain a full tank. The theory is that the small float valves will allow the evaporation capacity to be met without the larger needing to be open. The trouble with this option is that the larger control valve pilot is permanently drowned and a small failure of this modulating pilot can result in the loss of water to the overflow. Without close monitoring of the tank it may go unnoticed and result in excess water usage or failure of the larger valve due to low flow cavitations.

Consideration should be given to using bi level type valves as used on domestic feed tanks due to the fact that minimum top water levels can have a minimum level differential of 150mm. Altitude valves have a minimum level differential of 300mm-1m with the latter being too much of a gap between top water when the valve opens.

### **COMBINED FIRE/DOMESTIC WATER TANKS**

Combined tanks have a maximum water level within the tank that needs to be retained in case of fire and volume of water above this for domestic feed water. Using bi level control in this application is ideal as it allows control of the domestic feed water to be turned regularly while maintaining a maximum fire level water capacity. Again, installing the float assembly external to the tank prevents future maintenance issues and allows easy access to both pilot and valve during install commissioning. OHS issues are averted as no one is required to enter the tank.

To correctly select the type of level control valve required there are a few simple questions that should be answered to allow correct selection of valves. Getting this right at the start will overcome the many issues and extra associated cost with rectifying to the correct valve.

- Flow required or expected flows
- Incoming pressure from either town's main or pumped pressure [pressure to the incoming side of the valve]
- Valve location
- Type of valves V application i.e.
  - Domestic feed tank
  - Fire water reservoir
  - Combined fire/domestic water tanks



**IMAGE 3:** Level control of emergency fire protection reservoirs in buildings. **IMAGE 4:** Be sure to always install WaterMarked and/or Australian certified products.

As with all installations be sure to install the appropriate WaterMarked or Australian Standard certified valve where available. ■

*Russ is a veteran of Queensland's water and waste water industry. For the past eight years, he has played an integral role in BWT's Queensland operations.*

*With 37 years' experience in sales and sales management roles, Russ has a deep knowledge of the technical requirements of pipeline construction and related industry. He has worked across all disciplines of the industry, including construction, supply, procurement and management.*

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# ACROSS THE DITCH

WE ASKED **PETER JACKSON**, CHAIR OF THE NEW ZEALAND PLUMBERS, GASFITTERS AND DRAINLAYER'S BOARD, TO PAINT A DETAILED PICTURE OF THE NZ PLUMBERS BOARD AND THE INDUSTRY AS A WHOLE.

## THE ROLE OF THE NZ PLUMBERS BOARD

The services performed by plumbers, gasfitters and drainlayers have a direct effect on the health and safety of all New Zealanders, their property and the environment.

These services help ensure that drinking water is high quality, that waste water is disposed of in a sanitary manner and that gas installations in homes and other places are safe.

The Plumbers, Gasfitters and Drainlayers Board is the statutory body established under the Plumbers, Gasfitters, and Drainlayers Act 2006 ["the Act"] to regulate these trades and promote the health and safety outcomes that New Zealand wants and needs.

The Board is responsible for administering the registration and licensing systems of plumbers, gasfitters and drainlayers and in doing so, is responsible for setting the minimum standards for registration and ensuring those persons carrying out regulated work are competent.

Broadly speaking, the Board's powers and functions can be categorised into registration, licensing, competence, discipline and prosecution. The Board receives complaints and, as a result, may investigate and discipline registered persons (including provisional licence holders) or instigate a prosecution in the District Court against those working illegally in the industry, most commonly unregistered or unlicensed persons.

The Board is a not-for-profit body whose operational revenue is derived from fees (such as registrations, licences, examination) and levies on the tradespeople who are registered and



licensed. There is no general tax payer contribution to any of its operations.

The Board operates within the building industry framework, including the Gas Act 1992 and the Building Act 2004.

Collaboration with other agencies with interests in building, health and safety, water, gas reticulation, sewage and waste water disposal is crucial to the Board's effectiveness in achieving its goals.

The Board ensures it works proactively with other agencies within the industry to develop effective regulation, share information, achieve

efficiency gains and to design and implement strategies that reflect shared goals and responsibilities.

## INDUSTRY PRACTITIONER STATISTICS

The final licensing figures for the licensing year just passed (2014/15) show there were 3226 certifying plumbers, 1654 licensed plumbers and 1397 apprentice plumbers, 1389 certifying gasfitters, 698 licensed gasfitters, 995 apprentice gasfitters, 2892 certifying drainlayers, 243 licensed drainlayers and 1460 people working under exemption in New Zealand. ▶



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The final numbers for the 2015/2016 licensing year will be available from 31 March 2016, and are expected to be similar to the year prior.

The PGDB's registration and licensing database does not collect gender specific information, however it is estimated that females engaging in the plumbing, gasfitting and drainlaying trades nationwide is currently very low; less than 20.

The number of women working across the construction sector in Canterbury quadrupled between 2009 and 2014 rising from 2400 to 8100. Before the earthquakes, only 9% of the Canterbury construction workforce were women, which was below the national average of 13.6%. By 2014 the figure had gone up to 16% and is still growing.

Many of those women work for the

Stronger Christchurch Infrastructure Rebuild Team (SCIRT), helping rebuild earthquake damaged roads, water, wastewater and stormwater networks.

#### QUALIFICATIONS PATHWAY

Apprenticeships [now known as training agreements] are expected to take four years. This is for the purpose of ensuring the trainee is exposed to a wide range of installations in building their experience and industry knowledge of their chosen trade/s. The expected end result of an apprenticeship is obtaining the National Certificate.

The National Certificate is gained by the trainee through assessment by an independent training provider, in the specific unit standards relating to each trade.

This system is run by the industry

training organisation for the trades.

Once a trainee has the National Certificate he/she is entitled to sit the Board's first registration level examination, which needs to be passed in order to be entered on the public register as a registered licensed plumber, gasfitter or drainlayer.

A person must also gain a pass in the Board's highest level examination, another 3 hr exam, to be registered as a certifying person in each trade [1 exam per trade]. A person must hold a practicing licence for 24 months at licensed level as well as pass the certifying examination in order to be able to be registered at certifying level.

Basically, once a person has been apprenticed, National Certificate certified, Board examined, Registered - say as a Licensed plumber, hold a practising licence for two years ➤

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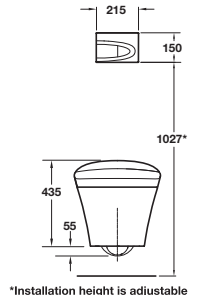
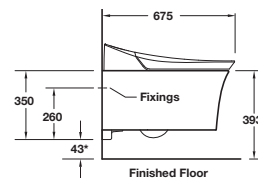
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**NZ LICENSING FEES**

The fees listed below are for the 2016/17 licensing year (1 April 2016 to 31 March 2017)

	Fee [incl GST]
For first-time registration as a licensed or certifying tradesperson the following fees apply:	
Registration	\$355.00
Annual practising licence fee (for that licensing year)	\$86.00
<b>TOTAL</b>	<b>\$441.00</b>
or	

If no other licence is held for the licensing year, please note that the disciplinary levy and offences fee must also be paid on application for registration, therefore the following fees will apply:

Registration	\$355.00
Annual practising licence fee (for that licensing year)	\$86.00
Disciplinary and prosecution levy	\$271.00
<b>TOTAL</b>	<b>\$712.00</b>

**Annual practising licence fee, disciplinary levy and offences fee**

	Fee [incl GST]
Annual practising licence - Licensed tradesperson	\$86.00
Annual practising licence - Certifying tradesperson	\$86.00

*Note: in addition to paying the annual practising licence fee above, you are also required to pay the disciplinary and prosecution levy below.*

Disciplinary and prosecution levy	\$271.00
-----------------------------------	----------

*Note: only one disciplinary and prosecution levy is payable per registered tradesperson, per licence period. For example, if you hold one or more practising licence, the following levy will apply:*

Number of licences held	Total cost per licensing year [incl. levy]
One	\$357.00
Two	\$443.00
Three	\$521.00

*Note: your annual practising licence will not be issued until the disciplinary and prosecution levy have been paid.*

as registered licensed plumber they can then apply to be registered as a Registered Certifying Plumber.

**CPD REQUIREMENTS**

Undertaking CPD is a condition of a license in New Zealand. Continuing professional development is the means by which registered people [i.e. Licensed and Certifying] maintain their knowledge and skills related to their trade.

The Board is committed to CPD as a valuable tool to assist in maintaining and improving the competence of registered tradespeople, and, as a consequence, to protect the health

and safety of members of the public.

A recent newly developed CPD model and partnership with Mico Plumbing & Bathrooms is set to lift the overall quality and consistency of training for tradespeople.

Previously the Board has required a number of CPD points to be obtained by 31 March 2016 each year in order to renew a licence. Points were obtained from courses that were accredited by the Board and form non-accredited [self-directed] learning.

Now, instead of relying on product manufacturers to produce courses that the industry will choose from, CPD training will move to a more

resourceful and consistent approach for the next licensing year.

Each tradesperson will now have key topics that they will cover by attending either a half day training course sponsored by Mico Plumbing & Bathrooms branches throughout New Zealand, or by completing the topics on-line. Training content will be developed by skills.

While there were many good aspects of the previous system, there were also a number of problems. In, particular, there were significant variations in the quality and cost of the courses provide. Many tradespeople were critical of the fact that the previous system had developed into a points gathering exercise, and a product forum for some suppliers rather than meeting its purpose of keeping tradespeople competent.

The newly developed CPD model and partnership with Mico Plumbing & Bathrooms that is set to provide training during 2016-2017, will mean a cost reduction for tradespeople. The cost will reduce from approximately \$75 per person to \$30.

As well as reducing the cost, the new model of CPD and partnership will help ensure the overall quality and success of the new approach ensures the industry stays abreast of key issues, and that there is better overall quality of content delivered.

The new system was developed in conjunction with a stakeholder group made up of industry representatives. On that committee were representatives from tradespeople, suppliers, Master Plumbers, the plumbers, gasfitters and drainlayers federation, and tertiary providers.

**TRANSFERRING AUSSIE QUALIFICATIONS OVER TO NZ**

The Board recognises Australian qualifications held by registered plumbers, gasfitters and drainlayers under the provisions of the Trans-Tasman Mutual Recognition Act [TTMRA] 1997 and will issue the

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The PSF is of interest to everyone across the sector, including manufacturers, importers, merchants/resellers, contractors, certifiers, regulators, educators and consultants.

The event is jointly presented by: The *Plumbing Products Industry Group (PPI)* and *Plumbing Connection Magazine*.



**Full details and registration at:** [www.plumbingsupplyforum.com.au](http://www.plumbingsupplyforum.com.au)

**Date:** Tuesday May 24th 2016

**Location:** Rydges - Sydney International Airport Hotel

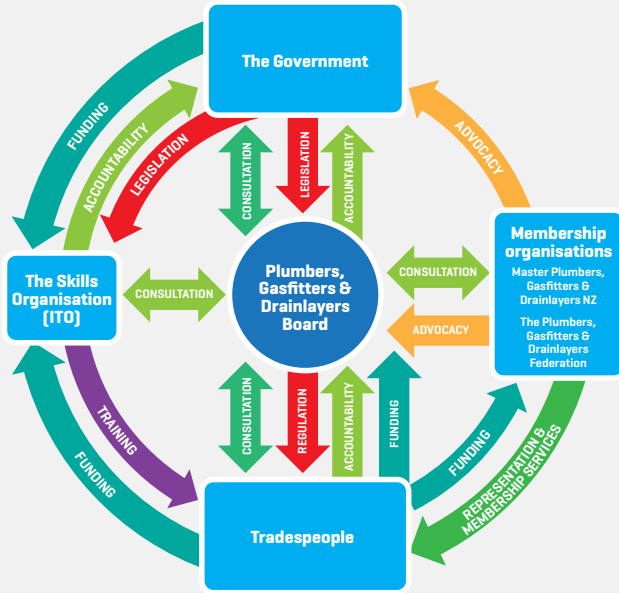
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**HOW THE PLUMBERS, GASFITTERS AND DRAINLAYERS BOARD RELATES TO ORGANISATIONS WITHIN THE INDUSTRY**



will be done either by the acceptable solutions outlined in the code e.g. G12 or G13 which can include reference to all or part of an AS/NZS Standard. The New Zealand Building Code is performance based so a plumber is not restricted to only using the NZBC or an AS/NZS or NZS but can develop their own method.

They would however need to be able to demonstrate how their method will meet the performance criteria of the New Zealand Building Code. This would in practical terms show how they either meet or exceed the methods detailed in the Standards or the Code. As this would be a complicated process most people use the acceptable solutions in the Code and or Standards.

A key point is that the methods used must meet the durability clauses of the code so as stated in most cases people stick with the proven methods as outlined in the Code or Standards.

equivalent registration.

Australian-qualified tradespeople who wish to apply for registration in New Zealand under the TTMRA can request an application form from the Board.

**REBUILDING CHRISTCHURCH**

EQC’s plans to settle drainage claims resulting from the Canterbury earthquake are under way, and they are taking their consumer responsibility seriously within that project. Use of registered and authorised contractor suppliers will be critical to the overall success of the project and EQC will be pushing the Board’s ask-for-the-card messaging.

In supporting the initiative the Board has worked in partnership with EQC to ensure targeted information sheets are available to them for distribution to claimants, and will be actively issuing joint subsequent media release activity during the project stressing the importance of using registered and authorised tradespeople.

**NEW ZEALAND BUILDING CODE AND STANDARDS NEW ZEALAND**

Australia Standards/New Zealand Standards are used in New Zealand, and in some cases New Zealand only clauses apply.

Plumbing, in New Zealand, is required to meet the New Zealand Building Code. In most cases this

**KEY TRENDS AND CHALLENGES**

- Occupational licensing is currently under review by the government so there may well be change in the way the industry is regulated. The review also means that the completion of the review of the Plumbers Gasfitters and Drainlayers Act 2006 will be delayed until after the occupational licensing review is completed.



The NZ Board is responsible for administering all registrations and licensing.

- Generally the construction sector is strong at the present time but demand for plumbing, gasfitting and drainlaying services varies across the regions.
- The pressure for a rapid increase in new residential building in some areas creates a risk of a high volume of unauthorised work being performed.
- The strong construction sector may see an increased number of overseas trained people wishing to come to New Zealand. The Board will need to assess the skills of these people so that safety is not compromised on the one hand, and unnecessary barriers to entry are not created on the other.
- Costs are an issue for the sector. Costs of education (including both initial trade training and CPD),

registration, and licensing are a burden on businesses.

- There are a large number of people working within the industry under exemptions. This creates some risks because these people are not subject to any regulatory oversight and are exempt from ongoing training requirements.
- The Board is currently undertaking a review of the registration and licensing Gazette notices including the effective exercise of supervision within the industry. This presents an opportunity to make changes that will enhance the competence of the industry.
- Key partners within the industry have indicated a willingness to work more closely with the Board. This creates the opportunity for increased voluntary compliance.

### CONSUMER OPINION

The public health component of plumbing, gasfitting and drainlaying and their contribution is under recognised by the public, leading to a growth in DIY and unlicensed activities.

There are a number of relationships with other key parties within the wider construction sector (e.g territorial authorities, consumer organisations, insurers, other regulators, retailers) that that have been formed and/or enhanced in order to contribute to the Board's public awareness objectives. ■

**Plumbers, Gasfitters and Drainlayers Board**

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# THE PERFECT MATCH

BATHROOM PRODUCTS HAVE COME A LONG WAY OVER THE PAST NUMBER OF YEARS AND THE HUMBLE TOILET PAN HAS SEEN SOME OF THE LARGEST DEVELOPMENTS OF ALL. **TERRY NGUYEN** EXPLAINS THAT WHEN IT COMES TO TOILETS PANS AND FLUSHING SIZES, ONE SIZE DOES NOT FIT ALL AND FINDING THE PERFECT MATCH IS A MUST.

**U**ltra-modern toilet pans are almost unrecognisable from their predecessors in all facets: looks, functionality and performance. Toilet pans are now able to perform an effective flush using far less water thanks to the design advancements in shape and size of the flush bowl and the profile in which the water flows through. The drawback of these cleverly engineered flush profiles is that they generally have a higher susceptibility to compromised performance when set up with incorrectly matched flushing devices.

Four Star WELS rated toilet pans are designed for low water consumption, with only 4.5 litres of water coming from a full flush. Because the volume of water is quite small, the pan must efficiently clear the contents of the bowl quickly where there is a residual amount of water following the waste to carry it to the sewerage network. For a toilet pan to operate at its maximum efficiency it requires water to be delivered to it at the rate and pressure that it was initially designed and tested for.

The flow rate and pressure changes the way water is dispersed around the rim to correctly cascade down into the bowl in the right locations. If not correct, the pan's performance can be severely affected. Insufficient flow usually means that the front of the rim is starved of water, and aggressive flow often results in water splashing onto the bathroom floor. New style rimless toilet pans can be particularly sensitive to incorrect flush conditions.

Flushing pressures and rates are controlled by the cistern, [or electronic valve] that the toilet pan has been matched with. For close coupled



Toilet pans matched with an incorrect flushing device can cause many issues.

suites, the cistern is mounted on top of the pan and would have been perfectly matched by the manufacturer during design. The matching task increases in complexity for wall faced, or wall mounted toilets which need to be connected to a separate flushing device, typically from a third party manufacturer.

Historically a discharge flow rate of 1.4 litres per second has been the number that cistern manufacturers have worked to. More often than not, this flow rate is still adequate and suitable for a lot of pans on the market.

In more recent times the evolution of bathroom design with greater emphasis on beauty and practicality in high density urban developments has seen a shift in toilet pan design. Smaller bathrooms promote the demand for smaller wall faced or wall mounted pans using the space in the wall to house the matched flushing device.

Rimless toilets, new to our market, have a narrower tolerance in flow delivery requirements than a typical boxed rim toilet pan. Such pans have a lower margin for error and



therefore some regulate inlet flow by the inherent hydraulic design of the pan. While this may aid in the toilet pan flushing performance it can sometimes create a situation where the cistern is unable to function correctly.

Cistern performance can also be affected by the toilet pan it has been matched with, where the hydraulic back pressure from the inlet of the toilet pan is able to vary the discharge volume. The discharge or outlet valve of the cistern is designed to operate under a particular set of conditions to ensure that it consistently delivers the correct amount of water during a flush.

Leading manufacturers have teams of design engineers tasked with ensuring a device can be made as flexible as possible, allowing the cistern to be matched with a vast

range of toilet pans in various set up situations. There are instances however, where the hydraulic design of pans can alter the internal behaviour of the flushing device [including electronic valves] where incorrect or inconsistent volumes are discharged. PROVE has seen instances where flushing devices can deliver too much, or too little water when coupled with a pan outside of the device's operating capability.

If a toilet does not appear to be flushing correctly, there is a possibility that the combination of flushing device and toilet pan has not been correctly matched. Under WELS legislation, plumbing merchants are required to ensure products sold are fit for purpose and meet all performance requirements and water efficiency standards. This means that purchasing

a pan/cistern combination together at a single retailer should be a safe bet, as opposed to procuring the items separately. When in doubt, it is best to request confirmation from the merchant and/or manufacturer as to whether a particular combination is a suitable match and performance has been verified. Matching a pan and flushing device without validating its suitability is similar to blind dating; in that the combination may function, but there is no level of confidence that the relationship between the two was ever going to work harmoniously. ■

**Contact:**

For information on how toilets are tested to Australian Standards, please contact PROVE Standards & Engineering. [www.proveng.com.au](http://www.proveng.com.au)



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# BACKFLOW PREVENTION IN THE EVERYDAY WORLD

PETER MCLENNAN REFLECTS ON THE RECENT WORLD PLUMBING DAY AND ASKS SOME QUESTIONS OF THE INDUSTRY AND THE CONTINUAL LACK OF EDUCATION, AT THE APPRENTICESHIP STAGE, IN BACKFLOW PREVENTION.

I recently attended the World Plumbing Day breakfast hosted by the Master Plumbers' Association of Queensland. The event has undoubtedly become one of the plumbing industry's 'must attend' functions of the year. Penny Cornah, the executive director and her team work hard on the smallest of details to ensure the day is relevant and informative for all in attendance.

With over 350 people in attendance, including the Queensland Premier and a number of her Ministers, opposition politicians, union officials and VIPs, the breakfast continued to promote the message that a plumber is not just a tradesperson but a frontline health professional.

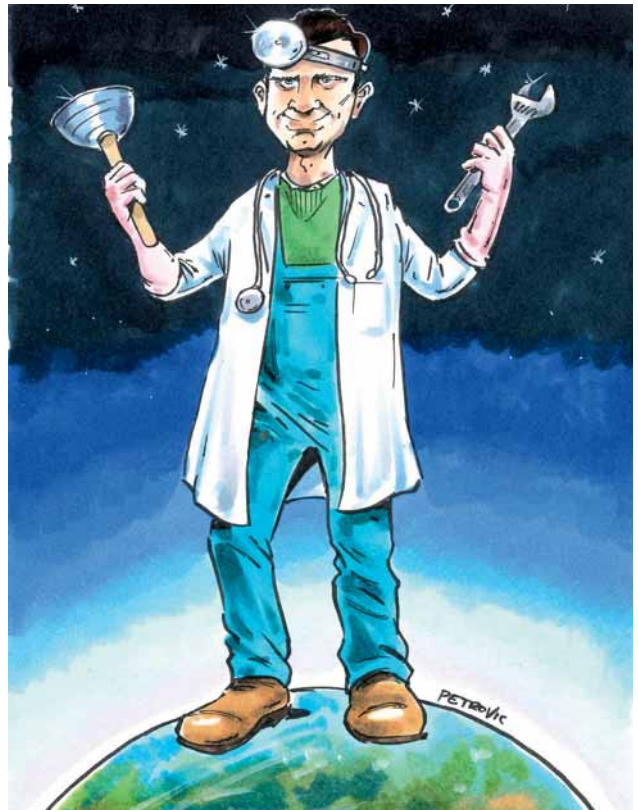
Can someone tell me then, why we still don't have a mandatory national continuing professional development programme for plumbers?

Other front line health professionals must regularly take steps to ensure their skills are kept up-to-date so when you consider a plumber can hold a license for 30 years and have no mandatory requirement to upskill, the image of a professional is shattered.

Now relate this to backflow prevention and cross connection control. Backflow is a result of a cross connection in the drinking water supply system. This is usually within a private piping system whereby the owner unknowingly connects the drinking water to a contaminant, most likely to be a hose type connection.

As a layman, the concept of cross connection control and backflow prevention is something I assume every plumber understands, so I find it reprehensible that the plumbing apprenticeship only refers to backflow prevention in a module related to irrigation. It is referenced in only one module during a four year apprenticeship.

**“ I FIND IT REPREHENSIBLE THAT THE PLUMBING APPRENTICESHIP ONLY REFERS TO BACKFLOW PREVENTION IN A MODULE RELATED TO IRRIGATION. ”**



We are talking about something that has the potential to cause death should a backflow incident occur when hazardous substances are mixed with drinking water.

I applaud the forward thinking regulators in each state that introduced the requirement for plumbers to hold an endorsement to their plumbing license for testing and servicing backflow prevention devices, but we must ensure the tradesperson's skill is current and relevant to today.

Queensland has legislated that the backflow tester must revalidate his backflow prevention endorsement every five years but while we don't have this requirement in any other state, the only alternative is for a focussed continuing education programme which is backflow specific.

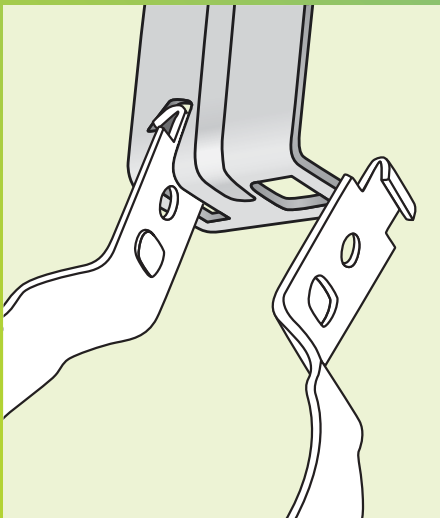
The Backflow Prevention Association of Australia Inc. has introduced a voluntary CPD programme which will

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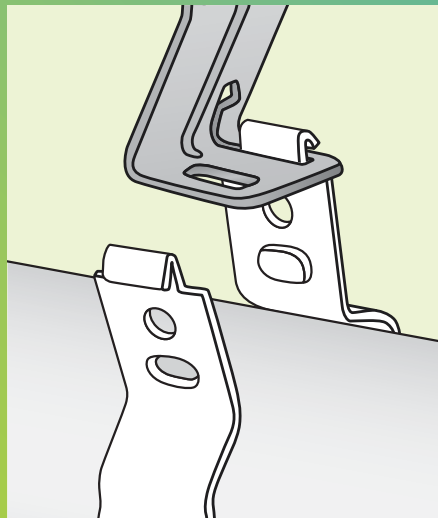
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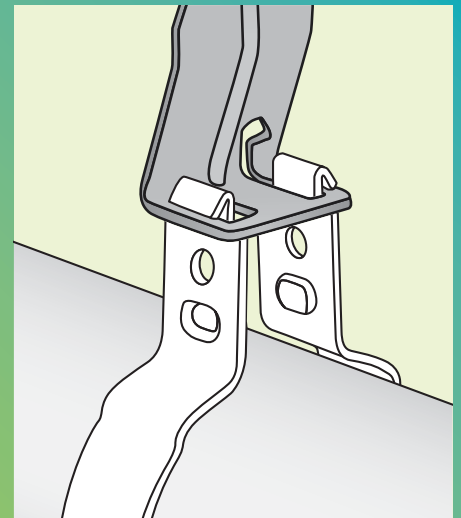
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## BACKFLOW PREVENTION

PETER MCLENNAN

evolve to include the missing upskilling that the backflow tradesperson needs to ensure they are worthy of the frontline health professional tag.

Training the tradesperson is great, but how do we inform the community; the mums and dads on the dangers of cross connections and why they sometimes have this 'ugly valve' in their plumbing system that needs annual and often costly testing and maintenance. If they understood that the clean fresh water they get from the tap could be poisoned by something they have connected to the water supply they would appreciate the need for vigilance in its maintenance and operational effectiveness.

The plumber is the ideal communicator of this information because they are welcomed onto the premises [often to fix something] and seen as a voice of authority. If the plumber was educated in the finer details of cross connection control, their position in the eyes of the customer would be increased from that of a 'fixer' to one of a preventative health professional.

Backflow prevention is a necessary and integral part of the modern plumbing system to ensure that when we turn the tap on, we get safe drinking water. We know this, but it is the what, the how and the why that is difficult to communicate to the everyday water drinker. ■

### THE PLUMBETTE

The World Plumbing Day breakfast introduced the audience to a remarkable lady called Rebecca Senyard. Bec is a wonder woman. She is a plumber, a mum, a wife, and a plumbing advocate that has recently been honoured with the Queensland Women in Plumbing Ambassadorship Award. What shone through for me was her desire to demystify the plumber stereotype and relate to the person next door.

She does this [I suppose in her spare time] through her blog The Plumbette. She writes about her experiences being a plumber and a mother. She writes the blog in a way to explain why plumbers do what they do and teach others what to look out for when hiring a tradesperson. Check it out at [www.theplumbette.com.au](http://www.theplumbette.com.au). She is inspirational in the way she communicates every day plumbing talk to her audience and has mastered the information barrier often experienced between tradespeople and their customers.

### Contact:

Peter McLennan has been involved with Backflow Prevention in Australia since the late 1980s. is the President of the Backflow Prevention Association of Australia Inc., and Secretary of the Backflow Prevention Association of Australia Inc. Queensland Chapter. Visit [www.bpaa.org.au](http://www.bpaa.org.au) to find out more about how the Backflow Prevention Association of Australia Inc. can help you understand Cross Connection Control and Backflow Prevention.

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# A SOUND INVESTMENT

TAKING THE TIME TO INSTALL A WELL-DESIGNED PLUMBING SYSTEM HAS ALL SORTS OF PAYBACKS, BUT NO NOISE IS ONE OF THE BEST FOR EVERYONE INVOLVED SAYS **JOHN FENNELL**.

**W**ith more complicated plumbing designs required to incorporate safety and energy saving equipment it is even more important to correctly design the plumbing system in order to eliminate the possibility of noise occurring throughout the system—either due to the flow of water or water hammer.

Water hammer is the pressure surge or shock wave caused when a fluid in motion is forced to stop or change direction suddenly. This commonly occurs with fast closing solenoid valves on washing machines and dishwashers.

Water hammer is a design issue and occurs in all pipe systems, but is often more noticeable in metallic pipes like copper or stainless steel due to their ability to transmit noise.

The noise is a warning system that allows action to be taken before damage is done or the pipe bursts, but can often go unnoticed until obvious problems occur.

But it's not only water hammer where noise can be an issue. High water velocities, damaged tap washers and poorly designed or installed plumbing can all create noise.

## THE SILENT TREATMENT

As appliances become more technologically complex and safety regulations keep rising, plumbing systems need additional controls, including non-return valves, Pressure Reducing Valves [PRV's] and Thermostatic Mixing Valves [TMV's] that act to protect both the people using the system and the system itself. If the correct size pipes are used and the system is at the correct pressure then they should have no influence in the system.

There are complicated equations for calculating the effect of water hammer but the key parameters are pressure and water velocity through the pipes. If smaller pipes are used the water has to travel faster to obtain the same flow at the outlet.

One of the most common mistakes when installing plumbing is not using the material or size specified in

the design. This may be due to a number of reasons like a lack of knowledge or availability of materials, but keeping costs down is often the most common. Most Hydraulic Consultants use design principles based around copper plumbing when calculating water usage, flow, velocities and pipe sizing.

If a design specifies DN20 copper pipe then this has an internal diameter of about 17mm. If the installer decides to use DN20 PEX pipe, it could have an internal diameter of about 14mm depending on the brand and type. What is more concerning is that the design of the fittings for many plastic pipes are significantly smaller

and for DN20 PEX fittings it can be down to 11.2mm. The effect on the water velocity, compared to copper for the same flow, is that for the DN20 plastic pipe it would require a velocity 47%

higher but the fittings requires an additional 130% [2.3 times] the velocity. [Note: AS/NZS 3500.1 and AS/NZS 3500.4 have equivalent pipe size tables and specify that DN20 copper is equivalent to DN25 PEX.]

It is important for plumbers and installers that, if using a different pipe from that specified in the design, you need to check with the pipe supplier that the internal diameters of the pipes and fittings are equivalent or larger than the original design.

The other contributing factor for noise and water hammer is pipe supports. All pipes have a specified maximum spacing for brackets and clips as listed in AS/NZS 3500.1 and AS/NZS 3500.4. Copper and steel pipes require less clipping due to their rigid nature. Plastics require more clipping but many plumbers fail to correctly install plastics and these can float and bang on the walls when there is a pressure surge or water hammer.

## RISING ISSUE

There's been an increase in the number of noise issues ➤



TMVs act to protect both the people using the system and the system itself.

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being experienced within more complex piping systems in areas such as Health Care and Hospitality irrespective of the pipe material. Occasionally these are contained to warm water delivery lines from Thermostatic Mixing Valves (TMV's) to fixture outlet, however at various sites noise is also occurring in some cold water lines or in areas where no TMV's are installed.

TMV's require the mandatory inclusion of a non-return valve as an integral part of the product to prevent cross connection of heated and cold water supply. Trials with different TMV's, removal of the TMV's, lowering the pressure and changing the end of line tapware generally did not eliminate the issue leading to the conclusion that it is primarily related to a combination of factors including pipe material choice, sizing and velocity issues.

One other issue has arisen being the possibility of Reverse Water Hammer. This is where a tap or control valve is located some distance away from the end of the pipe. As the tap or control valve closes, the flowing water causes a vacuum immediately after the device. The vacuum may suddenly reverse the water flow, causing a vibration and loud banging noise. To minimise this occurrence, the pipe work after the

device should be larger thereby reducing the water velocity in the pipe on the outlet side.

#### STEPS TO MINIMISE NOISE AND WATER HAMMER

- Design pipe work so that the velocity is no greater than 1.5 m/sec.
- Ensure that when changing materials or designs that the internal diameter of alternate material is the same, or larger, than the design criteria.
- Keep the pressure in the system well below 500 kPa with pressure limiting valves.
- Make sure that all pipe work is secured by clips at the correct spacing for the pipe material.
- Install one or more water hammer arrestors upstream of fast closing valves
- Install soft closing lever taps
- If taps or control valves are not at the end of the line, ensure that the outlet pipe is one size larger to eliminate reverse water hammer. ■

John Fennell. CEO, International Copper Association Australia.

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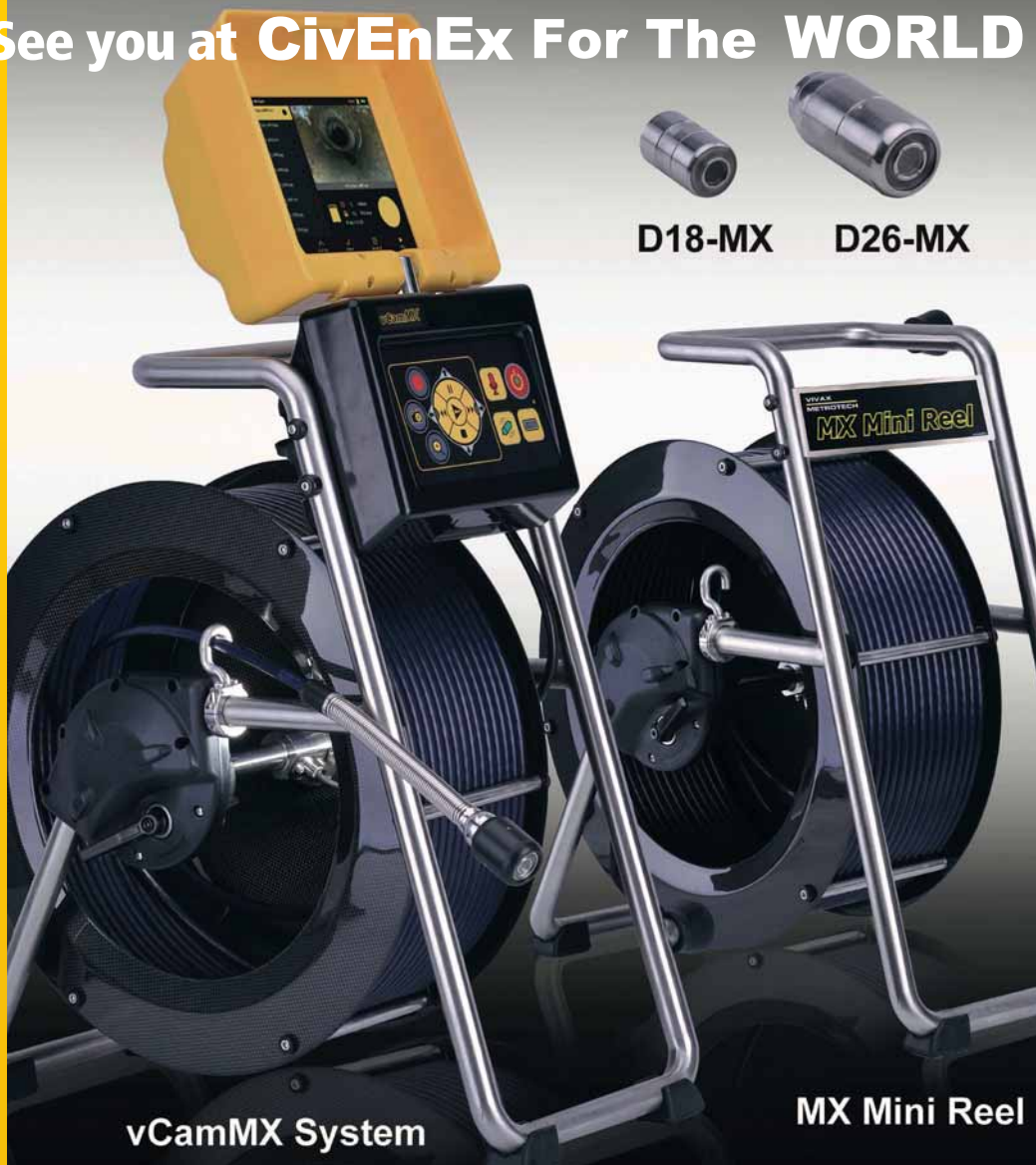
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# FIVE STEPS TO EFFECTIVE SOCIAL MEDIA

WHETHER YOU LIKE IT OR NOT, SOCIAL MEDIA IS HERE TO STAY. **CECELIA HADDAD** EXPLAINS HOW TO USE IT BEST TO YOUR ADVANTAGE.

In today's world, the social media market has become a dynamic, authentic and important entity. It has the ability to influence the ideas and opinions of millions of people worldwide. Since it is autonomous, substantial and changeable, it can't be ignored. There is a real necessity for businesses and organisations to enter the world of social media, monitor it, act through it and respond to its challenges.

"But how can I make social media effective without spending too much time on it and is it really worth it?"

This is a question I often hear from clients when thinking about marketing.

Social media doesn't have to be complicated or time consuming and can be very effective with benefits that include:

- Building relationships and engage with customers
- Raising awareness of your company and successful projects
- Demonstrating thought leadership and position you as an expert in your field
- Listening to, understanding and engaging with your audience.

You don't have to use every social medium but rather choose the one or ones that are right for you. LinkedIn, Facebook, Twitter, Instagram, Pinterest, YouTube, Google+, Blogger all have advantages to offer the building industry. There are two stages in getting on board – listening and participating.

Listening means monitoring social media and you can do this for a month or two before you actively get involved.

## WHY LISTEN?

- Your customers, competitors and even suppliers are already online and most likely talking about you
- You can gauge customer perception and use it to improve your offering
- This information gives you the groundwork and research on which to base your marketing strategy and help you confirm or conform your message.

And now get involved...



## WHY PARTICIPATE?

- It opens dialogue between you and current/potential customers
- It builds your brand visibility and provides an opportunity to promote your projects
- You can use valuable online feedback that is cost effective to collect
- It can drive traffic to your website.

Planning social media is a bit like planning to build a house. You have to start with a design and direction and while you may have to make some adjustments on the way, if you don't have a plan it will never be successful.

## There are just five steps to follow:

**1. Determine your key messages** – what are you going to say about your organisation, how it is different from other companies and why a customer should build their new home with you. Make sure this stands out from your competitors.

**2. Develop a content calendar** – a month by month plan ➤

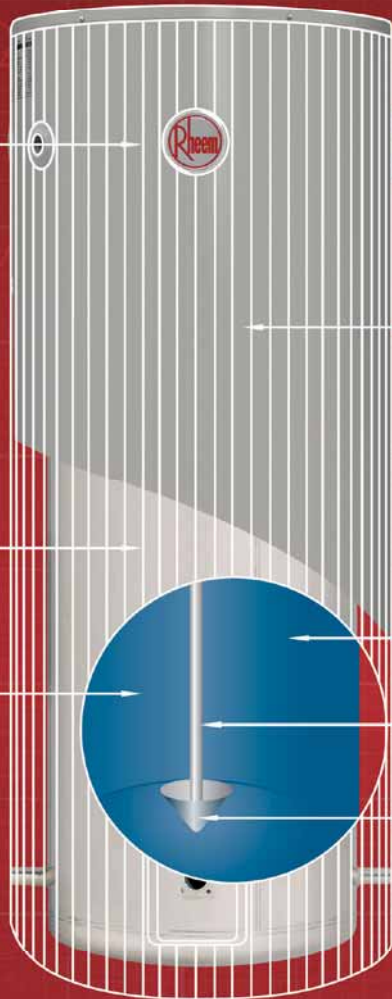
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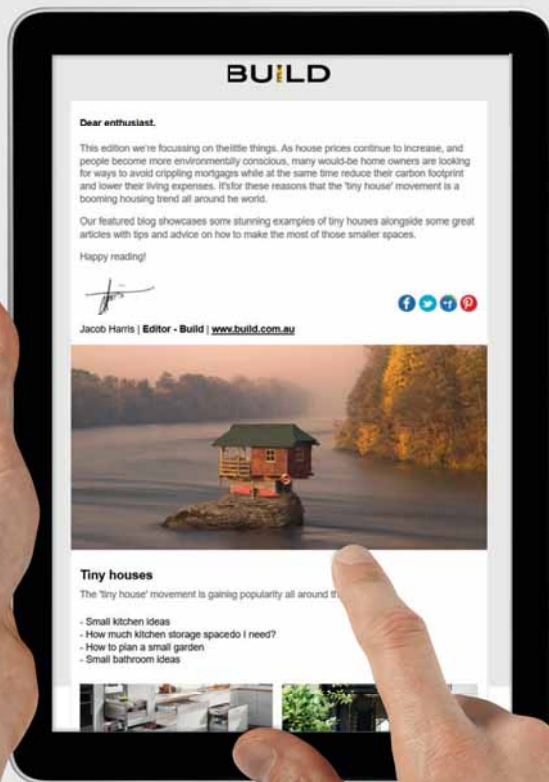
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**BUSINESS PROMOTION**  
CECELIA HADDAD

of what you are going to talk about through social media. You can change the theme each month for example, sustainable homes, energy saving tips for designing your new home and planning a major alteration and addition.

**3. Schedule content to be posted on a regular basis** – there are some free and low cost social media services that allow you to write posts and schedule them in advance so you don't have to be at your computer at the time you want to post something. This is ideal for builders who are almost always on the road or on a building site and planning ahead will save so much time.

**4. Feedback** – monitor comments and be sure to respond to both positive and negative comments. Positive comments need a 'thank you, that's great to hear'. Negative comments need an action – dispelling a myth, correcting a fact, altering a perception or fixing a problem or complaint.

**5. Evaluate** – this involves revisiting your starting point and measuring where you arrived. What changes have occurred? What has worked and I need to do more of? What didn't work and why? What do I need to improve or just stop doing altogether?

**Here are some tips for best results:**

- Amp up the use of visual content: images and videos are far more noticeable and are more likely to prompt engagement than text.
- Keep it short: posts with 80 characters or less get far more engagement. Just because you can fill 140 characters doesn't mean you need to.
- Find a balance between informative and annoying – there are many different opinions about how often you should post but in the building industry and considering the subject matter then following this guide: Twitter – once per day; Facebook – twice per week; LinkedIn – once per week and a fortnightly or monthly written post.
- Don't just broadcast your message. Ask questions, get people talking, debating and thinking.
- Build your connections: spend time finding former customers, influencers, people who might refer you and increase your circle of contacts.
- Start small and build slowly. Like all good things, it takes time (and patience).

Finally, just do it. You have to be in it to benefit. ■

**Contact:**

Cecelia Haddad is the Director of Marketing Elements in Sydney. [www.marketingelements.com.au](http://www.marketingelements.com.au)

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# SUBMITTING A PROFESSIONAL TENDER LETTER

ANDY FARRELL EXPLAINS THAT WHEN IT COMES TO SUBMITTING TENDER LETTERS, IT'S MORE THAN JUST A GAME OF NUMBERS.

Quoting or 'tendering' for a project is a fundamental necessity for any plumbing business to be awarded the contract of a large job. There is a comprehensive process that unfolds before the first ground is broken on a project and it's important to ensure that all the "boxes have been ticked" before signing the works contract.

The decision to submit a tender for a project should be a carefully considered process that balances the opportunity against a realistic evaluation of the likelihood of success and the ability of your business being fit to perform the required works.

The approach should be systematic, incorporating an evaluation of each facet of the project coupled with the requirements of the potential client. Submitting a tender is often a time consuming process and it's important to target the projects that suit your businesses capabilities.

Communication is an extremely important element of the tendering process and it is crucial that you inform the client as early as possible of your intention to submit a tender or not. If you decide not to submit a tender, then it is courteous to send an 'unable to tender' letter explaining the reasons of your decision. This particular project may not suit your requirements and that's fine, but don't disappoint a client by not informing them. Remember, by maintaining a good relationship with a client ensures you will have an opportunity to tender (and hopefully win) future projects.

So, you have made a decision to quote a project. You've conducted a site visit, read all the documents and compiled a price that you have confidence in. The next thing to do is present the price in a formal submission also known as a tender letter.

A well-presented, professional tender letter should focus on the requirements within the invitation to tender [ITT] document and/or as stipulated by the client. It is very important to clearly address each element of the tender request and if you have any additional information useful to the submission then it should be presented as an addition within the tender letter. Offering cost saving alternatives can be a great way of separating yourself from the crowd, while giving the potential client confidence in your submission.

The design and layout of the tender letter should include a header with your business details and logo. The footer



A sample of a professional tender letter. Visit [www.plumbingpack.com.au](http://www.plumbingpack.com.au) to download the template.

should contain the page number and project name title. The submission should be divided into clear sections, either as specified by the buyer or created to provide a clear and logical presentation of the proposal content.

**A TYPICAL TENDER SUBMISSION SHOULD INCLUDE (BUT, NOT LIMITED TO):**

**Scope of Works** - This is a brief description of the required works as shown within the tender documents. ➤

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ESTIMATING  
ANDY FARRELL

**Tender Price (break-up)** - The tender documents will usually specify the requirements for how the pricing should be presented. Normally this will be a 'total amount including GST', but sometimes a client may request a detailed breakdown of the cost elements to be provided (such as per service or zone).

**Cost Saving Options** - There may be areas within the tender documents that you identify where a more cost effective solution can be applied. This is an opportunity to present a cost reduction to the client, reaffirming the confidence in your understanding of the project and save them a few bucks.

**Tender Documents** - Include a list of all the plans, specifications, reports and addendums that were used to price the project. Note - ensure to indicate the revision number and/or dates.

**Tender Inclusions** - It's important to list (bullet point) the project specific elements to convey that you have made allowances for each of the required works.

**Project Assumptions** - There may be existing site conditions that are deemed to be operational and any elements of a project that are expected to be provided by the principle contractor.

**Tender Exclusions** - As per the tender inclusions, it is equally important to list the elements that are NOT included within your submission price.

**Price Validity** - This is a time frame of how long your tender price will remain firm for. Compiling a professional tender submission is an important "first impression" that represents you and your business.

Take the time to ensure you've covered all the requested elements within the documents; after all it's more than just submitting a price to a prospective client. ■

**Contact:**

Andy Farrell has put a lot of a lot of work into developing an estimating and management system to make running a plumbing business as simple as possible. He's also made himself available to answer any questions readers might have on estimating. For a free copy of a Tender Letter Template - visit [www.plumbingpack.com.au](http://www.plumbingpack.com.au)





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# CHOOSING THE RIGHT WATER HEATING SYSTEM

**JON PALFREY** DISCUSSES THE KEY FACTORS USED TO DETERMINE WHICH WATER HEATING SYSTEM IS MOST APPROPRIATE FOR COMMERCIAL AND INDUSTRIAL APPLICATIONS.

## GENERAL PRINCIPLES

### Commercial & Institutional

Commercial and institutional heating systems serve the same purpose as a domestic water heater but in much larger quantities required by commercial facilities such as hotels, apartments, motels, guest houses, schools, commercial laundry facilities, office amenities and canteens etc.

### Industrial

These systems cover more specialised applications where heated water is used for mixing, heating, sterilising and other similar requirements.

## SELECTION GUIDELINES

**To decide on the water heating system to recommend and install, follow these steps:**

1. Determine the peak demand period for the application and energy type to be used for the system
2. Calculate the hot water requirements over the peak period relating to volume and temperature
3. Select the water heaters that will meet the demand calculations as per individual system specifications
4. Ensure adequate space is available for the installation of a commercial plant – it will require a footprint to fit but also sufficient area available for maintenance and service
5. For an effective and efficient system, correct pipe sizes are required for cold water supply, heated water delivery and the gas fitting line in the case of a natural or propane system.

## SYSTEM SUITABILITY = ASKING THE QUESTIONS

If the commercial application is an existing facility and there is the opportunity to meet with the occupants and discuss heated water for their daily business needs then it can be very advantageous to not only ask the owner of the business but also the key staff who actually use heated water fixtures to perform their work activities. Kitchen hands and waiters are good examples.

A good example of this procedure is if a restaurant is seeking to upgrade the hot water system. It isn't the number of seats in the restaurant but the number of meals on their busiest day of the week that the system needs to be capable of delivering to. You need to think of the highest usage



pattern experienced during the peak demand period.

Once the number of meals is correctly ascertained then refer to the associated sizing guide to determine the type of meal service facility and match the allowances per meal being prepared [i.e. 3.1 litres or up to 5.5 litres for a three course meal].

Then confirm the temperature necessary to service the fixtures being used for washing up.

Most municipal councils require a minimum of 77°C water supply at a scrub sink area; there is also a preference for "commercial" temperature hot water if a floor is being hosed down after a shift to remove surface debris and grease.

Finally, check that the system to be installed will actually deliver the desired temperature as most domestic hot

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TABLE HEADING		
Application	Suggested peak period	Hot water requirements, 60°C supply temperature [unless indicated otherwise]
Snack bars, take-away foods	1 to 2 h 12 to 1 pm or 12 to 2 pm	Allow 3.1L for each meal. This covers cooking and washing, e.g. 200 meals over 2h=620L. Note: Water is required greater than 77°C for sanitising.
Canteens, cafes, hotel kitchens, restaurants	1 to 2 h 12 to 1 pm or 12 to 2 pm	Allow 5.5L for each 3 course meal. This covers cooking and washing, e.g. 200 meals over 2h = 1100L. Note: Water is required greater than 77°C for sanitising.
Holiday flats, hotels, motels, guest houses	1 h 7.30 am to 8.30 am	Allow 20-25 L per head over the peak hour, e.g. 40 guests = 1000L over 1h. For 4 and 5 star accommodation allow 35-50L per head.
Apartments	1 h 7 am to 8 am	Allow for each type of apartment in the building. e.g. studio = 25L, 1 bed apartment = 40L, 2 bedroom = 70L 3 bedroom = 90L, 4 bedroom = 110L, Penthouse = 150L
Caravan parks, camping areas	Spread over 2 h	Allow 20 L per person; average 4 persons per van, e.g. 30 vans = 120 people = 2400L over 2h. In parks used mainly for long-term holiday or residential purposes, the peak period may extend over a much longer time. The actual usage pattern should be ascertained.
Hairdressing salons	3 to 4 h	Each installation to be individually evaluated, but as a guide allow 10L per customer.
Squash courts	spread over 4 h	Allow 20L per player; average 16 players per court over 4h, e.g. 4 courts = 20 x 4 x 16 = 1280L over 4h.
Office amenities	spread over 8 h	Allow 3-4L per person per day. Showers seldom used or 1.5L per person over a 1hour peak.
Factory change rooms (light industry)	1 h 4 pm to 5 pm	Average of 30% use showers. Allow 20L per head. Average of 70% use hand basins. Allow 3L per head. (This is equivalent to 8 to 9 L per person.)
Factory change rooms (heavy or dirty industry)	1 h 4 pm to 5 pm	Allow 30L per head. In some industries, such as mining projects, up to 50L may be required.
Coin-operated laundries	spread over 8 h	Allow 70L per machine per hour. e.g. 6 machines = 70 x 6 x 8 = 3360L over 8h. For large commercial laundries allow 10L per kilogram of dry washing.
Glass washing machines	usually over 2 h	Determine quantity of glasses to be washed over peak period Allow 3 glasses per litre of beverage sold. Most machines require 7L of hot water per wash of 25 glasses and can handle one wash per minute, e.g. 1000L of beverage over 2 hours requires 1000 x 3 x 7 / 25 = 840L of hot water. Alternatively, allow 3 glasses per person [use licensed capacity as a guide]. Notes: [1] Temperature required by regulations is 82°C [2] Where beverage consumption is known in gallons, multiply by 4.55 to convert to litres.

*Note this sizing guide should be taken as an average only and individual site assessments may be necessary.*

water systems have a maximum thermostat temperature of 65-70°C depending on the system type, whereas a commercial water heater must be capable of delivering and maintaining water at or around 80°C.

**MULTIPLE DWELLINGS**

Most capital cities in Australia are seeing considerable increases in apartment living, where centralised water heating plants are being used to provide heated water in a “flow and return” designed system.

Typically each individual apartment is metered on consumption of the volume of hot water used by an energy provider.

**Advantages of a centralised water heating plant include:**

- More cost effective systems to supply and install
- Diversity in system design allows larger users more

volume of hot water

- Where meters are used to measure volumes, occupants pay for what they use
- Hot water meters assist in special tariff arrangements with energy suppliers
- System redundancy allowing for partial shut down for service and maintenance needs.

**RECOMMENDATIONS FOR MULTIPLE DWELLINGS**

- Locate the system as close as possible to pipe risers in the building
- Use service ducts and cavities to run piping
- All heated water piping is to be insulated to minimise heat loss as required by local authorities.
- An allowance of 10% storage of the first hour delivery requirement will provide an adequate diversity buffer.

- Allow space to not only locate the plant but also enough area for service, maintenance, removal and part replacement.

### INDUSTRIAL APPLICATIONS

#### Points to consider when recommending/installing:

1. Determine the overall operation is within the working range of the proposed system i.e. delivery temperature
2. Consider all plant options and if mains pressure [such as a mains pressure store system] is required for delivery purposes
3. Determine governing factors such as...
  - Cold water supply temperature
  - Quantity and temperature of heated water that's required
  - Intervals of time at which heated water is needed
  - System recovery time
  - Accuracy of temperature required
  - Available energy source
4. Prepare a proposition based on these facts and consider using the following equipment options
  - Flow control valves
  - Thermostatic mixing valves

- Flow control solenoid valves
- Pre-packaged circulating pump units

### RHEEM TECHNICAL ADVISORY SERVICE

This free Rheem service is available throughout Australia with qualified staff available to assist in plant sizing and advice on key installation and design criteria.

Rheem commercial staff can meet you on site to gain an accurate assessment of an installation's needs and the key points to consider.

Today many options and solutions are available to provide the end user with the correct and most suitable system for their commercial or industrial needs.

Rheem is also delivering commercial training sessions in 2016/17 to provide the attendee with first-hand knowledge on sizing, installing, commissioning and fault finding Rheem Commercial water heating systems.

To register for this and other Rheem training courses visit the Rheem website for details. ■

John Palfrey is Rheem Australia's Training Manager.

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# WHAT'S HOT IN HOT WATER

PLUMBING CONNECTION TAKES A LOOK AT WHAT IS CURRENTLY MAKING NEWS IN THE EVER CHANGING HOT WATER SECTOR.

## HYDRONIC SMART CONTROL

Bosch Hot Water and Heating is launching an innovative new smart controller that is expected to become a must have accessory for the Bosch Hydronic Boiler range.

The CT100 smart control allows the owner of a Bosch boiler to control their hydronic heating system via a smart phone and free Bosch App, from anywhere in the world.

The Bosch group is working across many business fields to be a leader in the area of connectivity and networked appliances. In this new age of the "Internet of things", the Bosch catch phrase Invented for life is being realised by connected Bosch appliances that enable higher levels of energy efficiency, comfort, and sustainability.

The introduction of the CT100 in Australia is the latest example of this philosophy. The controller is connected to the home router and then paired to the owner's smart phone. The CT100 can function as a conventional touch screen controller, or can be remotely operated via the app and smart phone.

The CT100 has the ability to communicate with the boiler to take advantage of control features such as weather and load compensation. This means the boiler can modulate its performance to ensure the optimum balance of energy efficiency and comfort is achieved.

The app also allows the user to see a chart of their boiler operation and energy consumption, allowing the easy identification of additional opportunities for potential energy savings

With an expected release to the Australian market in 2016, this controller is sure to revolutionise hydronic heating in the home.



[www.bosch-climate.com.au](http://www.bosch-climate.com.au)

## CELEBRATING 40 YEARS OF RENEWABLES

2016 marks the 40th year in the development of renewable energy products from Stiebel Eltron. In 1976, Stiebel Eltron began to invest in a range of innovative renewable products to help its customers save money by reducing their energy consumption in key activities like hot water, heating and cooling.



Stiebel Eltron was one of the first manufacturers of heat pumps in Germany and quickly established itself as a market leader. With worldwide demand for heat pumps increasing, Stiebel Eltron demonstrated its commitment to renewable energies with the construction of the most advanced heat pump manufacturing facility in Central Europe. The "Dr. Theodor Stiebel Hall" cost over 10 million Euros and was a milestone in the company's history. The production area can produce more than 25,000 heat pumps. In 2009, a second manufacturing plant was opened at its headquarters in Holzminden, Germany.

In 2016, 40 years since the first heat pump, Stiebel Eltron will release an all-new innovative range of hot water heat pumps in Australia.

"It is an exciting time at Stiebel Eltron Australia. We celebrate this year our 40th year of renewable products in Europe, and nearly 10 years in Australia. Our new range of innovative heat pumps will set a benchmark for domestic hot water heat pumps within Australia. All aspects of the design have been carefully considered from the perspective of the homeowner through to the installer. Like all excellent things in life, they take time to develop, but the wait has been worth it," said sales director Stiebel Eltron Glenn Day.

Its new heat pumps will be launched later this year.

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

## Propress Smart Connect-Feature

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Feature  
by Viega 



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### Quality and reliability you can stake your reputation on!

All Viega press fittings offer a unique safety feature – the Viega Smart Connect-Feature. Thanks to this technology, which has been tried and tested millions of times, unpressed fittings automatically leak during the pressure test. Viega press fittings with Smart Connect-Feature work with both compressed air and water. If the connection has a leak, the “dry” leakage test will show a visible pressure decrease over the entire pressure range from 2.2 kPa to 300 kPa. If the leakage test is carried out with water, this visibly escapes from the unpressed fittings in the pressure range of 100 kPa to 650 kPa. Another advantage of the Viega press connection is the cylindrical pipe insertion. This prevents damage to the sealing element during the assembly process. Make the smart decision you can stake your reputation on. **Viega. A better idea!**





**ONE HANDY TOOL**

The highest performance and most versatility of all Dremel rotary tools comes in the shape of the Dremel 4000 Gold kit. The increased strength of its motor plus electronic feedback circuitry enables consistent performance at all speed levels. The kit includes five Dremel attachments including a shaping platform, comfort guard, multipurpose cutting kit, flexible shaft and line and circle cutter. The Gold Kit also includes 70 high quality accessories.

[www.dremel.com](http://www.dremel.com)



**INNOVATIVE PIPING**

Alongside multilayer PEX-AL-PEX gas and water piping system Austec is offering compatible PEX-B pipes. Both flexible pipes are compatible with the same series of DR brass fittings for gas and water application. Requiring fewer fittings and one set of tools makes the system extremely cost effective. With the same fittings for water and gas you only need one set of fittings in stock for both gas and water applications.

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

**ALL-IN-ONE**

The new vCamMX is a portable all-in-one mini inspection system for viewing the internal condition of pipes, conduits, ducts and similar tubes between 25-100mm in diameter. The control module houses the 8" daylight-viewable LCD screen which displays the images from the camera on the 10mm pushrod, the distance of pushrod, as well as the current time/date. The system records in 'avi' video and takes pictures directly to a USB and can be backed up to an SD card.



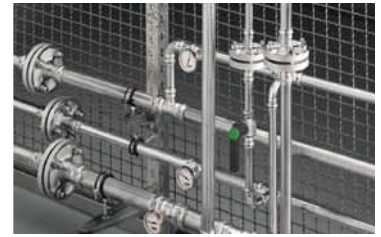
[www.vxmtaus.com.au](http://www.vxmtaus.com.au)

**JET POWER**

The RIDGID KJ-5000 portable water jetter provides 5075 psi actual working pressure to handle commercial and industrial pipe clearing applications. This jetter propels a highly flexible and lightweight thermoplastic hose through 50mm to 250mm lines - blasting through sludge, soap, grease, and sediment blockages. As you pull the hose back, it power scrubs the line flushing debris away and restoring drain lines to their full, free-flowing capacity - all without the use of harmful chemicals.



[www.ridgid.com](http://www.ridgid.com)



**NON-RUSTING PIPING**

Viega's Sanpress Inox stainless steel system has been long regarded throughout Europe as the perfect drinking water system. And in Australia, with a trend towards stainless steel in multi-storey buildings as the main riser for the higher pressure rating of the pipe, the Sanpress Inox system provides an effective and efficient solution. Sanpress Inox uses reliable Viega press technology, thus ensuring the maximum comfort during assembly, even in hard to reach places.

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



**SMART SINK**

The Smart Sinks system is a versatile and flexible system designed and manufactured in Australia. The Smart Sinks Filtration Bin is a fully mobile system suitable for both indoor and outdoor applications making it ideal for cleaning equipment when working in high-rise construction sites.

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



# ATT

ACROSS THE TRADES

WINTER 2016



**INSIDE:**

**A WATERTIGHT APPROACH  
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## ***Mapping the future***

***The rise of commercial drones***



## EYES IN THE SKY

New developments in drone technology are paving the way for widespread adoption of the machines across a range of commercial applications.

**Jacob Harris** explains.

Unmanned aerial vehicles (UAVs), commonly known as drones, are just about everywhere you look nowadays and are being used for everything from film making to tracking sharks on the NSW coast.

According to Juniper Research, commercial drone sales are expected to rise by 84% this year alone, with annual sales approaching US\$500 million. And as the technology continues to become cheaper, more robust and more accessible, their usage seems set to become even more widespread in an ever increasing variety of scenarios.

One development that seems set to broaden the scope of application for drones is a 3D LiDAR (laser mapping technology) payload named Hovermap that has been developed by the CSIRO.

"Most UAV systems you buy off the shelf rely on an expert pilot – there's no collision avoidance – so if the pilot does the wrong thing the UAV is going to crash into anything that's nearby. We've been trying to solve this problem by adding stereo cameras, LiDAR systems and radar to UAVs for many years, allowing them to sense the world around them in 3D and react to obstacles," says principle research scientist and leader of the Robotic Systems Team in CSIRO's Data61 division, Dr Stefan Hrabar.

Hovermap differs from past efforts because of its ability to use LiDAR to simultaneously map its surroundings while sensing its position in the 3D space without the need for GPS.

"The technique is called Simultaneous Localisation and Mapping (SLAM). This allows anything that is carrying a laser to use information generated



**The CSIRO has developed a 3D LiDAR payload that can simultaneously map its surroundings while sensing its position in the 3D space.**

by that laser to build a map and at the same time figure out where it is in that map. So it's localising and mapping simultaneously, in real time – figuring out where the obstacles are and preventing the pilot from flying in to things," says Stefan.

While there are other UAV systems that use LiDAR to sense or map the environment, these systems rely on GPS and inertial navigation systems (INS) integration to estimate the position and orientation of the LiDAR. This often renders them incapable of flying indoors, underground or close to structures that interfere with GPS signals. But because Hovermap uses SLAM technology, it is able to operate effectively in these areas.

The system can be used in two ways: one is to generate 3D maps and take measurements using the LiDAR, while the other is to carry out close-up inspections using cameras and other

sensors by exploiting Hovermap's ability to safely fly close to structures.

"If you need the 3D structural information to take measurements or see if something's moved, you use the LiDAR map. But if you need to do a visual inspection – if you're looking for small cracks or rust for example – you're not going to see that in the LiDAR, there's just not enough resolution in the data. You need a camera on board," says Stefan.

Hovermap's collision avoidance and pilot assist modes are currently being flight tested and will effectively reduce the cognitive load on the pilot, allowing them to focus more on the mission than on piloting the UAV. The system calculates the best flight speed and optimal distances from structures when undertaking mapping and inspection tasks and 'knows' where it's been, ensuring no blind spots are created. This

reduces the necessary skill level of the pilot, making the technology accessible to a much broader user base.

Stefan's team are also in the process of making it possible to integrate photographs taken by Hovermap into the LiDAR map. Though still in development, this capability will see information from the LiDAR and the camera combined with a high degree of accuracy. Because Hovermap uses its onboard laser as a positioning system (it is a far more straightforward process to locate the position of the camera in relation to the laser, as opposed to a GPS satellite) Hovermap is able to pinpoint where an image was taken with far greater accuracy than a system using a GPS.

"When you take a picture you will know exactly where that picture was captured from. If you have the 3D map and an image, you will be able to project the image information onto the map and

alternate between the two. So if you click on the 3D view you'll be able to show up the 2D photographic images that cover that point in space and if you click on something in the image it will show you where that feature is in the 3D space," says Stefan.

The ability to combine this information with such a high level of accuracy will open up a range of possible applications in construction, asset management, mining and energy, agriculture and even forensics.

"Police are interested in using this for crime scene mapping, they're already using the hand held version (called Zebedee) but part of what they need to do when they collect evidence is take photos. If there's been a motor accident for example you won't see a skid mark in the laser scans because it's just a difference in colour. But if you're capturing LiDAR and images at

the same time and you want to take a measurement of how long that skid mark was, because we've got the 3D map and the images you could click on the beginning and end of the skid mark in the image and use the associated 3D layer to take the measurement," says Stefan.

Queensland company V-TOL Aerospace is collaborating with CSIRO as its product testing and commercialisation development partner by exploring Hovermap applications, while the payload's immediate primary uses include mapping vertical assets, surveying and measuring variations on large construction jobs, they believe the roll on effect will soon be felt in the small-medium business sector.

"We've actually migrated towards the smaller end of town operating <20kg UAVs because we think it's going to be a very big market. It's already starting

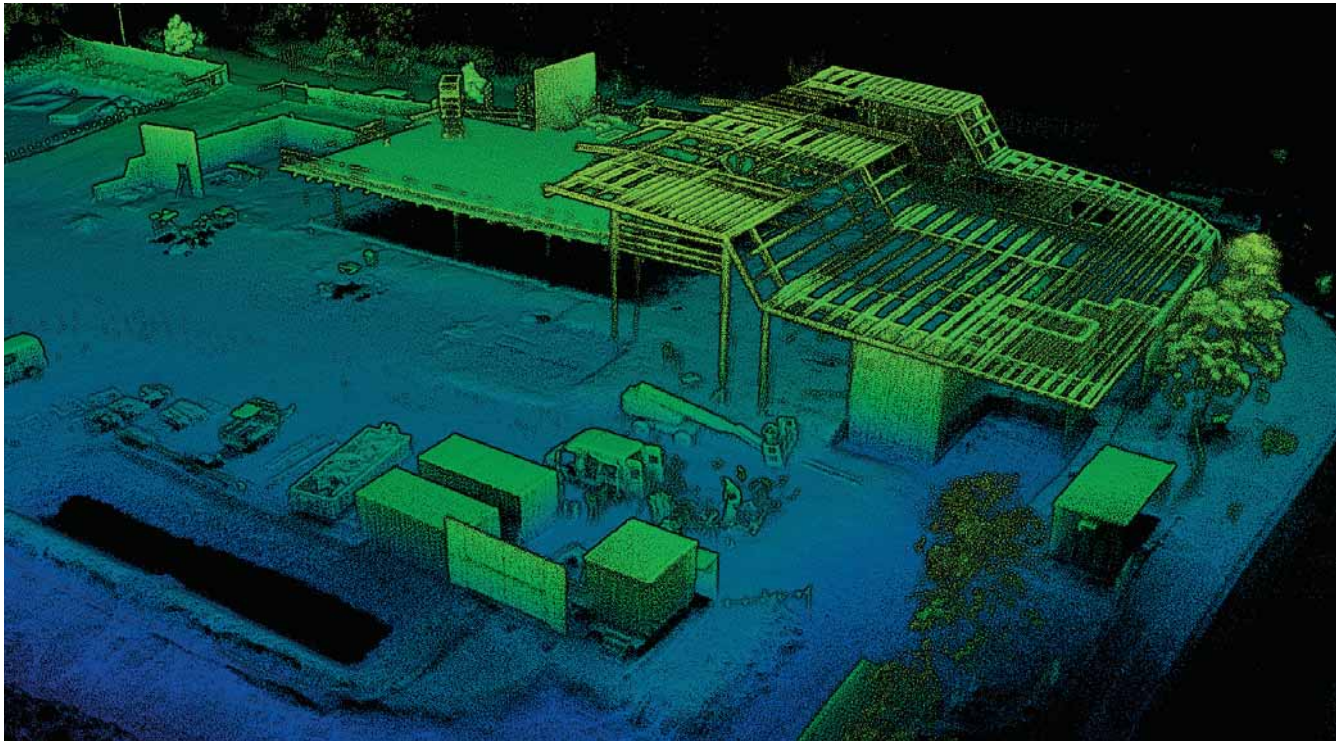


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**Hovermap calculates the best flight speed and optimal distances from structures when undertaking mapping and inspection tasks and 'knows' where it's been, ensuring no blind spots are created.**

to grow because of the many consumer-level products becoming available. But there's a gap between entry-level and the big end of town and that area is where there's a real commercial opportunity – provided the products and service options are bundled effectively," says V-TOL managing director Mark Xavier.

Mark believes that most organisations that need geospatial information, whether it's photography, video or survey maps, will have easy low-cost access to it in the near future and he also points out that the technology will mitigate risks to workers by reducing the need to use cherry pickers and the like for maintenance and inspections at height. Instead, the machine will carry out all the risky work, thereby reducing the risk of falls and other injuries.

This isn't the end game for this technology though – not by a long shot. Collision detection and avoidance is going to be a key enabler for many applications. Both Stefan and Mark agree that although regulatory issues pose a significant hurdle, delivery drones dropping parts to remote job sites could

soon be technologically viable.

This being the case, Mark is of the opinion that much publicised efforts such as Amazon Prime Air and Google's Project Wing to establish large scale drone-based delivery services are still quite a way off.

"The idea of Amazon delivering things by dropping them through a chute or leaving items at a door step in urban areas is a little bit farfetched at this point in time. That's not to say that it's not possible technically, and eventually acceptable to the regulators, but I just wonder about the economic viability of it because it's not cheap.

"Unless you're mass producing these things and they all behave and network properly, it's going to be as difficult to do that as having autonomous vehicles on the roads. The technology is really jumping ahead but I don't know whether we're there yet and the regulations will definitely take a while to catch up," says Mark.

While we shouldn't expect to see droves of self-flying robots in the skies overnight, autonomous flight is no longer

something that is relegated to realm of science fiction. Stefan foresees, and is working towards, autonomous flying robots with the ability to map whole areas unassisted.

He also sees the price point of UAV devices dropping significantly in coming years and points out that the boom in research into self driving cars is pushing the physical size and cost of collision avoidance sensors down significantly. Once the price of sensors and related components is sufficiently reduced, it's quite possible that small, off the shelf consumer UAVs will come with sensors on board and be able to detect obstacles and keep themselves and other airspace users safe.

"There's a big future for this type of technology. The combination of collision avoidance and 3D mapping without GPS enables a host of new applications for UAVs. With these you're suddenly able to do a lot of things you couldn't do before – it's a synergistic outcome with huge potential for impact in Australia and the rest of the world," says Stefan. ▲



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## TOOLS

### TABLET

**Apple**

[www.apple.com/au/ipad](http://www.apple.com/au/ipad)

Apple has introduced the 9.7" iPad Pro. At less than 500g it features a new pro Retina display with greater brightness, wider colour gamut, lower reflectivity, Night Shift mode and introduces new True Tone display technology to dynamically adjust white balance. The new iPad Pro delivers incredible performance with the 64-bit A9X chip that rivals most portable PCs, along with a four-speaker audio system, new 12mp iSight camera for shooting Live Photos and 4K video, 5mp FaceTime HD camera, and faster wireless technologies. And iPad Pro includes support for the breakthrough Apple Pencil and a new Smart Keyboard cover designed to fit the new 9.7" iPad Pro.



### VACUUM LIFTERS

**Kennards Hire**

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

Designed to carry and place glass into window frames, OKTOPUS make class-leading compact vacuum lifters and are a much loved part of Kennards Hire Lift & Shift's product stable. Their new range of dual-vacuum glass lifters all have two independent vacuum circuits - so if one was ever to fail, the other will be there to prevent anything from going wrong.

All lifters come equipped with a crane arm and an audio-visual low vacuum alert. They are also compact and universal, suitable for every construction site.



### MULTI-FUNCTION RATCHET

**GearWrench**

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

GearWrench is proud to present the Quarter Inch Drive, Compact Multi-Function Ratchet (MFR), for almost any and all mechanical occasions.

Whether it be for motor engines, or complex manufacturing machinery, the MFR dual-flex head is designed to get you into those awkward spots that ordinary ratchet wrenches can't - this is because MFR can be locked into seven different positions, and unlocked for angled access.

The MFR is sleek, and designed to save you time - with a quarter-inch drive on one end and a quarter-inch hex bit-driver/holder on the other, it is both functional and compact.



### MOBILITY SYSTEM

**Bosch Blue**

[www.bosch-pt.com.au/professional](http://www.bosch-pt.com.au/professional)

The Bosch Mobility System is highly compatible, flexible and customisable, making it ideal for numerous applications.

Compatible with the Sortimo in-vehicle equipment system, trailers can quickly and safely load, unload, secure and transport all of their equipment into their vehicle, making it easier and quicker to safely move from job to job.

Consisting of four core product categories, which are all compatible with one another, the flexible Bosch Professional Mobility System includes: Click & Go Elements, Individual Storage Solutions, Tool-specific Inlays and Transportation Support.



## SAFETY APP

### GetHomeSafe

[www.gethomesafe.com](http://www.gethomesafe.com)

GetHomeSafe has launched its second app to meet demand for monitoring the safety of people working alone. The new 'lone worker' app meets demand from businesses interested in using it as an essential tool for their workforce.

"Property management firms, local government, consultants and the agricultural sector are those that are either already using it or are very interested in looking further at its applications across their business," says founder Boyd Peacock.

"There are a huge number of firms out there with a need for their staff to confirm they're OK at certain times, such as letting a supervisor know they're home safe at the end of a shift. Most of them are currently using text or phone-in systems."



## BLUETOOTH HEADSET

### Jabra

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

Jabra has unveiled Jabra STEEL, a robust Bluetooth, wireless headset specifically designed for tradesmen in rugged working environments. Whether on-site in high winds, covered in dirt or under a kitchen sink, Jabra STEEL withstands high drops onto hard surfaces, water, dust, extreme temperatures, making it suitable for tradespeople and outdoor workers.

Jabra STEEL offers HD voice with dual-microphone noise cancellation technology that listens to the surrounding environment and isolates your voice, enabling users to take important calls on the worksite and be clearly heard.

The Jabra STEEL features extra-large buttons that have been specifically designed to be used with wet, or even gloved, hands. It also provides easy access to Siri/Google Now and allows voice activated call pick-up, as well as message readout (Android phones only).



## WORK PANTS

### Eleven

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

The new Combat Cargo and Super Easy Stove Pipe Pants are a slim fit with stretch, designed for work but with a contemporary style. The fabrics have built-in stretch that is prewashed for comfort. Both pants feature contoured legs, a lower waist, multi-function pockets in all the right places including a deep pocket for a mobile and internal zip pocket for wallet. And for durability the pants feature a triple stitched crotch gusset, reinforced slanted back hip pockets, extra strong belt loops and a hardy work fabric.



## PRESS TOOLS

### Milwaukee

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

The introduction of the new Milwaukee Force Logic Press Tool range is set to redefine the way copper pipes are connected. Gone are the days of traditional soldering or brazing to connect copper pipes. With a balanced one-handed, in-line design, the new press tools offer not only the most ergonomic solution for navigating around installed pipes, but also deliver on the highest level of press accuracy and reliability.

This new press method involves flame free installation where fittings are consistently pressed, improving joint performance, minimising gas leaks and risk of fire. Delivering increased efficiency for service plumbers, the new press tools not only eliminate the need to drain the system as required with conventional solder connections but do not require the need for hot works permits on major job sites.





# GETTING CARDED



**For contractors in particular, mobile payments can improve cash flow and reduce the time spent chasing invoices.**

As every contractor knows, chasing invoice payments can be a real chore. But there is an ever increasing number of portable card readers that enable payment to be collected on site, as soon as the job is done.

According to a survey conducted by Galaxy research, half of all Australians believe the land down under will be one of the first countries in the world to go cashless. The survey, commissioned by Mastercard, also revealed that 64% of Aussies are already reducing the amount of cash they carry and 36% believe society would be safer without cash.

Obviously, it will still be many years

before we dispense with cash altogether but without a doubt it is the direction we are heading in. With this changing consumer mindset, the benefits to small businesses for accepting card payments are growing more pronounced all the time.

“Australians have long considered credit and debit cards a fast and convenient way to pay, but what we are starting to see is a real understanding of, and appreciation for, the safety benefits of cards over cash. Australians know that if their wallet is stolen or lost, any cash is as good as gone. However, knowing they’re protected against any unauthorised purchases on their cards provides the peace of mind they need in an already unfortunate scenario,” says senior vice president and county manager at Mastercard, Andrew Cartright.

For contractors in particular, the ability to accept card payments can improve cash flow and reduce the time spent chasing up unpaid invoices. There are now many portable options that enable small businesses to accept card payments from customers on site.

Square Reader is one option that has recently been made available in Australia and is reportedly the lowest cost card reader available. The reader itself costs \$19 upfront and then the company takes a small percentage of each transaction made.

“Sellers using Square Reader pay 1.9% per card transaction. This is the first time Australians have had access to one low, single rate for a powerful ecosystem of tools—from integrated card payments to a powerful point of sale, analytics and reporting tools, inventory management, online invoices



and digital receipts,” says Square’s Australian Country Manager Ben Pfisterer.

Melbourne business Pipes Plumbing recently started using Square Reader and is finding the ability to accept onsite payments is improving cashflow.

“Before I had Square, I had to rely on cash, checks or direct debit from people in order to get paid. But now, as soon as a job’s complete, I can invoice people on the spot and process the payment straight away. The job’s done and the payment’s already gone through,” says Pipes Plumbing owner Andy McKinnar.

There are a range of options currently available which come in a variety of shapes and sizes – from small pieces of hardware that plug into the headphone jack on a smart phone to portable, Bluetooth enabled EFTPOS machines. ▲

#### SQUARE READER

At only \$19, Square Reader is the lowest-cost card reader available on the Australian market. It takes moments to get set up and start accepting card payments with Square Reader, which plugs directly into the headphone jack of your iOS or Android

smartphone or tablet. Within minutes sellers can be securely accepting Visa, MasterCard or American Express credit or debit card payments. Sellers pay 1.9% per transaction, no matter which card is processed, and funds are deposited quickly into any Australian bank account.



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### MOBILE PAYWAY – WESTPAC

Westpac's Mobile PayWay enables users to take payments and issue refunds on a designated mobile device. It provides automatic, same day settlement to your nominated Westpac bank account and has no minimum monthly fees – only pay for transactions you process (however other fees may apply).

It is compatible with most debit and credit card types – including MasterCard, Visa, EFTPOS and American Express – and is available on iPhone and iPad using iOS 7 and above or Android (version 4 or above).



### GOPOS LITE - BENDIGO BANK

One of the first lightweight EFTPOS devices to be released in the Australian market, Bendigo GoPos Lite connects to any network, giving business owners more freedom and connectivity than ever before.

Bendigo GoPos Lite is easy for both business operators and their customers to use. Once approved, merchants simply download a free app onto their smartphone or tablet, then pair to the GoPos Lite device via Bluetooth. The transaction is keyed into the smartphone or tablet and the customer then enters their card and PIN into the reader. A receipt can be sent to the customer via email or SMS to complete the transaction.



### NAB NOW

NAB Now is a mobile point of sale solution for Small Business that enables you to accept card payments from customers anywhere, anytime. Specially designed to suit the needs of small and micro businesses on the go, NAB Now uses a small lightweight card reader that connects to your smartphone via Bluetooth and allows you to process payments on the spot through the app as long as you're connected to the internet.



### MINT MPOS – M10

Designed for businesses on the move, Mint mPOS M10 is a light yet robust solution that lets you take payments anywhere. Connecting to your smartphone or tablet via Bluetooth, Mint mPOS is quick and easy to set up. It's a highly secure EFTPOS machine that accepts major cards and offers customers more ways to pay including NFC Contactless.

Unlike many other systems within this space Mint mPOS can be self-installed. Once a business owner receives the Bluetooth NFC card reader and downloads the Mint mPOS iOS or Android app, they are instantly able to take payments, issue SMS or Email receipts, add surcharges, do split payments, process tips, search transactions or issue a refund.





Scan the code to learn more about our anchor solutions and NCC compliance.

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Hilti Anchoring Solutions

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Our anchors are the proven strongest solution for safety critical applications in concrete, fully backed by technical documentation, software and engineering services.

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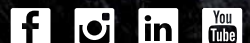
We offer the widest range of ETA backed anchoring solutions for every application from basic through to the most complex and challenging.



**NCC compliance** To ensure you comply with the Australian National Construction Code (NCC), ask for an ETA anchor approval.

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For more information visit [www.hilti.com.au](http://www.hilti.com.au) or call 131 292





# BRINGING ANCHORS UP TO STANDARD

SA TS 101:2015 is a new standard for concrete anchors that promises to raise quality and safety levels within the construction industry.

Concrete anchors are used to connect different structural materials including concrete to concrete, steel to concrete, timber to concrete as well as non-structural components. The design of these anchors is relatively complex and cannot be incorporated into any of the existing materials standards.

As a result, a new Standard for concrete anchoring has been developed by the construction industry in consultation with the Australian Engineered Fasteners and Anchors Council (AEFAC). The new Standard, named SA TS 101:2015 *Design of post-installed and cast-in fastenings for use in concrete*, will be referenced within the next revision of the National Construction Code (NCC) due to be released in May.

SA TS 101:2015 covers post installed chemical anchors, mechanical anchors and cast-in anchor channel used in concrete for all safety-critical applications. The Standard is based upon European design guidelines (ETAG) and European Technical Assessment (ETA) product assessment as the method of compliance under the Deemed to Satisfy (DTS) provisions of the NCC. Designers will have a consistent design approach and comparable product assessments to facilitate efficient and effective designs.

Hilti have advocated these design principles and product assessment methods for some time. The company believes that, when used together, these principles and methods ensure an appropriate anchoring solution and a



**The standard covers post installed chemical anchors, mechanical anchors and cast-in anchor channel used in concrete for all safety-critical applications.**

safer structure overall.

"The objective of having SA TS 101:2015 published has been to raise safety and quality standards in the Australian anchor industry and make the industry a safer one" says head of engineering for Hilti Australia, Zoran Skoric.

"This will herald a new beginning for the Australian anchor industry, one where the design and evaluation of anchors used in safety-critical applications will be brought into line with other fastening systems already referenced in the NCC and adopted throughout the building and construction industry."

Hilti anchors are already ETA assessed and the design software PROFIS Anchor and PROFIS Anchor Channel – designed to assist planners and specifiers to select anchors and anchor channels – are compliant with SA TS 101:2015.

Chairman of the Australian Engineered Fasteners and Anchors Council (AEFAC) Board Professor Emad Gad says the AEFAC is very pleased that the new standard has just been published.

"This marks a significant development for the Australian construction industry as we implement international best practice. We now have consistent and robust means of prequalification and design of anchors for safety critical applications. Furthermore, the Standard will be referenced in the 2016 NCC, which gives designers the assurance of deemed to satisfy provisions. These major developments have become possible because of AEFAC's work and the support provided by the organisations represented on the SA TS101 development committee." ▲

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\*Recommended drive away price for the Trafic SWB Single Turbo with solid paint valid for vehicles ordered between 1/4/2016 and 30/6/2016 or while stocks last. ABN Buyers only. Offers exclude fleet & government buyers. Renault reserves the right to vary, extend or withdraw this offer. †Three (3) year/200,000km warranty offer and 3 year/200,000km Roadside Assistance both apply to all new or demonstrator Trafic models. Warranty & Roadside Assistance valid for 3 years or 200,000km (whichever comes first) from new. Demonstrator vehicles receive balance of new vehicle warranty and Roadside Assistance. Roadside Assistance terms and conditions apply. Call our Customer Service Team on 1800 009 008 or view the Terms and Conditions statement at [www.renault.com.au/drivingpeaceofmind](http://www.renault.com.au/drivingpeaceofmind) for details. #ADR combined cycle figure.





## MAKING A SPLASH

An American tool manufacturer has been making waves with their range of waterproof power tools. Nemo's Becky Fienberg catches up with **Jacob Harris** to explain.

**N**emo Power Tools started out as an engineering firm that designed goods for people who needed a specific product but didn't have the technical knowledge or ability to design and build it themselves. But when a military client came to them and wanted an underwater cordless drill, the company decided it was something that deserved a closer look.

"We thought it was a really cool product so we decided to develop it further," says Nemo director of business development Becky Fienberg.

The drills were custom designed and built one at a time before small scale production began in 2013. Nemo's first clients were in the pool and spa industry, shortly followed by marine researchers, but their client base soon widened to include everyone from commercial divers to plumbers. Since then, the company has developed several iterations of that first product and it is now available worldwide.

There are a whole lot of variables to consider when designing and developing a tool that's capable of operating under 50m of water. And with both a general manager and a chief executive with diverse engineering backgrounds the company knew the importance of using the right materials and components.

"We've gone through I don't even know how many testings in a variety of different places to make sure that we have the best components. For example, we now use mechanical seals from the Italian company EagleBurgmann who have been making



**Nemo's first customers were in the pool and spa industry but their client base soon widened to include everyone from commercial divers to plumbers.**

seals for around 50 years and really know their stuff.

"Every single aspect of the tool has to be waterproof and prevent the ingress of water. If water can find its way in, it will. So that's how we have to think when we are designing our tools," says Becky.

As the range of professions interested the tool broadened, Nemo decided it was time to branch out. They developed a 'pool and spa' drill that has the same power as the 'divers' edition but is only waterproof to five metres so there's no need for it to be pressurised.

"We've made it simpler to use and it's also less expensive. That's because we thought there are a lot

of people who could benefit from using a tool that's waterproof but who aren't necessarily going to dive deep with it: plumbers, electricians and even general contractors who happen to work in really muddy or wet places who are interested in having a waterproof tool," says Becky.

As of 2016 Nemo will be expanding its offering further, adding an angle grinder, an impact wrench, an impact driver and a hammer drill to its stable. The company also has several new developments in the pipeline including a 'special ops' brushless drill that will be waterproof to 100m. ▲

**Nemo Power Tools**  
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**Includes 92kW TSI with DSG  
and a corporate escapee.**



## **New Caddy. A lot goes into a Volkswagen van.**

People who start their own small businesses put a lot into their van. Not just their supplies, but also their hard work, time and the career they left behind to follow their passion. At Volkswagen, we've loaded our new Caddy with innovative features like a 92kW turbo charged petrol engine, DSG transmission, BlueMotion Technology, touch screen audio, with City Emergency Braking\* and Adaptive Cruise Control\* as optional extras. We put in so much, because you put in so much.

\*Safety technologies are not a substitute for the driver's responsibility of the vehicle.



**Commercial  
Vehicles**



## RENAULT LCV RANGE

**A**fter delivering around 4,000 new light-commercial vehicles in Australia last year – a record for the diamond brand – Renault Australia has moved to bolster its LCV stable with 2016 model year updates for the compact Kangoo, mid-size Trafic and large Master van and cab chassis lines.

In particular, the French brand has boosted safety equipment with head- and chest-protecting airbags now standard across all three model lines (with the exception of the short-wheelbase Kangoo), while Master vans pick up a reversing camera and long-wheelbase diesel Kangoo vans add rear parking sensors.

A variety of other detail additions to the equipment lists have occurred, such as a phone docking module now included on Trafic. Petrol-powered short-wheelbase Kangoo variants also now come with a tailgate, although barn doors remain available as an option.

Renault has also moved to sweeten the deal with enhanced optional packages across all three model lines.

Master now offers a \$1,990 Premium Pack that adds hi-tech equipment such as lane departure warning, automatic headlights (switching between high and low beam and with a cornering function) and the R-Link touchscreen multimedia system. It also includes rain-sensing windscreen wipers, front fog lights, climate-control air-conditioning, a 'hands-free' key and extra storage compartments.

For Trafic, a \$2,490 Premium Pack is offered on the entry-level single-turbo model for the first time, bringing a wide-view mirror, deadlocking system, anti-theft spare wheel holder, media-navigation system and upgraded sound system with

7.0" touch screen, reinforced heavy-duty 800A battery, LED ceiling lights, 'Java' cloth upholstery, revised dashboard with extra storage, higher-grade cabin trim, heated seats, 17" alloy wheels and body-coloured exterior items such as the front bumper, rear light column and door rail.

The Trafic twin-turbo diesel's Pro Pack has been deleted in favour of a lavish new \$2,990 Lifestyle Pack which includes all of the Premium Pack features plus automatic climate-control air-con, hands-free entry and engine start/stop, and extra exterior details such as a chrome front grille with gloss-black Renault logo.

The new side/head airbags are available on the SWB Kangoo in a \$790 Pro Pack which also includes an overhead cabin storage shelf and glazed barn and dual side sliding doors, while LWB variants have these items (minus the airbags already fitted) bundled together with R-Link navigation, an upgraded audio system and front fog lights for \$1,990.

A new high-spec \$1,290 Lifestyle Pack for the five-seat Kangoo Maxi Crew model has also arrived, comprising R-Link multimedia, leather-clad steering wheel, rear seat ventilation outlet, extra-dark tinted windows and body-coloured bumpers with gloss-black door mirrors.

Renault LCV pricing starts at \$21,990 plus on-road costs for the Kangoo SWB 1.6L petrol manual, \$34,490 for the Trafic L1H1 SWB 1.6L diesel manual and \$42,990 for the Master L1H1 SWB low-roof FWD 2.3L diesel manual. ▲

**Renault**  
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## VOLKSWAGEN CADDY

Volkswagen's fourth-generation Caddy compact van has reached the Australian market, with the German brand rolling out more new variants during 2016 to flesh out a range that arrived late last year with a new higher-output petrol engine and a host of high-end features.

Aiming to keep the Caddy in its position as the top-selling sub-2.5t van in Australia, VW claims every area of the new model has been enhanced and refined.

An entry-level petrol engine and two new diesels are anticipated soon, but at launch VW has thrown its weight behind a new 1.4L TSI220 four-cylinder petrol engine that delivers 92kW of power at 4,800rpm and 220Nm of torque from 1,500-3,500rpm.

The previous Caddy didn't offer a petrol engine, nor has it ever been available with an automatic transmission, but that has now changed with a seven-speed DSG gearbox on offer alongside the standard six-speed manual. The TSI220 also delivers fuel economy as low as 6.0L/100km thanks to the inclusion of VW's 'BlueMotion' technology which includes automatic engine idle-stop and brake energy recuperation.

A variety of other high-tech driver-assist features were engineered into the vehicle, including fatigue detection and a damage-limiting multi-collision braking system – just two items among an already impressive list of standard safety equipment – while combined side/head airbags for the driver

and front passenger are also now on board.

Among the optional packages developed for the new Caddy is a driver assistance pack with adaptive cruise control, forward collision warning, 'front assist' surround monitoring system, city emergency braking and advanced lighting features.

Still a delivery van at its core, the Caddy's redesigned exterior and cabin keep it up to date in terms of aesthetics, comfort, convenience and practicality.

VW continues to offer two wheelbase lengths – the 2,682mm SWB and 3,006mm Maxi – with the latter coming in either standard two-seat van or five-seat Crewvan. At the business end, cargo space ranges from 3,200L in the SWB panel van to 4,200L in the Maxi, while the Crewvan is pegged back to 1,650L when all seats are in use, but configurable back up to 4,130L.

GVM ranges from 2,095kg on the SWB van (fitted with DSG as standard) to 2,249kg on the top-end Maxi Crewvan, while unladen mass runs from 1,322kg to 1,523kg and payloads vary from 726kg to 847kg, depending on the variant.

With no manual, the SWB auto kicks off from \$28,990 plus on-road costs, just ahead of the manual Maxi van priced from \$28,190 and the Maxi Crewvan from \$32,690. DSG on the two Maxis costs \$3,000. ▲

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**Volkswagon**  
[www.volkswagon.com.au](http://www.volkswagon.com.au)

# HYUNDAI ILOAD

Hyundai has introduced a comprehensive update for its iLoad van, boosting cabin technology and safety equipment in a move designed to keep the Korean brand's popular light-commercial vehicle at the top end of the 2.5t-3.5t segment.

Second only to the Toyota HiAce in sales terms last year, but facing a new VW Transporter in the marketplace, the iLoad's 'Series II' upgrade includes standard side (thorax) airbags for the driver and front passenger – adding to the frontal airbags already on board – and a 7.0" touch screen infotainment system with various connectivity options including Siri Eyes Free (for iOS-compatible devices) and Google Now (Android) voice activation.

Other connectivity options include Bluetooth, USB, AUX, MP3 and digital iPod.

A rear-view camera has become standard on liftback variants – the rearward view is shown on the new touchscreen – and diesel automatic variants now have cruise control fitted standard.

Minor exterior styling changes are also apparent, with revisions to the grille, front bumper and tailgate garnish, for example, while detail improvements to the cabin have been made including a new instrument cluster, blue switchgear illumination, and a redesigned centre stack and HVAC control system that stems from the new infotainment system.

The iLoad Series II is offered in three-seat van or six-seat

crew van configuration.

At the entry level, the three-seat van – priced from \$31,990 plus on-road costs – is offered with a 127kW/224Nm 2.4-litre 'Theta II' MPI petrol engine paired exclusively to a five-speed manual gearbox (and only available as a liftback).

Both body styles are available with a 2.5L CRDi diesel engine with either six-speed manual or five-speed automatic transmission and the choice of liftback or twin-swing rear doors.

The diesel van starts from \$37,990, with the crew van variant adding \$2,000, auto transmission \$3,000 and the twin door option requiring an extra \$550. Metallic paint also adds \$695.

The 2.5L diesel produces 100kW/343Nm in manual form or a more impressive 125kW/441Nm when mated to the automatic, thanks to the inclusion of variable geometry turbocharging.

All iLoad models are fitted with air-conditioning, steering wheel-mounted audio controls, power windows, height-adjustable driver's seat, tilt-adjustable steering column, 16-inch wheels, and ABS brakes with electronic brake-force distribution. Diesel variants up the ante with electronic stability and traction control ▲

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Hyundai  
[www.hyundai.com.au](http://www.hyundai.com.au)



# FIAT FULLBACK

Fiat Chrysler Automobiles (FCA) has developed an all-new utility, known as the Fullback, in partnership with Mitsubishi Motors, although the “work hero” – as Fiat describes it – is not anticipated to join the related L200 Triton on the Australian market any time soon.

Despite a positive reception for the Fiat Fullback when it was unveiled at the Dubai motor show late last year, FCA Australia has considered the business case and decided that, for the time being at least, it does not fit with the more upmarket direction it is now taking the Italian brand here.

The Fiat Professional light-commercial brand remains an important part of FCA Australia’s business in Australia, with the Ducato, Scudo and Doblo (combined) accounting for 27 per cent of total Fiat sales last year, and the Triton connections bring a number of obvious benefits to the Fullback case, including right-hand-drive production in nearby Thailand, with which Australia has a free-trade agreement.

The market for one-tonne utes in Australia also remains incredibly strong, attracting a broad range of automotive brands with ultra-competitive vehicles.

For now, Fiat’s focus is on launching the Fullback in the Middle East, Africa and Europe this year, but chief executive of Fiat Professional for the region, Domenico Gostoli, who up until recently was Asia-Pacific vehicle brand manager for Iveco, based in Melbourne, told journalists in Dubai that the company

will explore all avenues – including Australia.

Fiat will offer the Fullback overseas in single cab, extended cab and double cab body styles, with pick-up and cab chassis rear ends, three trim levels, and petrol and diesel engines with 4x2 and 4x4 drivelines.

The underpinnings and major mechanicals are pure Triton, and the sheet-metal similarly looks to be carried over from the donor vehicle, limiting scope for change to areas such as the grille, bumpers and cabin detailing.

In the Middle East and Africa, the Fullback will be available with a 2.5L diesel engine in two states of tune (81kW and 131kW) and a 97kW 2.4L petrol engine. The petrol is paired exclusively with a five-speed manual gearbox, while the diesel offers either five-speed manual or five-speed automatic transmission.

Europe and a select group of other markets will use the more advanced 2.4L turbo-diesel with two power outputs – 113kW and 133kW – combined with either a six-speed manual or new five-speed auto with sports mode.

Fiat says the Fullback name was chosen because of its connotations with rugby and American football – “the last man in the line of defence and also a defender in attack ... a player who is capable of dealing with any situation”. ▲

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The Metal Pecker compliments other tools that do their best work on single thickness profile cutting at ground level, or on flat sheet.

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Full length handles provide greater leverage



# CHEVROLET COLORADO XTREME



The Chevrolet Colorado Xtreme concept unveiled at the recent Bangkok motor show has strong Australian connections, with Holden's design team in Port Melbourne crafting the vehicle which is not so much a flight of fancy but a pointer to the upgraded ute due to arrive here later in the year.

As well as being a showcase of the Australian design team's global capability – a role that has become all the more significant with Holden set to close its local manufacturing operations in 2017 – the Xtreme was developed to draw attention to General Motors' bow-tie brand in Thailand and other parts of South-East Asia, where there is a huge appetite for one-tonne utes, particularly Japanese brands led by Toyota.

The official line from Holden is that the Xtreme is strictly a show car, but watch out for design elements – particularly the front-end treatment – appearing on future models such as the Colorado Series II facelift.

Spy shots of the Colorado range undergoing testing at Holden's Lang Lang proving ground in South Gippsland, Victoria, also indicate that the forthcoming upgrade will extend beyond mere aesthetics, with a suspension overhaul anticipated.

As its name suggests, the Xtreme takes the Colorado into

more aggressive territory, painting it in matte-orange paint (dubbed 'Furness') and packing it with head-turning harder-core accessories such as black fender flares, massive 18" all-terrain wheels and tyres (including custom bead locks and an extra spare in the tub), a big rear sports bar (with unique side plates), an integrated spoiler with high-mounted stop lamp, and neat detail elements such as a colour-coded spade and high-lift jack in the cargo bay.

Let us also not overlook the uprated suspension, front 'Safari' bar with integrated LED strip and winch, big black bonnet scoop, custom tub liner with adjustable tie-down tracks and integrated spare wheel mount and tool holders, rear step with integrated corner step and tow bar, and a roof basket with more integrated LEDs.

The cabin continues the orange and black theme and carries new auxiliary gauges and accessories such as a passenger grab-handle on the side of the instrument panel and an inclinometer.

The dashboard also has an 8.0" colour touch screen equipped with the latest MyLink infotainment system ▲

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**Chevrolet**  
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# VOLKSWAGEN TRANSPORTER

Volkswagen is looking to flex its muscle in the big-selling 2.5-3.5t light-commercial van and cab chassis segment with the launch of the new T6 Transporter range which brings sharper looks, better economy, improved driver-assist safety systems and other advanced technology.

While an entry-level TDI250 Runner variant is anticipated soon, the all-diesel T6 has reached showrooms with no fewer than 18 variants across two EA288-series engine specs (TDI340 and TDI400), six-speed manual and seven-speed DSG automatic transmissions, 4x2 (FWD) and 4x4 (4Motion) drivelines, two wheelbase lengths (3,000mm SWB and 3,400mm LWB), three van roof heights (regular, medium and high), standard two-seat single and five-seat Crewvan cabins and a handful of cab-chassis variants in both single and dual cab.

Both the 340 and 400 engines are familiar 2.0L direct-injection four-cylinder units now with VW's 'BlueMotion' technology that includes a fuel-saving automatic engine idle-stop function. The base engine delivers 103kW of power at 3,500rpm and 340Nm of torque from 1,750-2,500rpm, and the higher-output unit musters 132kW at 4,000rpm and 400Nm from 1,500-2,000rpm.

Fuel consumption on the official combined cycle is rated as low as 7.2Ls per 100km, up to 8.3L/100km.

As seen in VW's redesigned Caddy compact van, side/head-protecting airbags are now fitted for the driver and

## VW AMAROK RECALL

Volkswagen Group Australia has begun a voluntary recall program to fix vehicles – starting with the Amarok utility – caught up in the global diesel emissions-defeat scandal that emerged last year.

Vehicles were found to have been fitted with a software device that only activates full emissions controls when under test conditions, allowing emissions up to 40 times higher during normal driving.

Affected owners will be notified by the company, which said the software upgrade will be free of charge, take less than 30 minutes to complete and will not affect vehicle performance, torque, fuel consumption or engine acoustics.

front passenger, and new active safety equipment such as a driver fatigue alert and multi-collision braking system have made the cut, joining a long list of features already standard such as electronic traction and stability control, ABS brakes, brake assist, hill-start assist and reverse parking sensors.

The cabin has come in for a comprehensive overhaul, with new materials, an improved layout, more storage facilities and a fully redesigned dashboard housing the car-maker's latest 5.0" high-resolution multimedia touch screen display (which can upgrade to 6.3") and related app connectivity. This marries with a new-generation audio system with four speakers, radio, MP3- and WMA-compatible CD drive, SD card slot, aux-in interface, USB port and Bluetooth phone and audio streaming capability.

All vans are fitted with cruise control, air-conditioning, remote central locking, electric windows/mirrors, fully adjustable multi-function steering wheel and height-adjustable driver's seat with lumbar support.

Exterior features include daytime running lights, a left-hand side sliding door (Crewvan has two), lifting rear tailgate with window and wiper/washer, and 16-inch or 17-inch steel wheels with a full-size spare.

GVM is 3,000kg across the T6 range, while unladen mass on the standard-roof vans varies from 1,764kg to 1,986kg (cab chassis: 1,584-1,828kg), depending on the variant. Payloads range between one and two tonnes, while the vans have a maximum load compartment volume of between 5.8 and 9.3 cubic metres, again depending on the roof height and wheelbase.

Pricing starts from \$36,990 plus on-road costs for the TDI340 SWB, topping out at \$49,090 for the TDI400 LWB 4Motion, while cab chassis T6s start at \$44,690 for the TDI340 LWB Single Cab and climb to \$48,790 for the TDI400 LWB Dual Cab 4Motion. ▲



Volkswagen  
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## MAHINDRA GENIO

**M**ahindra is pitching its facelifted 2016 Genio squarely at the trades, offering more bang for your buck with the budget-oriented Indian-built one-tonne ute range that continues to start from \$19,990 drive-away.

Detail changes inside and out serve to modernise the Genio, with a new grille and updated 15" wheels the main attractions on the outside while the cabin now has darker trim throughout.

Electronic traction control remains optional, but Mahindra's local distributor is working to have it fitted standard by the end of the year.

The Genio continues to be offered in single and dual cab body styles – the latter kicking off from \$24,990 drive-away – with a turbo-diesel engine and either a 4x2 or 4x4 driveline available.

The power source in question is a 2.2L four-cylinder 'mHawk' unit with a variable geometry turbocharger that produces 88kW of power at 4,000rpm and 280Nm of torque from 1,800-2,800rpm. A five-speed manual is the only gearbox on offer, while specifying a 4WD system adds \$3,500.

Fuel economy on the official combined cycle is listed as 8.6L/100km.

Mahindra claims the cabin is one of the most spacious in its class and the Australian-sourced aluminium tray – supplied by Queensland manufacturer Triple M Truck Bodies – is fitted

standard. It measures 1,777mm wide and 2,700mm/1,950mm long (single/dual cab), both with removable drop sides and tailgate.

Gross vehicle mass is 2,980kg, kerb weight 1,720-1,980kg depending on the variant, and payload ranges from an even tonne on the 4x4 dual cab to 1,100kg on the 4x2 twin, 1,160kg on the 4x4 single and a handy 1,260kg on the 4x2 single. Braked towing capacity is on the low side at 1,800kg across the range.

The suspension design is a conventional independent double-wishbone arrangement up front, with a solid-axle leaf-sprung configuration at the rear. Disc brakes are fitted at the front end, and drums at the rear.

Standard features include front fog lights, air-conditioning, central locking, tilt-adjustable steering, cruise control, electric windows/mirrors and steering-mounted audio controls, while Bluetooth phone connectivity is available as an option. The dual cab offers a 'Digital Drive Assist System' with trip computer information such as internal and external ambient temperature, date and time, and fuel consumption.

Standard safety equipment includes dual front airbags and ABS brakes. ▲

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# TRADESTUFF

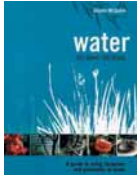
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## Water: not down the drain

A guide to using rainwater and greywater at home

Water Not Down the Drain is a comprehensive guide to sustainable water use around the home. With Australia experiencing one of its driest phases in history, everyone has to think about how they use the water available to them and find ways to reduce their day to day water use.



**\$35.95**.....CODE 761

## A quick reference and solution handbook

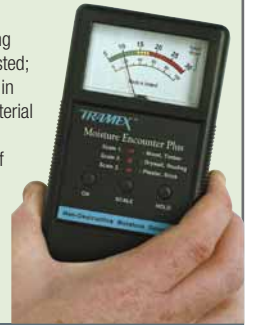
This handbook covers broad topics such as pump types and suitability. Emphasis is directed mainly on centrifugal pumps and their characteristics including capacity, head speed, power and efficiency, supported by charts, tables, formulas and graphs. There is a useful trouble-shooting chart and has installation hints.



**\$25.95**.....CODE 362

## TRAMEX Moisture Encounter Plus Non-Destructive Moisture Meter For Building Inspection.

This is an upgraded version of the world's most popular and successful non-destructive moisture meter, the Moisture Encounter. It incorporates all the features and benefits found in the original Moisture Encounter such as: non-destructive moisture measurement of wood, plastic, drywall, block, brick, roofing and most materials found in the building envelope. It uses three ranges of sensitivity; deep signal penetration to detect elevated moisture through most covering materials such as ceramic tile, drywall, carpet, vinyl flooring, VCT, floor laminates, wall coverings, roof membranes and coatings without damaging or puncturing the materials being tested; rubber electrode pads in direct contact with material being tested for better sensitivity and depth of signal penetration.



**\$795.00**.....CODE 696

## HB 233-2008 Fire Protection Systems Testing Water Conservation Handbook

A Handbook to assist in minimizing wastage of water during fire tests and a companion guide to AS 1851-2005 Maintenance of fire protection systems and equipment. This Handbook considers the systems listed which require flowing water as part of the testing and maintenance, and makes recommendations as to how that water usage can be minimized, reduced and/or recycled.



**\$95.55**.....CODE 763

## Solar Hot Water

This is a very small book with a lot of big information and will help you with many applications. Plan your own solar hot water system. It gives you an understanding of solar 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. A very helpful booklet.



**\$16.95**.....CODE 589

## Plumbing & Drainage Guide

This guide explains in simple terms the general principles of the building codes and Standards for sanitary plumbing and drainage in Australia and New Zealand. It is intended as an aid for designers, builders, students and owner/builders. It also serves as a useful reference guide for plumbers, drainers and building officials. This book covers most common plumbing and drainage solutions.



**\$71.90**.....CODE 424

## Domestic Plumbing & Drainage Standard

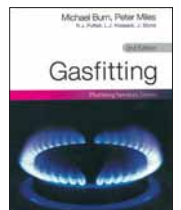
AS/NZS 3500.5:2012 Prepared to provide a suitable Standard for domestic plumbing work associated with buildings not exceeding three floors in height. The objective is to describe in a simplified way the installation requirements for hot and cold water services, sanitary plumbing and drainage and stormwater drainage. This standard is a MUST HAVE if you are involved with any domestic plumbing.



**\$325.00**.....CODE 521

## Gasfitting: Plumbing Services Series

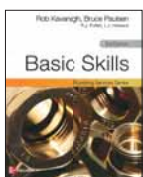
This text assists the licenced gasfitter to understand and correctly interpret the Standards laid down in the current code for the installation of gas burning appliances. This new second edition incorporates thorough and wide ranging revisions to bring it up to date with the requirements of the Plumbing and Services Training Package.



**\$69.95**.....CODE 165

## Basic Skills

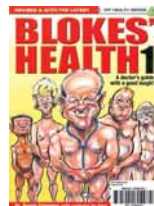
The third edition of Basic Skills has been completely updated to incorporate the wide ranging revisions that meet the requirements of CPC08. New features include a trade maths chapter for applied plumbing, chapters on sustainability, communication and OHS in the workplace, a competency grid to the Training Package, worksheets and interviews with plumbers.



**\$59.00**.....CODE 604

## Blokes Health

This is an absolute gem of a publication and a valuable resource for men of all ages. Written by Dr Bernie Crimmins, Blokes Health provides extremely useful health advice in a simple manner. There aren't many books you can buy that could actually SAVE YOUR LIFE!



**\$19.95**.....CODE 394

## The New Tramex CMEXpert II

The Best Concrete Moisture Measuring Instrument just got Better! The CMEXpert II allows for instant non-destructive moisture tests of concrete. Accessories available are Wood Probes for testing wood flooring prior to installation. Relative Humidity Probes & Sleeves for in-situ and Hoods for surface RH testing of slabs.



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**Good Tiling Practice**

This guide to successful ceramic tiling contains 120 pages of practical, fully illustrated advice on how to avoid tiling failures. Aimed at designers, tilers, inspectors and builders, its 15 chapters cover everything from selecting the right tiles for specific purposes, choosing substrates, adhesives and grouts, wet-area requirements, maintenance, swimming pool tiling and 'troubleshooting'.



**\$52.50** .....CODE 320

**HB 230-2008 Rainwater Tank Design and Installation Handbook**

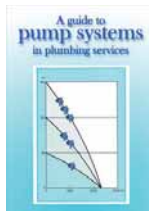
This handbook has been developed to provide practical information for the collection, storage and use of rainwater within an urban environment on private residential property. It outlines the minimum standards and performance requirements criteria for all development works associated with rainwater tank installations. It applies to new installations as well as alterations, additions, maintenance and repairs to existing installations.



**\$69.95** .....CODE 720

**A Guide to Pump Systems**

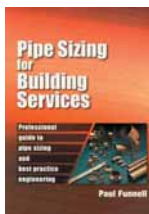
A guide to Pump Systems in Plumbing Services is an Australian first publication specifically written for plumbing designers, practitioners, consultants and specifiers of plumbing installations and equipment involving the use of pumps for all classes of buildings and construction. The content of the handbook includes information on pump systems associated with water supply, rainwater, harvesting, bush fire protection, sewage, disposal by pumping, special purpose installations and dewatering systems.



**\$29.95** .....CODE 669

**Pipe Sizing for Building Services**

This is the key that unlocks the secrets to pipe sizing! Tables provided in Australian Standards are based on minimum requirements for sizing, but this book has tables and charts that will provide an optimal design solution for specifier, installer and customer. The result will be more efficient and cost-effective use of materials, faster installation and commissioning, and problem-free solutions for the customer.

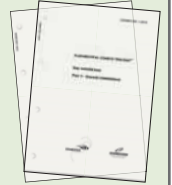


**\$52.50** .....CODE 701

**New Gas Installation Standard**

Part 1: General installations (A)  
Part 2: LP Gas installations (B)

After six years, the building industry can breathe a little easier with the release of the updated AS/NZS 5601. It highlights minimum requirements for the design, installation and commissioning of gas installations and provides 'deemed to comply' solutions to promote uniform Standards. If you work with gas, this revised Standard is vital.

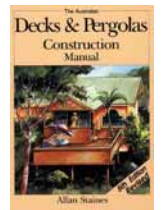


**\$305.00** .....CODE 489A

**\$205.00** .....CODE 489B

**Decks and Pergolas Construction Manual**

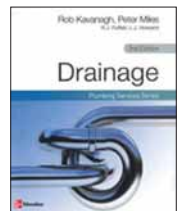
One of our most sought-after construction manuals, this is an invaluable reference covering every aspect of decks and pergola construction. Includes designing, estimating, building, timber selection charts, fastening & anchoring recommendations, terminology, painting & finishing, and preparation of plans for councils.



**\$28.95** .....CODE 49

**Drainage Plumbing Services Series**

Drainage Plumbing Services Series 3rd edition is an important entry into the world of drainage and sanitation history and maintenance. The text provides an overview of how to deal with the collection, treatment and disposal of waste. Common treatment methods and alternative disposal methods are explored in depth and with astute attention to principles, practices and regulations.



**\$74.50** .....CODE 392

**Little Red Roofing Book**

Roof cuts and rafter lengths – Hancock's 10th edition is a very popular, best selling book. With calculations, diagrams and tables it will help you with plumb and side cuts for hip and rafter, down and side purlin cuts and more. Calculations for roof frames, roof cuts and rafter lengths. This 88-page pocket size edition is in metric, updating all the old calculations, and it is a very easy-to-use roofing guide which you can use with complete confidence. This book will earn its keep.



**\$25.95** .....CODE 129

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