

**ELECTRICITY 101:  
RESISTANCE**

**CIPHEX WEST PREVIEW  
AND PRODUCT SHOWCASE**

**WHAT TO DO WITH THOSE  
PESKY R-22 CHILLERS**

# **HPAC** **HEATING PLUMBING AIR CONDITIONING**

OCTOBER 2018



**SMALL FIXES MAKE  
WAVES IN BATHROOM  
RENO MARKET**

**WHEN TO USE A  
3-PIPE BUFFER TANK  
CONFIGURATION**

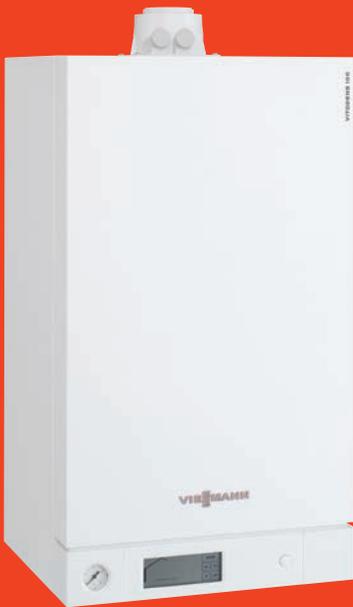
**BALANCING:  
IT'S A BIG DEAL**

**CANNABIS &  
THE WORKPLACE:  
LEVERAGE LEGAL  
TOOLS FOR A SMOOTH  
TRANSITION**

**RADON MITIGATION  
IN COLD CLIMATES**

# Quality is not an act, it's a tradition

**VITODENS 100** - Our most popular boiler series ever!



## **VITODENS 100-W, B1HA**

gas condensing boiler  
Heating input: 21 to 125 MBH

- Easy start-up and operation
- Easy to service
- Quality and reliability -  
Made in Germany



## **VITODENS 100-W, B1KA**

gas condensing Combi boiler  
Heating input: 21 to 125 MBH  
DHW max. input: 149 MBH

- On-demand DHW
- Simple installation and  
space saving design
- Ideal for apartment units and  
houses with one DHW draw

**VIESSMANN**

# CONTENTS

OCTOBER 2018 / VOL. 92 NO. 6



## FEATURES

**20**

### HYDRONICS: BALANCING

#### MAKE THE RIGHT CHOICE

An overview of new valves, as well as traditional balancing valves, and their application in hydronic and plumbing systems.

*By Kevin Freidt and Mark Olson*

**26**

### HVAC: BALANCING

#### RESIDENTIAL DUCT SYSTEM

#### BALANCING: WHAT'S IN YOUR TOOLBOX?

Efficient, even heating is an unknown idea for many consumers—technicians and installers should aim to rectify that. *By Ian Mcteer*

**32**

### INDOOR AIR QUALITY

#### RADON CANADIANIZED

Passive systems show promise as mitigation system of choice for colder climates. *By Jillian Morgan*

**58**

### BATHROOM SHOWCASE

#### A BREATH OF FRESH AIR

In loo of full renovations, small fixes make waves. *By Jillian Morgan*

**62**

### MANAGEMENT

#### TEAM BUILDING ON A WHOLE NEW SCALE

Work on a sustainable volunteer development project proved to be life changing. *By Steve Goldie*

CONTINUED ON P5

# Leading the way with affordable innovation



*Replaces ALL 3-speed  
hydraulic circulators in its class*

Every 0015e3® pump we make is designed for easy installation and set-up with some unique features:

- 3 easy settings. **Install it, forget it.**™
- **BIO Barrier**® protects pump from system contaminants
- **SureStart**™ automatic unblocking and air purging mode
- High-efficiency **ECM motor** uses up to 85% less electricity
- **Integral Flow Check** (IFC®) included
- **2-bolt** universal flange

**See your local stocking distributor for details.**



**TACO CANADA LTD.**  
8450 Lawson Road, Milton, ON L9T 0J8  
Tel. 905-564-9422 Fax. 905-564-9436  
[www.tacomcomfordsolutions.com](http://www.tacomcomfordsolutions.com)

# CONTENTS

OCTOBER 2018 / VOL. 92 NO. 6

**74**

## DESIGN

THE HYDRAULICS OF HYDRONICS:  
A BALANCING ACT FOR INDIVIDUAL  
ZONES

If a designer is only doing a handful  
of calculations, what kinds of  
inefficiencies are being designed into  
systems that will shackle the building  
and its owner for life?

By Robert Bean

**80**

## HYDRONICS

LESSONS LEARNED

When to use a three-pipe buffer tank  
configuration.

By John Siegenthaler

**84**

## ELECTRICITY 101

CRACKLE, BUZZ AND POP

What you need to know about  
resistance.

By Curtis Bennett

**88**

## FINANCE

RULES CHANGE FOR TAXATION OF  
INVESTMENT INCOME

The Department of Finance has  
decided it is being cheated by an  
element of the system it created.

By Hank Bulmash

**90**

## REFRIGERATION

WHAT TO DO ABOUT THAT PESKY R-22  
CHILLER—PART I

The crucial pieces of information you  
need to determine the best choice  
for R-22 replacement.

By Dave Demma

**93**

## MANAGEMENT

DON'T GET CAUGHT IN THE WEED(S):  
CANNABIS AND THE WORKPLACE

Cannabis legalization presents  
challenges new and old for  
employers, but leveraging legal tools  
can make for a smoother transition.

By Diane Laranja

**97**

## PLUMBING

THE CASE FOR RAINWATER  
HARVESTING

Is this age-old practice an area of  
potential growth for contractors?

By Robert Waters

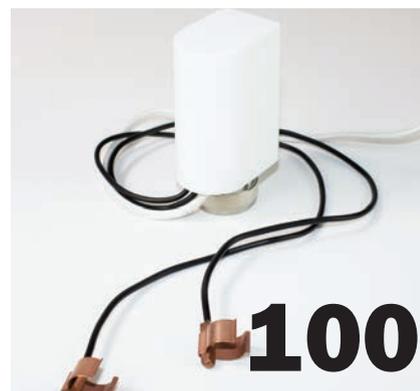
**100**

## CONTROLS

BEYOND THE BASICS

What are the keys to optimal radiant  
system performance?

By Mike Miller



## DEPARTMENTS

**6 UPFRONT**

**8 NEWS FEATURE**

Retrofitting Robson Central  
Vancouver heritage building gets  
HVAC overhaul. By Jillian Morgan

**10 INDUSTRY NEWS**

**66 MECHANICAL SUPPLY NEWS**

**73 PEOPLE**

**96 TRAINING**

**96 THE SOURCE**

**102 CALENDAR**

## SHOW PREVIEW

<b>37</b> INTRODUCTION	<b>38</b> SESSIONS
<b>44</b> EXHIBITOR LIST	<b>48</b> PRODUCT SHOWCASE

Follow Us On



# THE POTENTIAL OF PREPAREDNESS

**AFTER AN ICE STORM IN THE SPRING** we were without power for four days at our cottage. This was more a case of falling through the cracks at Hydro One than the severity of the storm but it did prompt a discussion about power vulnerability and the possible purchase of a generator.

I have since become the owner of a 10kW generator—not at home in the city but at the cottage (the logic or illogic of this is a topic for another day). This was a substantial investment, not so much for the equipment, which seemed pretty dear in comparison to a furnace or boiler, but for permits, Hydro One disconnect and connect fees, every inch of cable, digging, and so on. While I wouldn't call it nickel and diming, I would call it a far cry from any quote or invoice I have received for a HVAC or plumbing job.

Everything necessary for the installation was itemized and costed on the generator quote, until finally the astounding total was presented. And who could protest: we were getting so much (47 lines worth) for that astounding total.

How could we transfer that sales *modus operandi* to mechanical and plumbing jobs? It should not be difficult—just as it is hard to go without electricity for any length of time, it is also difficult to have no heat in the event of a furnace or boiler breakdown. The flooded basement, which happened because the customer did not want to spend a grand or two to retrofit in a back-flow valve, is messy and costly.

Selling customers on being proactive rather than reactive may take a shift in focus and a leap of confidence. After talking to the generator dealer, I came to the conclusion that selling prevention and preparedness is far more lucrative than selling the fix.



How many customers do you have whose equipment is nearing the end of its life? It is better for everyone if replacements are done when it is 20C rather than -20C

*Kerry Turner*

Editor

## CORRECTION

The graphics gremlins were at work in HPAC's August 2018 print edition. In Mike Miller's article *Figures 2 and 3* were incorrect. *Figure 3* in Rob Waters' solar heating article was also incorrect. The correct figures are showing online in the digital edition and in the Articles section at [www.hpacmag.com](http://www.hpacmag.com).



HPAC MAGAZINE  
111 Gordon Baker Road, Suite 400, Toronto, ON M2H 3R1  
TEL: 416.442.5600 FAX: 416.510.5140  
[www.hpacmag.com](http://www.hpacmag.com)

- EDITOR **Kerry Turner** (416) 510-5218  
KTurner@hpacmag.com
- ASSISTANT EDITOR **Jillian Morgan** (416) 510-5201  
JMorgan@annexbusinessmedia.com
- ASSOCIATE PUBLISHER **David Skene** (416) 510-6884  
DSkene@hpacmag.com
- ACCOUNT MANAGER **Vince Naccarato** (416) 510-5118  
VNaccarato@hpacmag.com
- MEDIA DESIGNER **Emily Sun**  
esun@annexbusinessmedia.com
- ACCOUNT COORDINATOR **Kim Rossiter** (416) 510-6794  
krossiter@annexbusinessmedia.com
- CIRCULATION MANAGER **Urszula Grzyb** (416) 442-5600 ext. 3537  
ugrzyb@annexbusinessmedia.com
- PUBLISHER **Peter Leonard** (416) 510-6847  
PLEonard@hpacmag.com
- VICE PRESIDENT **Tim Dimopoulos** (416) 510-5100  
tdimopoulos@annexbusinessmedia.com
- PRESIDENT & CEO **Mike Fredericks**

PUBLICATIONS MAIL AGREEMENT NO. 40065710

Heating Plumbing Air Conditioning (established 1925) is published 7 times per year by Annex Publishing & Printing Inc. HPAC Magazine is the leading Canadian business publication for the owner/manager of mechanical contracting businesses and their supply partners.

ISSN: 0017-9418 (Print)  
ISSN 2371-8536 (Online)

Contents Copyright © 2018 by Annex Publishing & Printing Inc. may not be reprinted without permission.

**SUBSCRIBER SERVICES:**

To subscribe, renew your subscription or to change your address or information please visit us at [www.hpacmag.com](http://www.hpacmag.com).

Subscription Price per year: \$43.00 (plus tax) CDN; Outside Canada per year: \$84.50 US; Elsewhere: 1 year \$92.50; Single copy Canada: \$5.00 CDN. Heating Plumbing Air Conditioning is published 7 times per year except for occasional combined, expanded or premium issues, which count as two subscription issues.

**MAIL PREFERENCES:** From time to time we make our subscription list available to select companies and organizations whose product or service may interest you. If you do not wish your contact information to be made available, please contact us via one of the following methods: Tel: 416-442-5600 ext. 3552, Fax: 416-510-6875 or 416-442-2191; E-mail: [blao@annexbusinessmedia.com](mailto:blao@annexbusinessmedia.com); or by mail: 111 Gordon Baker Rd., Suite 400, Toronto ON M2H 3R1

Annex Privacy Officer  
[Privacy@annexbusinessmedia.com](mailto:Privacy@annexbusinessmedia.com)  
Tel: 800-668-2374

HPAC Magazine receives unsolicited materials (including letters to the editor, press releases, promotional items and images) from time to time. HPAC Magazine, its affiliates and assignees may use, reproduce, publish, re-publish, distribute, store and archive such unsolicited submissions in whole or in part in any form or medium whatsoever, without compensation of any sort.

**NOTICE:** HPAC Magazine, Annex Publishing & Printing Inc., their staff, officers, directors and shareholders (hence known as the "Publisher") assume no liability, obligations, or responsibility for claims arising from advertised products. The Publisher also reserves the right to limit liability for editorial errors, omissions and oversights to a printed correction in a subsequent issue. HPAC Magazine's editorial is written for management level mechanical industry personnel who have documented training in the mechanical fields in which they work. Manufacturers' printed instructions, datasheets and notices always take precedence to published editorial statements.

Funded by the Government of Canada  
Financié par le gouvernement du Canada



Proud member of:





## Benchmark<sup>®</sup> Platinum

Optimize Your Hydronic System for Maximum Efficiency and Savings

### **AERtrim** **Peak Performance**

AERCO's patented O<sub>2</sub> Trim technology self-adjusts the combustion process to deliver optimal O<sub>2</sub> levels keeping your boiler operating smoothly at peak performance.

### **Dual Returns** **Maximum Efficiency**

Enables design and application flexibility — increases efficiency up to an additional 7%.

### **onAER** **Predictive Maintenance**

A pro-active tool detailing comprehensive unit performance so you can ensure your system operates optimally reducing costly unscheduled maintenance.

## RETROFITTING ROBSON CENTRAL

**A VANCOUVER HERITAGE BUILDING IS OVERHAULED WITH EFFICIENT HEATING AND COOLING SYSTEMS AND NEW TECHNOLOGY. BY JILLIAN MORGAN**

Morguard Investments Limited has brought a decades-old structure in downtown Vancouver, BC into the 21st century.

The retrofit of Robson Central, a former library, focused on reducing energy consumption and maintaining comfort throughout its 24 hour a day, seven day a week operating cycle.

“Morguard’s team and Robson Central’s tenants worked together to overcome different challenges,” said Tom Johnston, vice president of property management, western region, at Morguard. “The key aspect to making the planned approach successful was the tenants’ openness to collaboration.”

Located in the city’s shopping district on the corner of Robson and Burrard streets, the building is home to Bell Media/CTV, the Globe and Mail and several retail tenants.

The addition of variable speed drivers, a direct digital control system and innovative software analytics to the more than 60-year-old building allowed Morguard to achieve a 20 per cent reduction in energy consumption over the course of 2017.

At 130,000-square-feet, it reached an energy-spend of 5.42 equivalent kilowatts per hour (ekWh) per square foot (sf), down from 68.6 ekWh/sf in 2016.

Heating and cooling for the building is provided by air handling units (AHUs) distributing conditioned air through duct systems with variable air volume (VAV) and fan-powered terminals to ceiling diffusers and floor grilles.

A central steam-to-water heating system supplies hot water through a piping system to heating coils in AHUs and reheat-coils in VAV and fan powered terminals supplying perimeter areas.

A base building chilled water plant supplies chilled water through piping systems to cooling coils in the AHUs. A second chilled water plant supplies chilled water to supplemental air handling units in the areas occupied by a single tenant.

“In terms of the ventilation system, five AHUs provide the base heating, cooling and ventilation for the building,” Johnston said. “These air handling units have economiser dampers, heating and cooling coils, supply and return fans with variable speed drives for variable air volume operation and cooling with outside air. The base air handling units supply both interior and perimeter spaces.”

Mechanical systems—down to the zone level of the building—are controlled by a direct digital control (DDC) system, installed by ESC Automation. Modern Systems installed the



The heating and cooling systems at Robson Central.

original DDC system, now fully replaced, in 1995.

Morguard also introduced a single building management system (BMS) platform and tailored software analytic rules, reports and features, including the Golden Standard, which is being used to monitor all changes made to the BMS and alert users of differences between current energy usage and set standards.

“This feature provides a dynamic update of indicators, creating opportunities for improvement and better use of resources,” Johnston said.

The building was also recommissioned entirely to improve operation of all equipment and systems, undergoing an investigation by the company to identify problems and systems integration issues.

“[The retrofit] was successful thanks to the installation of submeters for all tenants [and] training provided by our consultant to all our tenants, so they could be able to access to the building’s system to control their zones, and the installation of base building equipment to provide accurate data and monitoring utility usage,” Johnston said.

Despite the challenges of retrofitting a heritage building home to major tenants, Morguard earned a LEAP (Leadership in Environmental Advancement Program) award in June from the Healthcare of Ontario Pension Plan for the building’s reduced energy consumption.

“The LEAP award received in 2018 from the Healthcare of Ontario Pension Plan encourages us to keep innovating and pursuing energy efficiency throughout all our operations,” Johnston said. [www.morguard.com](http://www.morguard.com)

# FOR THOSE READY TO MAKE A SOUND DECISION



In an otherwise stagnant field, only one brand of furnace is bringing innovation to the HVAC world. Napoleon's Ultimate 9700 Series looks different because it is different. The revolutionary Vortex turbulator<sup>™</sup> increases heating efficiency, the ultra violet light purifies air and the SureView burner window shows the flames in operation as the furnace runs whisper quiet. Don't get boxed in by outdated thinking.

[napoleonheatingandcooling.com](http://napoleonheatingandcooling.com)



## AHR EXPO RETURNS TO ATLANTA IN 2019

The 2019 AHR Expo will return to Atlanta, GA for the first time in nearly two decades, to be held at the Georgia World Congress Center from January 14 to 16.

Clay Stevens, show manager, said HVAC/R is a key economic driver for the state, with the U.S. Department of Labor projecting 20 per cent growth in the coming years.

“We come to the show to check the pulse of the industry, and to get an opportunity to build relationships with new and existing customers in the U.S.,” Kevin Bergin, director of Aspen Pumps Inc., said at the 2018 show. “This show lets us see how people are thinking about the year ahead. Based on the [2018 show], we’re seeing a lot of confidence.”

The 2018 expo drew record crowds and reported a positive economic outlook among exhibitors. Exhibit space for the 2019 show is sold out.

AHR will be held in conjunction with the ASHRAE Winter Conference. The conference is comprised of eight tracks, including refrigeration, HVAC/R fundamentals and applica-



The exposition attracts over 60,000 attendees and 2,100 exhibitors from 35 countries.

tions, systems and equipment and common system misapplications, among others.

Grant Imahara, former host on Discovery Channel’s Mythbusters, will kick off the conference’s opening plenary session with a keynote talk. [www.ahrexpo.com](http://www.ahrexpo.com) [www.ashrae.org](http://www.ashrae.org)

## HGTV STAR BRYAN BAEUMLER BACKS APP THAT CONNECTS HOMEOWNERS WITH CONTRACTORS

HeyBryan, an app for Android and iPhone that connects home service providers to homeowners, has partnered with HGTV’s Bryan Baeumler.

Set to launch in fall 2018, the app enables users to find vetted, qualified home service providers for general handyman services, electrical, plumbing and appliance repair.

Homeowners can review and rate home service providers directly

through the app, and contractors who consistently earn high ratings and positive reviews can earn certification.

Interested contractors can sign up at [www.heybryan.com/become-tasker](http://www.heybryan.com/become-tasker).



All taskers are subject to background checks and payment is processed through the app.

## TORONTO, MONTREAL AND VANCOUVER SIGN GLOBAL AGREEMENT TO REACH NET ZERO BY 2050

Mayors of Toronto, Montreal and Vancouver have signed on to a global agreement comprising 19 cities to meet net-zero carbon standards by 2050.

Led by the C40 Cities Climate Leadership Group, the Net Zero Carbon Buildings Declaration requires cities to:

establish a roadmap to reach net zero carbon buildings; develop a suite of supporting incentives and programmes; and report annually on progress.

The pledge is part of the World Green Building Council’s Net Zero Carbon Building Commitment for Businesses, Cities, States and Regions.

Leading up to the Global Climate Action Summit, which was held in San Francisco, CA, C40 urged cities to step up their climate action and ambition—the declaration is one of the city commitments under that initiative.

Of the 19 cities, 13—including Montreal, Toronto and Vancouver—will take extra steps as part of a commitment to owning, occupying and developing only assets that are net-zero carbon by 2030.



These steps include evaluating current energy demand and carbon emissions from municipal buildings, and identifying opportunities for reduction; establishing a roadmap to reach net zero carbon municipal buildings; and reporting annually on progress.

“We are excited to be signing the C40 Net Zero Carbon Emissions Declaration along with other major cities around the world,” said Vancouver Mayor Gregor Roberson. “Vancouver’s Zero Emission Building Plan will not only reduce GHG emissions from new buildings by over 60 per cent but is also driving our green economy with a 53 per cent increase in green building jobs since 2010.”

The commitment also includes a pledge to work with regional governments and the private sector, and calls on national governments for equal action.

Other cities that signed the declaration include: Copenhagen, Johannesburg, London, Los Angeles, New York City, Newburyport, Paris, Portland, San Francisco, San Jose, Santa Monica, Stockholm, Sydney, Tokyo, Tshwane and Washington D.C. [www.c40.org](http://www.c40.org) [www.worldgbc.org](http://www.worldgbc.org)

PHOTO C40 CITIES

Continued on p12



Navien...the condensing leader brings you the future of fire tube boiler technology

## New NFB high efficiency condensing fire tube boilers

Out of this world quality — built from top to bottom with in-house designed and manufactured Navien parts. Also, our state-of-the-art robotic laser welding and automated assembly systems assure the highest level of quality.



**Patented stainless steel heat exchanger with a one-piece combustion chamber** eliminates high stress point welds that are prone to corrosion.

**AFUE 95.0%**  
Energy Star 2018 most efficient rating.



**Advanced user interface controls** with intuitive text display and innovative click wheel simplifies boiler setup.

**Optional add-on NaviLink Wi-Fi remote control system.**

**Cascading up to 16 units and common venting up to 8 units.**

**Field gas convertible, NG or LP.**



**Built-in hardware to connect a boiler pump, 3 zone pumps or 3 zone valves**

integrated into the unit. No need to add extra zone panels.

**10:1 Turn Down Ratio** reduces excessive boiler cycling, saves money and energy.

To learn more visit [NavienInc.com](http://NavienInc.com)

**KD Navien®**

Always a step ahead

## ASHRAE RELEASES GUIDE FOR ENERGY-EFFICIENT BUILDING DESIGN

ASHRAE has published a resource for building professionals designing efficient and grid-responsive buildings.

Titled "Building Our New Energy Future," the guide aligns with ASHRAE's 2018-19 society theme of the same name.

The resource was developed in collaboration with the American Institute of Architects, the National Institute of Building Sciences, and the U.S. Department of Energy's National Renewable Energy Laboratory.

Topics include distributed energy resources, electric vehicles and buildings, the Internet of Things, smart grids and buildings, the future of utilities and high-performance building design.

Strategies to communicate about prioritizing loads, storing versus using energy, and advances in renewable energy are provided throughout. It also shares new practice areas and business opportunities for building professionals that will emerge.

Electronic versions of the resource can be downloaded at [www.ashrae.org/about/leadership/ashrae-president](http://www.ashrae.org/about/leadership/ashrae-president).

## CAF-FCA HIRES NEW EXECUTIVE DIRECTOR



France Daviault will take over as executive director of the Canadian Apprenticeship Forum. She is replacing Sarah Watts-Rynard, who was in the role with the association for eight years.

Daviault most recently served as vice president of the Automotive Industries Association of Canada, where she oversaw association operations and industry programs.

She also held the title of executive director of Heavy Duty Aftermarket Canada, in addition to leading the communications team for the Canadian Council of Motor Vehicle Administrators.

Daviault has her Certified Association Executive designation from the Canadian Society of Association Executives, and has been a guest lecturer at numerous symposiums.

[www.caf-fca.org](http://www.caf-fca.org)

## VANCOUVER TO CONSTRUCT FIRE HALL TO PASSIVE HOUSE STANDARDS

The City of Vancouver will replace its aging fire hall No. 17 with a newly constructed building designed to Passive House Standards. Construction is expected to start November 2018.

Along with a small group of projects, the hall is part of the Canada Green Building Council Zero Emission Building standard pilot, which aims to use green building performance standards to reduce greenhouse gas emissions from commercial buildings.



The project is one of the first City of Vancouver-owned buildings being designed as part of the City's Zero Emission Building Plan, adopted by council in July 2016.

PHOTO HCMA ARCHITECTURE + DESIGN

Set to open in 2019, the fire hall project aims to reduce heat loss from the building by over 70 per cent. It will use a geo-exchange system and generate on-site renewable energy using solar photovoltaics. At twice the size of its aging predecessor, it will include provisions for a training hall with four drive-through apparatus bays, a full size hose/training tower and a training yard, as well as accommodation for a two-crew operation. The hall will be built to a post-disaster standard and serve as an emergency hub and a secure location for city IT services. Construction will begin in November 2018.

The project received a grant and loan from the Federation of Canadian Municipalities' Green Municipal Fund to go beyond a zero emissions standard and increase on-site renewable generation to achieve a net zero energy standard.

[www.nrcan.gc.ca](http://www.nrcan.gc.ca)

## THE BUILDINGS SHOW RETURNS TO DOWNTOWN TORONTO

Tens of thousands of building industry professionals are set to converge on Toronto starting November 28th for the 30th anniversary of The Buildings Show. The three-day annual event will include some 1,500 exhibitors, featuring a range of products and services, as well as numerous educational workshops.

About 30,500 professionals walk the floor and network with colleagues at the event each year.

This year's show caters to five distinct market sectors. It includes Construct Canada, the HomeBuilder & Renovator Expo, STONEX Canada, the World of Concrete Toronto Pavilion, and PM Expo. It will cover both the north and south buildings of the Toronto Metro Convention Centre.

Contractors can expect to see a wide range of new building products in all sections of the show and gain access to the latest industry know-how at dozens of learning sessions. Seminars will run throughout the first two days of the show.

Be sure to stop by booth 4928 and visit with HPAC's staff.

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

Continued on p14



# PROTECT YOUR BUSINESS

## MAKE SURE YOU'RE COVERED WITH A FULL LINE OF INNOVATIVE SOLUTIONS, TRAINING AND SUPPORT

When everything's on the line, it's important to have the right team at your side. That's why so many professionals put their trust in Fujitsu and its award-winning line-up of solutions. A partnership with Fujitsu means access to ductless products, VRF, unitary products, and first-class training and support that positions your business to succeed every single day. Fujitsu...hands down, the perfect choice.

Visit [fujitsugeneral.com](http://fujitsugeneral.com)



**FUJITSU**  
INFINITE COMFORT

# INDUSTRY NEWS

SEE THE LATEST NEWS @ [HPACMAG.COM](http://HPACMAG.COM)

## MCAC PROGRAM LOOKS TO BRING TOGETHER CANADA'S YOUNG MECHANICAL PROFESSIONALS

The Mechanical Contractors Association of Canada has launched a program for young professionals in the mechanical construction industry.

The YEP! program, unveiled at a mid-year board meeting, aims to connect young professionals from across Canada by providing industry exposure to and increasing awareness of the provincial, zone and national mechanical contractor associations.

YEP! will also create networking opportunities and support career development.

For more information, contact Ariel Shortt at [ashortt@mcac.ca](mailto:ashortt@mcac.ca) or 613-232-0492. [www.mcac.ca](http://www.mcac.ca)



Polypropylene pressure piping in commercial plumbing application.

## PLASTICS PIPE INSTITUTE LAUNCHES GEOTHERMAL AND POLYPROPYLENE PIPE COMMITTEES

The Plastics Pipe Institute, Inc. (PPI) has created two new groups within its Building and Construction Division (BCD): the Geothermal Steering Committee and Polypropylene Pressure Pipe Steering Committee.

Geothermal ground source activities

will be the focus of the BCD. BCD's first publication related to polypropylene pressure pipe, PPI TN-57 Proper Integration of Copper Tubing and Components with PP-R Piping Materials for Plumbing Applications, was published June 2018. [www.plasticpipe.org](http://www.plasticpipe.org)

## TRIMBLE ROUNDS OUT CONSTRUCTION OFFERING

Trimble has completed its acquisition of Portland, OR-based Viewpoint. With this purchase, Trimble will offer a central workflow platform for construction management. Viewpoint will focus on general, specialty and heavy civil contractors, and link project data into the owner-facing e-Builder suite.

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

Continued on p16

### LOW INTENSITY INFRARED TUBE HEATERS



**HL3 SERIES**  
Premier, Two-stage Low-Intensity Tube Heater

- Fewer on/off cycles over single stage.
- Documented fuel savings.
- Enhanced comfort.

**DX3 SERIES**  
Premier, Single-stage Low-Intensity Tube Heater

- High-quality construction and equipment longevity.
- Specially designed stainless steel burner.

Brant Radiant Heaters Limited offers the most extensive line of low-intensity infrared radiant tube heaters available.

From our award-winning, engineered vacuum systems to our patented, two-stage line of heaters, you'll find a product that ideally suits your needs. Re-Verber-Ray® low-intensity heaters are a little to no-maintenance, cost effective and energy-efficient solution for heating a wide variety of areas.

**RE-VERBER-RAY**  
INFRARED RADIANT HEATERS

*Call us to find a distributor near you.*

**BRANT RADIANT HEATERS LIMITED**

34 Scott Ave.  
Paris, ON.  
N3L 3R1  
[www.brantradiant.com](http://www.brantradiant.com)  
PH: 1-800-387-4778



## EASY. SAFE. FREE.

### THERMOSTAT RECYCLING

We recycle all elements of the thermostat; plastic, metal, electronics and mercury (which is particularly hazardous).



➔

Do your part and join the more than 1,500 contractors already participating in the program.

FOR MORE INFORMATION

1 (800) 267-2231, x 224

Email [pthompson@hrai.ca](mailto:pthompson@hrai.ca)

Administered & delivered by:



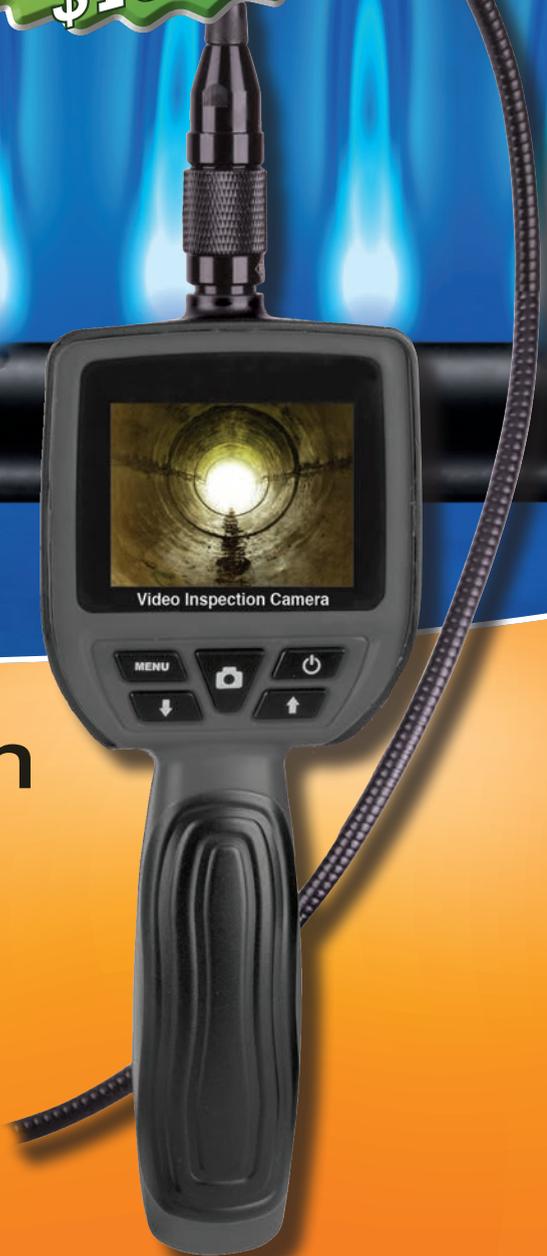
Supported by:



Be sure. **testo**



**FREE!**  
Video Borescope\*  
\$159 Value



# Precision Combustion Analysis from Testo

FREE Video Borescope with purchase of a testo 320 or 330 series Combustion Analyzer!\*

**\*Offer valid on purchase of testo 320 and 330 series.  
For more info visit [www.testo.com/promo](http://www.testo.com/promo)**

Offer valid on purchases between Sept 1, 2018 and Dec 31, 2018.  
All redemption submissions must be postmarked by January 31, 2019.

# INDUSTRY NEWS

SEE THE LATEST NEWS @ [HPACMAG.COM](http://HPACMAG.COM)

## BRITISH COLUMBIA, NOVA SCOTIA OFFERED STORM SURGE COVERAGE



Water damage coverage introduced in B.C. and N.S.

British Columbia and Nova Scotia homeowners can now be insured for storm surge damage under The Co-operators Group, a national insurance co-operative.

The water damage coverage is intended to protect homeowners against common causes of water damage, including: overflowing lakes, rivers and creeks, sewer or septic backup, heavy rain and storm surge.

The flood risk model used by The Co-operators incorporates data on factors that help predict areas at risk of flooding.

Read more on the impact of water damage in Ian McTeer's "Water, water, everywhere," online and in *HPAC* December 2017 at [www.hpacmag.com](http://www.hpacmag.com). [www.cooperators.ca](http://www.cooperators.ca)

## PCL CONSTRUCTION, MICROSOFT DEVELOP SMART CONSTRUCTION PLATFORM

PCL Construction has partnered with Microsoft to develop smart building solutions, including Job Site Insights (JSI).



PCL Construction is partnering with Microsoft.

JSI is a cloud-based smart construction platform built on Microsoft Azure, a cloud-computing platform that includes Power BI and the Azure IoT suite, as well as analytics and artificial intelligence capabilities.

The platform is designed to visualize the construction site and map devices to space, equipment, assets and people through the use of artificial intelligence and machine learning technologies.

"Smart Building solutions are important to our clients, enabling building operators to gain valuable insights, and it's an exciting area to be involved in," said Mark Bryant, CIO of PCL.

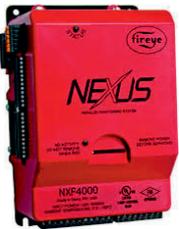
Through the partnership, PCL hopes to develop solutions to improve building features, including heating and cooling, among other aspects. [www.pcl.com](http://www.pcl.com) [www.microsoft.com](http://www.microsoft.com)

Continued on p18

# CANADA CONTROLS

- Tech Support
- Training
- Product Solutions!

### Fireye NXF4000



Both flame safeguard and high efficiency linkageless in a common control.

Supports up to 4 servo motors, 2 VFD's and O2 trim for multiple fuels. Reduce emissions and greenhouse gases! Three servo sizes up to 50 Nm torque.

### DUNGS MultiBloc-E Valve



Dual safety shut off valve with removable (non hydraulic) actuators. With a

pressure sensor downstream the second valve can act as a regulator with pressure control resolution of .1 Inch wc.

### DUNGS FRM Regulator with OPD



New high pressure regulators up to 150 PSIG with over pressure protection slam shut function for

both high and low pressure. Manual reset for OPD. Also available are low pressure ranges and relief valves for regulatory requirements.

Contact us at:

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

Canada Controls Inc. ☎ 289-374-0052  
1020 Brevik place, Unit #3  
Mississauga, Ontario, L4W 4N7

# GO green with

# CANARM<sup>®</sup> HVAC

## A2X Spun Aluminum Exhaust Fans LOW PROFILE DESIGN



- Sizes, 8" to 24"; 30 & 36" coming soon
- Newly designed inlet, wheels and air routing improves performance up to 30% by size
- Available with high efficiency ECsmart motors
- Direct & Belt drive configurations
- Wall and roof mountable up to 24"

HIGH EFFICIENCY  
EC MOTORS

up to **70%** ENERGY SAVINGS  
with EC Motors



DELTA

# SEE CANARM FOR ALL OF YOUR VENTILATION NEEDS

SEE OUR COMPLETE LINE OF BLOWERS & EXHAUST FANS AT [WWW.CANARM.COM](http://WWW.CANARM.COM)

Choose the right fan or blower for your application with our fan selection software

# DELAIR

[www.canarm.com/delair](http://www.canarm.com/delair)

## Did you know that Canarm also Manufactures OEM Blowers?

G SERIES DOUBLE INLET  
BELT DRIVE BLOWERS



OEM

900-BI BACKWARD  
INCLINED BLOWERS



NEW

OEM

DPL-DD DIRECT DRIVE FLAT  
BLADE & AIR FOIL BLADE  
PLENUM FANS



NEW

OEM

Need product in a hurry? Canarm stocks many items for same day or next day shipping!

[www.canarm.com](http://www.canarm.com)  
[hvacsales@canarm.ca](mailto:hvacsales@canarm.ca)



CANADA  
BEST  
MANAGED  
COMPANIES

Ph: 1-800-267-4427



# INDUSTRY NEWS

SEE THE LATEST NEWS @ [HPACMAG.COM](http://HPACMAG.COM)



Patty Hajdu, minister of employment, workforce development and labour, with elected officials and co-op students from Ontario Power Generation (OPG), introducing the Empowering Future program at the OPG Darlington Nuclear Information Centre.

## CO-OP WAGE SUBSIDIES TO OPEN JOB OPPORTUNITIES FOR POST-SECONDARY STUDENTS

A \$6.6 million program by Electricity Human Resources Canada (EHRC) to

improve job readiness for post-secondary students has launched.

The Empowering Futures program is designed to create up to 1000 new jobs for students in the electricity sector over

the next four years. Available to post-secondary STEM and business students across Canada, the program offers up to \$7,000 in co-op wage subsidies to electricity and renewable employers.

Funded by the Government of Canada's Student Work-Integrated Learning Program, Empowering Futures aims to encourage and support industry employers, especially small- to medium-sized companies, to hire co-op students and provide them with an opportunity to gain valuable experience in a real work environment.

[www.electricityhr.ca](http://www.electricityhr.ca)



## THE ONE-STOP SHOP FOR ALL YOUR HVAC NEEDS

FAN COILS. HEAT PUMPS. HUNDREDS OF PARTS.



The Whalen Company has always been known for reliability, performance and innovation of fan coils and heat pumps. But we also have a complete line of replacement products, service parts, and the knowledge to support your comfort conditioning system. By offering true replacement parts, refrigeration chassis or complete units, The Whalen Company can save you time and money by supplying exact replacements that don't require field modifications.

Combine that with a flexible product offering for new construction or renovations and you have an HVAC manufacturer that works with our customers to meet all of their needs. Does your HVAC manufacturer offer this much?

[WhalenCompany.com/Shop](http://WhalenCompany.com/Shop)

Flexible, Comfort Solutions Provided With Pride From Our Family to You





## SOLAR SUSTAINABILITY. DELTA® PERFORMANCE.

Introducing a bright new solution from Delta – solar electronic faucets and flush valves. Our products efficiently harvest power from natural, artificial, ambient and even occupancy lighting, which makes them perfect for any number of applications. We've combined the sustainability of solar power and the reliability of batteries into thoughtfully designed products that are backed by Delta Faucet quality.

[deltacommercialfaucets.ca](http://deltacommercialfaucets.ca)



see what Delta can do™

# MAKE THE RIGHT CHOICE

An overview of new valves, as well as traditional balancing valves, and their application in hydronic and plumbing systems.

BY KEVIN FREIDT AND MARK OLSON

Several manufacturers have introduced new balancing valve technologies into the market. Familiarity with these new valves, as well as traditional balancing valves, will assist you in selecting the correct one for specific hydronic and plumbing system applications.

## MANUAL BALANCING VALVES

Manual (a.k.a. pressure-dependent) balancing valves with two ports for measuring differential pressure across an internal orifice have been industry workhorses for decades. They are sometimes called “static” balancing valves because once adjusted there is no movement of parts inside the valve.

There are two types of manual bal-

ancing valves: the fixed orifice (FO) type and the variable orifice (VO) type. Orifice refers to the portion of the valve located between the two ports used to measure differential pressure.

### Fixed orifice balancing valves

In a FO valve there is no change in internal geometry between the differential pressure ports—the orifice remains fixed while the valve is being adjusted.

A direct relationship exists between pressure drop across the ports and flow rate. That relationship is governed by the following formula:

Where: Q is flow rate (in gpm), Cv is the flow coefficient of the orifice between the ports,  $\Delta P$  is the pressure drop across the ports in psi.

For example the manufacturer’s published Cv value for the valve in *Figure 1* is 6.4. If the  $\Delta P$  across the ports is measured as 0.3 psi, then the calculated flow rate is:

$$Q = C_v \sqrt{\Delta P} = 6.4 \sqrt{0.3} = 3.5 \text{ gpm}$$

To eliminate the need of installers doing this calculation, manufacturers plot the relationship on wheels or charts to allow fast determination of flow rate. *Figure 2* shows a chart for the



Figure 1 Fixed orifice, 3/4 in.



valve shown in *Figure 1*. The red lines show how the previously calculated flow is determined.

$$Q = C_v \sqrt{\Delta P}$$

Special instruments are used to measure differential pressure across FO and VO balancing valves. *Figure 3* shows a FO balancing valve connected to a digital manometer using small hoses. Some manometers can be programmed to directly convert the differential pressure measured across a valve to a flow rate reading.

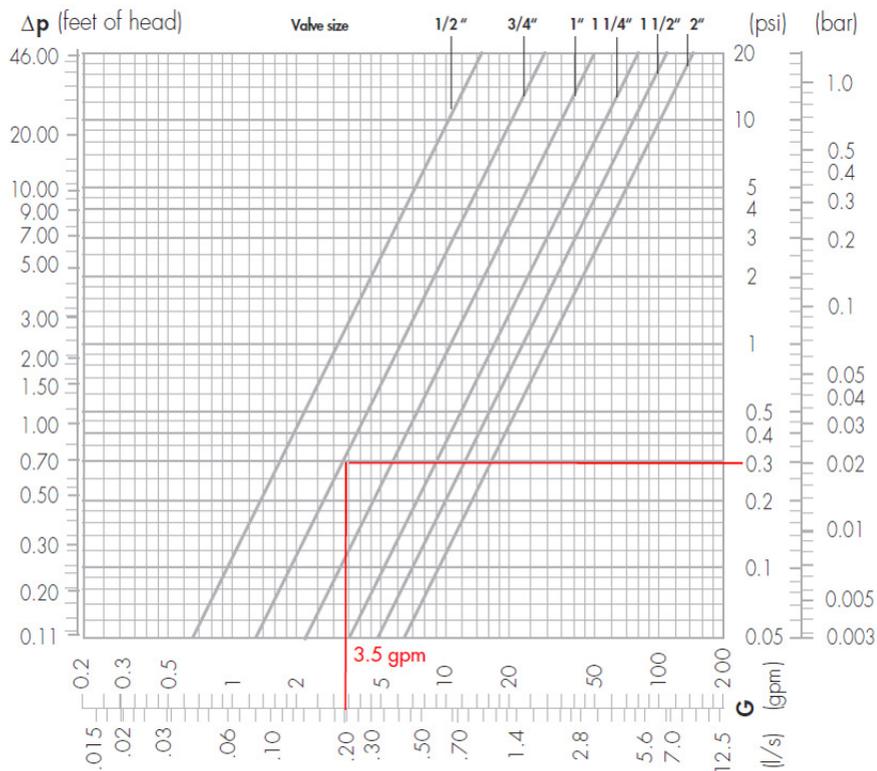


Figure 2 Flow versus pressure drop chart, fixed orifice



Figure 3 Fixed orifice with manometer hook-up



Figure 4 Variable orifice with knob set at 2

**Variable orifice balancing valves**

The second type of manual balancing valve is called a variable orifice (VO) valve. Figure 4 shows an example. As the contractor turns the knob to adjust flow the geometry of the orifice between the pressure ports varies.

Notice that the internal adjustment member of the valve is positioned between the pressure ports. Thus the Cv value of the orifice changes as the valve is adjusted. This makes the procedure for determining flow rate more involved than with a FO valve.

Manufacturers publish a family of

curves for each size valve. Each curve relates to a specific knob position. Figure 5 shows the family of curves published for the valve shown in Figure 4. The red lines illustrate how a knob setting of 2 combined with a measured differential pressure of 3 psi, indicates a flow rate of 3 gpm.

If this flow measurement of 3 gpm was the first one conducted, and 5 gpm is the desired flow rate for the circuit, the contractor might choose to open the valve to position 3 or 4, determine the new flow rate, and through simple interpolation determine the

knob setting that should result in a flow rate close to the target value of 5 gpm. This process would be repeated, as necessary, until the target is attained.

Balancing a circuit with traditional manual balancing valves is an iterative “trial & error” process. Furthermore because circuits are hydraulically coupled, adjusting flow in one circuit affects flow in the other circuits. A system with 10 circuits can require 60 or more readings and adjustments to achieve the desired flow rates.

Accurate balancing requires skill and

Continued on p22

experience. Various test, adjusting and balancing organizations exist in North America to train and certify balancing professionals.

### Direct reading balancing valves

A variation of the FO valve that was introduced in North America a few years ago does not require  $\Delta P$  readings, and instead uses a built-in flow meter. The flow rate is directly read by the balancing technician. This type of valve is generally more expensive than traditional manual balancing valves, but can simplify balancing, reduce balancing labour time significantly, and eliminate errors. *Figure 6* shows an example.

Within this type of valve a bypass channel connects to both sides of a venturi. To set the flow rate the balancing technician pulls the ring on the bypass valve which allows flow through the bypass channel. A spring/disc mechanism travels within this bypass channel, its position relative to flow rate. The disc is magnetic and attracts a small steel bead located within an external sealed glass cylinder. The cylinder graduations are calibrated so that the bead location indicates the valve's flow rate.

To set flow rate, the balancing technician simply rotates the control stem with a wrench while viewing the meter until

Code 142251A <sup>3/4"</sup>

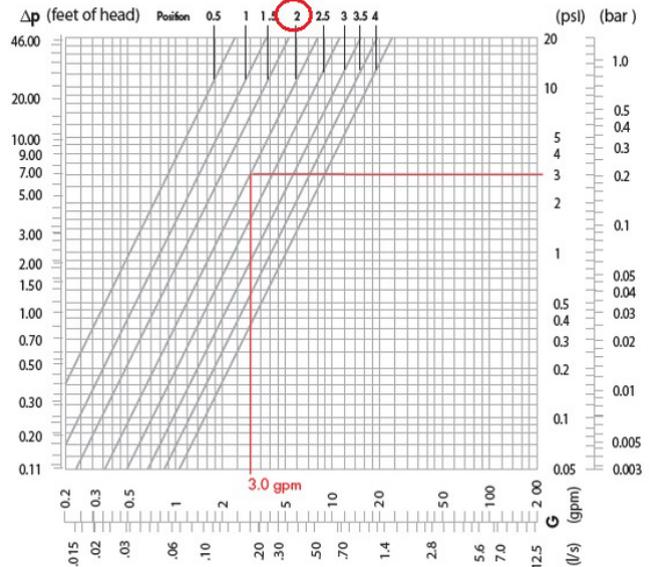


Figure 5 Flow versus pressure drop chart, variable orifice

reaching the target value, then releases the ring. Circuit flow can be set in a fraction of the time required for traditional manual balancing valves. Furthermore, common sources of error such as incorrectly calibrated instruments, misinter-



**Giant**<sup>®</sup>

Enhancing everyday living



Proudly Canadian

**CIPHEX WEST**  
November 7 & 8, 2018  
BMO Centre, Stampede Park, Calgary

**VISIT US AT BOOTH #336**







## SUPER CASCADE

RESIDENTIAL ELECTRIC WATER HEATERS - BOTTOM ENTRY

**A ECOPEAK<sup>®</sup> TECHNOLOGY**

- Helps reduce overall power demand during peak periods;
- Longer lasting and more reliable, at comparable cost;
- Less stress on electrical components.

**60 IMP. GALLONS**

ECOPEAK<sup>®</sup> is a registered trademark owned by Giant Factories Inc.

**B - Oversized magnesium anode rod;**

- Double coating of blue cobalt glass enriched with zircon;
- Brass drain valve.

**40 | 60 IMP. GALLONS**

MODEL EQUIPPED WITH ECOPEAK TECHNOLOGY

**1-800-363-9354**

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

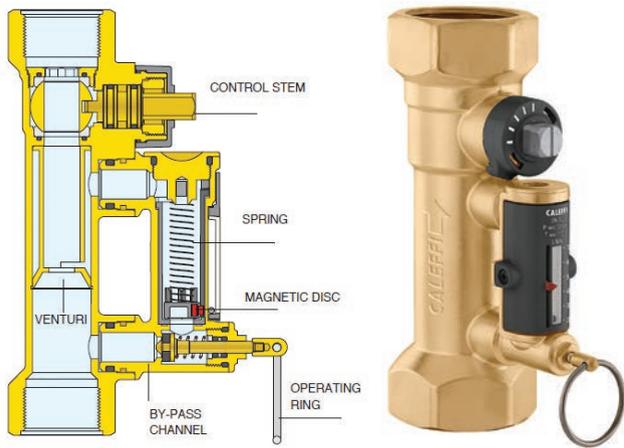


Figure 6 Direct reading manual balancing valve

preting pressure readings, incorrectly interpolating logarithmic charts, and incorrectly interpolating adjustment knob positions can be eliminated.

In DHW recirculation systems, the calculated branch flow rates required to maintain a minimum temperature at the farthest fixture are frequently so low that they are difficult or impossible to read using traditional manual balancing valves that rely on differential pressure. For a given flow rate the differential pressure across a VO valve is greater than that of a FO



Figure 7 Direct reading manual balancing valves on a DHW return riser



Figure 8 PI balancing valve

valve—seemingly giving the advantage. But an offsetting factor is having to interpolate based on adjustment knob position.

Because of these advantages, direct reading manual balancing valves are becoming more common in DHW recirculation applications. Figure 7 shows an example of one on a DHW return riser. Notice the minimum graduation of ½ gpm. This is a commonly specified circuit flow rate, and low enough that it is often difficult to accurately set using a traditional differential pressure type balancing valve.

Continued on p24

## Time-tested design. Replaces in seconds.

With its small footprint, patented features, and superior stainless steel body, the new **Zurn Wilkins 475ST Backflow Preventer Series** replaces competitors models without repiping and lasts without fail. We solve smarter to make it easy for you and safe for those who use it.



ZURN.CA  
US 1.855.ONE.ZURN CANADA 1.877.892.5216

## < BALANCING

### AUTOMATIC BALANCING VALVES

Figure 8 shows a type of balancing valve type often referred to as an automatic (that is pressure independent) balancing valve. Unlike a manual balancing valve, an automatic balancing valve has internal parts that move as differential pressure across the valve changes. Because of this these valves are sometimes referred to as dynamic balancing valves.

### PRESSURE-INDEPENDENT BALANCING VALVES

Other balancing valves technologies now exist that also have moving parts. They include thermal balancing valves and pressure independent control valves. These valves are also automatic. So the simple descriptor of “automatic” is no longer sufficient. We like to refer to the valve type shown in



Figure 9 Cylinder-piston-spring flow cartridge assembly

Figure 8 as a pressure independent (PI) balancing valve (to differentiate it from a thermal balancing valve).

Unlike a static balancing valve, a PI balancing valve controls flow rate within a circuit to a fixed value as long as the pressure drop across the valve is within a specified working range. It does so using a cylinder-piston-spring cartridge assembly within the valve. As differential pressure across the valve

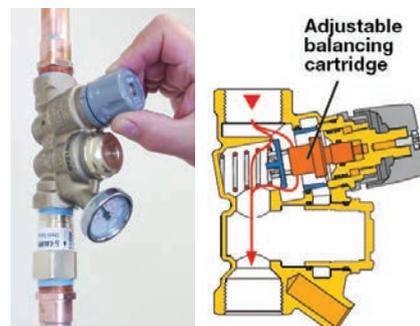


Figure 10 Field adjustable thermal balancing valve

increases from 0 to the minimum value of the working range, flow increases proportionally.

Up to this condition the piston within the valve has not yet moved. However, as differential pressure continues increasing, the piston begins compressing against the spring (Figure 9), reducing the “characterized” flow aperture area and keeping flow at rated value. This regulation process continues as pressure increases to the maximum differential pressure value of the working range. As long as differential pressure falls between the min and max values (that is the “working range”), the flow rate through the circuit stays at rated value. In a multi-branch system, pressure independent valves maintain a stable flow rate within each branch as flow in other branches cycle on and off or modulates.

Because PI valves are supplied with a calibrated flow rate setting, configured at the factory, they are essentially pre-balanced. The circulator simply needs to be sized so that the pressure drop across the valves is within the working range.

Several designers prefer PI valves over manual valves to simplify commissioning. This holds for plumbing applications as well, and thus low-lead rated PI balancing valves are available.

### THERMAL BALANCING VALVES

An intriguing type of balancing valve is known as a thermal balancing valve (TBV), which is offered by two or three

**Auto Cable Feed Unit Shown**

**Auto Cable Feed**

**Upright Position**

## Model CT

**UNIQUE Variable Speed Motor Feature** gives operator maximum cable control and exceptional cleaning power from 75 to 350 RPM with constant torque.

- Professionally designed to clean 3/4" to 2-1/2" diameter drain lines up to 50 Ft.
- Standard unit features a hand tighten Jacobs Chuck. **The CT is also available with a 2-way auto cable feed that keeps hands off rotating cable as it advances and retrieves cable with the push of a lever, and helps keep work area clean.**
- Balanced, heavy-duty steel tubular frame allows for 2 position operation.
- Rugged stainless steel cable drum will not rust and resists denting.
- Holds up to 50' of 1/4" cable, 50' of 5/16" cable, or 35' of 3/8" cable.

**Distributed in Canada by:**  
International Power Systems, 877-477-3353

**The Counter-Top Drain Cleaner You Can Count On For Top Performance!**  
**1-800-833-1212**  
[www.electriceel.com](http://www.electriceel.com)

**Electric Eel®**

**Drain Cleaning Tools For Professionals**

manufacturers in North America. We expect more manufacturers to begin production of these valves in the near future.

A TBV modulates flow rate within a circuit in order to maintain a fixed temperature at the valve. In recirculating domestic hot water (DHW) plumbing systems this is significant because unlike hydronic applications where balancing is intended to control heat transfer, in recirculating DHW systems balancing is done to ensure adequate water temperature at the fixtures. TBVs are a temperature solution for a temperature problem.

Both fixed temperature and field adjustable temperature types are available. *Figure 10* shows a contractor adjusting a field adjustable type within a circuit return riser.

In a thermal balancing valve an internal thermostatic cartridge expands and contracts in response to the water temperature passing through the valve. When cool water is passing through, the valve is fully open. As water temperature rises, the valve begins to close down until the temperature reaches the user-set value. At this position the valve allows minimal flow, just enough for ongoing temperature sensing.

If the entering water temperature begins to decrease, which occurs when there is minimal DHW demand, or from

water heater draw down, the valve begins to open allowing higher flow through the branch.

This continual expansion/contraction action of the TBV ensures water temperature control within each recirculating branch over a wide range of DHW demand. When combined with a variable speed circulator operating in constant pressure mode, TBV valves can result in sizable pumping energy savings too.

Whether embarking on a new hydronic or plumbing system project, accurate flow balancing is paramount to achieving design objectives. The balancing technologies mentioned here offer solutions for specific balancing requirement(s). The key is in selecting the right one for the job. <>

---

*Kevin Freidt is director of product management and technical support with Caleffi North America. He has a BS Mechanical Engineering Technology and is LEED accredited v2.0. Mark Olson is general manager of Caleffi North America, Inc. Olson has a master of science in engineering, applied mechanics and a bachelor of science in engineering, industrial and operations engineering. To see other articles by this author visit [www.hpacmag.com](http://www.hpacmag.com).*

**You need Little GIANT®**  
You provide answers to customer challenges, and for more than 75 years the Little Giant® brand has provided the dependable, water-guzzling solutions. When you combine our passion with yours, together we help prevent unnecessary damage to their valuables by eliminating unwanted water collection before it starts.

[littlegiant.com](http://littlegiant.com)

**TRUE BLUE**

 **Franklin Electric**

# RESIDENTIAL DUCT SYSTEM BALANCING: WHAT'S IN YOUR TOOLBOX?

Efficient, even heating is an unknown ideal for many consumers—technicians and installers should aim to rectify that.

BY IAN MCTEER

In Stephen King's novel, *The Colorado Kid*, one character realizes that "sooner or later, everything old is new again." As I wrote earlier this year, several of the so-called dangerous hydrocarbon and toxic refrigerants of the pre-Thomas Midgley Jr. days are new again in the guise of "natural refrigerants."

When the post-war residential housing boom started in earnest, some sociologists, philosophers, architects and others derided the vast wastelands of "ticky-tacky" box houses seemingly plopped into the landscape around major cities as mind-numbingly anti-human prisons for unwitting wage slaves. "Little boxes on the hillside/ little boxes made of ticky tacky/ little boxes/little boxes all the same," went the song made famous by folk singer Pete Seeger in the 1960s. Because the plain-Jane ticky-tacky label turned into a sales impediment, residential buildings took on several cosmetic enhancements: the back-split, the side-split and the multi-level building designs became popular. Forced by some municipalities to provide off-street parking, the room-over-the-garage design seems to dominate many subdivisions now.

Looking forward to 2020 and beyond, in the age of efficient, energy saving designs, the ticky-tacky house is back. Now called "dumb boxes" the former "boxes all the same" are lauded for being "the least expensive, the least carbon intensive, the most resilient, and

have some of the lowest operational costs compared to a more varied and intensive massing," according to Toronto-based architect Lloyd Alter in a recent article published on TreeHugger.com.

"Every time a building has to turn a corner, costs are added. New details are required, more flashing, more materials, more complicated roofing. Each move has a corresponding cost associated with it. Every jog, bump and twist is ultimately a potential leak and thermal bridge," according to Alter.

The dumb box design of yesteryear was also easy to heat even though insulation proved to be afterthought for some builders and poor quality windows ensured terrific ventilation. Most often, the furnace or boiler was in the dead centre of the basement with equal length trunks and short perimeter runs making even heating happen without much in the way of system balancing being necessary.

With the proliferation of the "split" and multi-level designs coupled with the demand for more useable space, the basement took-on a fresh, new name: the unfinished recreation room. Furnaces were moved "out of the way" and the notion of central heating seemed to be lost forever.

The ductwork associated with exotic residential building designs, although worthy on paper, far too often did not work well in reality. It became very difficult to provide even heating in build-

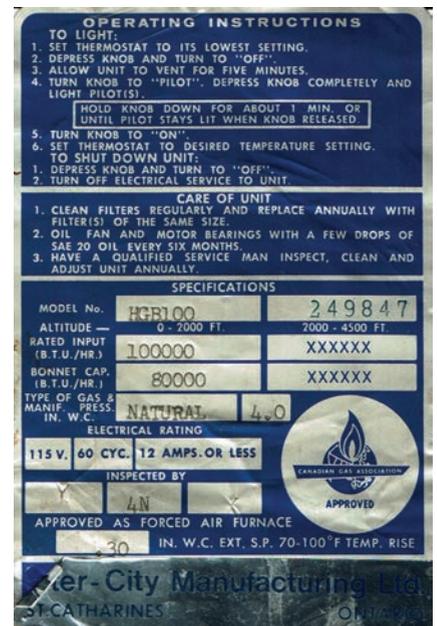


Figure 1 A 1970s gas furnace rating guide

ings equipped with single-zone, single-stage forced warm air systems.

To make matters worse, central air conditioning installations started to proliferate in the 1980s. Highly prized compact evaporator coils dramatically reduced airflow, especially in duct systems attached to low static belt-driven blowers. Regardless of pulley size or motor horsepower, yesterday's furnaces simply could not provide adequate airflow.

Then, government mandated higher efficiency forced air furnaces were often simply mated-up to existing plenums containing those horridly restrictive evaporator coils. Fortunately those coils are gone, but today's AHRI matched and rated air handlers, furnaces, evaporator coils and outdoor units are too often shoehorned into

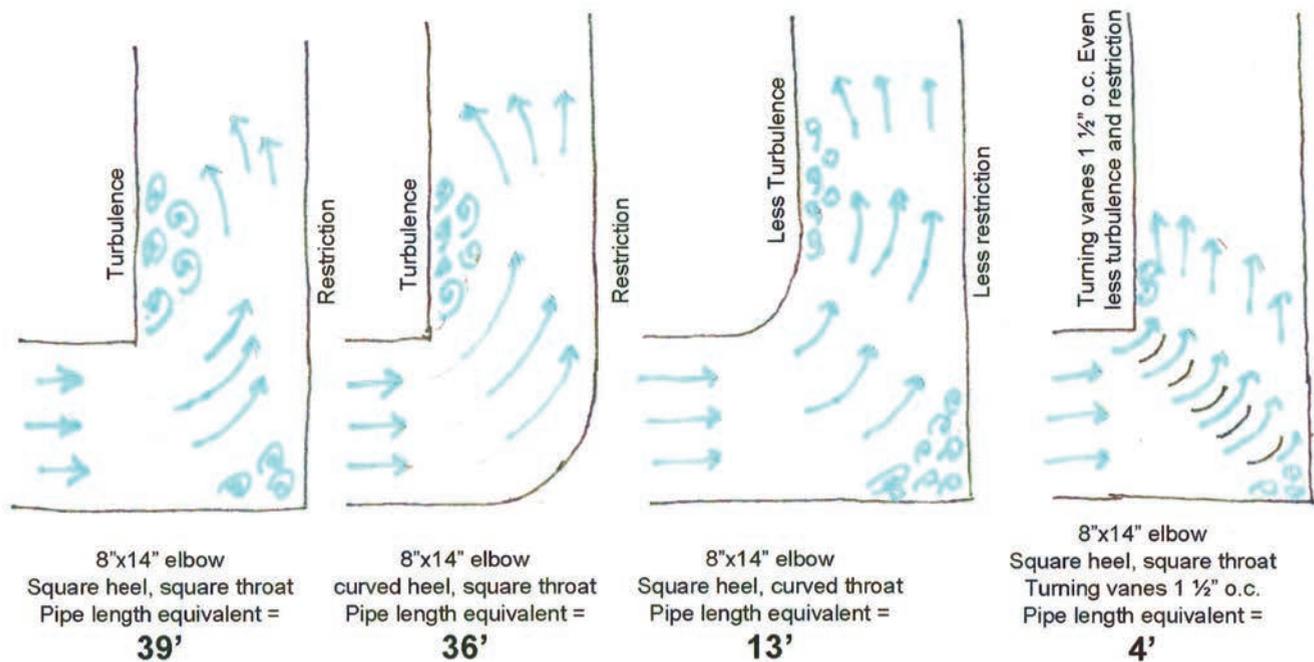


Figure 2 Turning vanes impact turbulence and restriction

yesterday's ductwork. Efficient, even heating is an unknown ideal for many consumers; it is amazing how many people simply accept that a house will always have uncomfortable rooms.

### BALANCING TOOLKIT

Any toolkit contains, apart from quality tools, an appreciable amount of knowledge, training and understanding. These tools belong to sales people, installers and technicians. Any given contractor, wishing to sell a high-efficiency variable speed gas furnace, either two-stage or modulating, must understand that the consumer is expecting monetary savings and better heating. Take a look at *Figure 1*, the rating plate from a 1970s era gas furnace.

Taking 80 per cent AFUE at face value and assuming the duct system was sized so that the furnace would run at an 85F temperature rise, the CFM requirement could have been calculated using the temperature rise method:  $CFM = \text{Btu/hr output} / 1.08 \times \text{temperature rise}$ . Thus,

$$CFM = 80,000 / 91.8$$

$$CFM = 874$$

Looking at the blower chart provided for the new, lower input replacement fur-

nace, let's say the minimum CFM requirement will be 1260 cfm. Using the fan laws, calculate the new static pressure remembering the manufacturer stated efficiency numbers (verified by AHRI) are based on a maximum total external static pressure of 0.5 in. w.c. Thus,

$$SP2/SP1 = (Q2/Q1)^2$$

Where:

SP1 = original static pressure taken from the rating plate (0.3 in.)

SP2 = new static pressure

Q1 = original air flow as calculated by the temperature rise method

Q2 = new airflow as determined by the manufacturer's blower chart

Thus,

$$SP2/0.3 = (1260/874)^2$$

$$SP2 = 2.08 \times 0.3$$

$$SP2 = 0.6 \text{ in. w.c.}$$

The new static pressure is already one-tenth more than the rated static pressure before an evaporator coil and possibly a cabinet-style air filter accessory are installed into an unverified duct system. The total external static pressure (TESP) could ultimately hit one-inch or more.

A PSC blower equipped furnace will simply unload, meaning a lower volume of air will be delivered throughout the

system creating limit tripping and evaporator coil icing service calls. The ECM equipped furnace should be able to move the needed airflow but there are several penalties to consider: higher power consumption by the motor, condensate blowing off the evaporator coil coupled with poor drainage and a lot of velocity noise leaving the end-user thoroughly unimpressed. Unless a major duct renovation will be included in this retrofit, it might be the time to consider other HVAC options, such as, retrofitting with a cold climate heat pump, or a small duct high velocity system.

### BALANCING TOOLKIT – KNOWLEDGE & UNDERSTANDING

Of course, technicians must know how to use system tools and be able to understand the data derived from taking careful measurements. However, residential duct systems often suffer from what I call the "if you build it" syndrome: just plop a duct in front of a fan and the air will go wherever it is needed, so the myth goes.

Residential forced warm air systems are expected to deliver comfort using smooth bore galvanized duct and pipe

Continued on p28



Figure 3

(sometimes too much flex pipe) on the delivery side and a mixture of wooden stud/joist spaces and jumper ducts on the return side. Joist spaces containing pipes, wires and bridging are not conducive to airflow; thus far too many residential systems do not have adequate return air.

As air moves through a duct (see *Figure 2*), friction is created by the moving air rubbing against the sides of the duct. Friction loss, caused by this rubbing action, results in static pressure loss exacerbated in wooden ducts due to the roughness of the wood surfaces compared to galvanized metal or aluminum.

Dynamic losses, caused by turbulence, are usually much greater than friction loss. Rapid changes in airflow direction resulting from the, admittedly necessary, use of offsets, risers, elbows, transitions and other fittings means less air at the delivery point. Thus, excessive friction and dynamic losses add-up to more energy needed to move the “pounds of conditioned air” about the building.

Know that residential duct systems often contain compact fittings built to be as short as possible making for tight radius turns. Once equivalent lengths are factored-in, it is easy to understand why the master bedroom on the second floor is 300 equivalent feet away from the furnace. Why would air, trying to take the path of least resistance, want to go there?

Two “S” offsets combined with two short radius elbows without turning vanes make for more turbulence that



Figure 4

could easily prevent the appropriate amount of conditioned air from finding its way to the master bedroom (see *Figure 3*).

Know that the building envelope itself is a “duct” that connects the supply ductwork to the return ductwork. Suppose any particular master bedroom contains two 6-in. supply ducts. There is only one 8 in. x 30 in. sidewall return air for the second floor in the hallway outside the room. What happens to even heating when the non-undercut bedroom door is closed: why would enough air flow into the bedroom when there is no place for it to go? What if the return air is pulling too much from a room creating depressurization? The system must be balanced to prevent such problems.

Know that dust and dirt clinging to the edge of joist lining and around holes for electrical wiring drilled through wooden joist return air ducts is an indication the return side is taking air into the system wherever it can—probably not enough from the master bedroom (see *Figure 4*). Dust, dirt, animal hair and other delights find a way into return air ducts; as the air slows down heavier particulates drop out leaving mounds of debris that must be cleaned out regularly, especially at retrofit time. All supply and return ducts must have sealed joints to minimize air leakage.

Know that many retrofits, done years ago, were ducted improperly leading to early equipment failure. For example, when the manufacturer specifies extra return air ducting for maximum airflow, simply enlarging the size of the drop



Figure 5

duct then choking it down at the furnace entrance is a guarantee of poor performance (see *Figure 5*).

### BALANCING TOOLKIT – TOOLS

There are many excellent test, adjust and balance (TAB) tools available at reasonable cost for HVAC sales people, technicians and installers. The question is, which one(s) should I use? Once the new furnace or air handler has been started, bulk airflow must be determined and there are several ways to determine how much air is flowing in the main trunk ductwork.

- Temperature rise method using Type K insertion thermocouple probes and an electronic thermometer. Apply data to the formula  $CFM = \text{Btu/hr output} / 1.08 \times \Delta T$ . Know that you should not accept nameplate furnace efficiency. It is best to do a combustion analysis to get the real AFUE number. Remember that the 1.08 factor is air density dependent and fluctuates with altitude. This is not a recommended method during hot summer weather!
- Measure the pressure drop over a known accessory such as an air filter or wet or dry evaporator coil using a dual input manometer and static pressure sensing tips. However, you MUST have the accessory manufacturer’s airflow chart in order to relate measured  $\Delta P$  to actual CFM.
- Summertime start-up using a smart refrigeration manifold: using measured refrigeration system parameters, it is possible for the smart manifold to calculate overall system



# The game changer in home comfort.

Lighter, smaller, easier, **BETTER.**

The KeepRite® ProComfort™ Deluxe 19 Air Conditioner and ProComfort™ Deluxe 18 Heat Pump with SmartSense™ Technology quietly deliver steady comfort, higher efficiency, and savings in a more compact design, thanks to the variable-speed inverter. The air conditioner delivers a superior rating of up to 19 SEER and the heat pump features ratings up to 19 SEER and 11 HSPF for optimal home comfort levels. They are easier to sell, easier to service, and easier to install.

**KeepRite®**  
Heating & Cooling Products  
**The Pros Know.**

© 2018 International Comfort Products

**smartsense**  
TECHNOLOGY

KeepRite® ProComfort™ AC & HP with  
SmartSense™ Technology

GoKeepRite.com



Timely registration required. See warranty certificate for details and restrictions.



See warranty certificate for details.



ASK ABOUT ENERGY STAR

## BALANCING TIPS



**Pressure Drop Method: determining bulk airflow** An Inclined manometer and static pressure tips are used to measure the pressure drop over a system accessory such as a cabinet-style in-line air filter. Requires a manufacturer-derived table of values for this accessory. Note: when an ECM fan motor is involved, be sure it is not ramping-up to overcome system restrictions.



A flow hood can be used for supply and return airflow measurements, however, back pressure can confound readings. Fairly expensive, rather delicate equipment requiring periodic recalibration, flow hoods may not be useful for the residential contractor.



The 16 in. x 8 in. return air grille is covering an opening that is only 14 in. x 7 in. Is it appropriate to use the free area opening data supplied by the grille manufacturer? Do you even know the name of the manufacturer? I used the actual opening area of 98 square inches divided by 144 = 0.681 square feet as the free area factor for my meter. Sometimes the bottom plate of the partition is not fully cut-out creating an undesirable restriction.



Run the blower at the highest airflow requirement according to the AHRI rated system requirements. It is not unusual to have a higher heating airflow requirement for high efficiency gas furnaces and heat pump air handlers equipped with electric heat kits. Use the vane anemometer on each return air grille, in this case the meter is set to average a traverse across the grille.



A 4 in. x 10 in. floor register from an unknown manufacturer. Some vane anemometer tools require the duct/pipe size

along with the manufacturer's "Ak" factor, others simply want the free area in square feet. If the manufacturer's data sheet says the free area is 27 square inches, then the factor I used in my meter was  $27/144 = 0.188$ .



Suppose you are lucky enough to have the approved heating plan for this building and suppose, during testing at the appropriate fan speed, this outlet is delivering 83 cfm instead of the 68 cfm noted on the plan. It should be a simple matter of adjusting the volume damper down inside the sheet metal boot to choke-off a bit of air allowing more air to go elsewhere. Sometimes the damper won't move; sometimes it breaks off as you try to adjust it; sometimes it is too loose and the adjustment won't hold; sometimes it is not accessible from below for repair/replacement; and many times there is not a damper at all.

performance targets. If the targets are met, then the system bulk airflow is adequate.

- Pitot tube and dual input electronic manometer or inclined manometer is probably the gold standard for accuracy but they require a traverse due to the small intercept area of the tube tip. Manufacturer's TESP charts are required to determine bulk airflow. Residential system turbulence can cause measuring inaccuracy.
- Hot wire anemometer measures the wind chill of a heated bead reporting out air velocity converted to CFM using the formula  $CFM = \text{Area of the duct} \times \text{velocity}$ . Again, a traverse is needed.
- Vane and mini-vane anemometers using a blade that rotates in proportion to airspeed are probably best used for measuring airflow at grilles and registers.

Starting-up new high efficiency equipment into any duct system could be a challenging and time consuming exercise. Once system bulk airflow has been verified, it is time to see where all that air is going. If the end user was promised better heating and cooling (especially in the master bedroom) your balancing toolbox containing not only great tools but all your accumulated wisdom will surely be put to good use.

Spend some time at Robert Bean's healthyheating.com website and look for his article entitled Integrated Design Illiteracy: The Root of All Evil in Architecture. I think Bean's view of how to make building occupants comfortable will convince any reader that tomorrow's "dumb box" housing cannot come along soon enough. <=>



*Ian McTeer is an HVAC consultant with 35 years experience in the industry. He was most recently a field rep for Trane Canada DSO. McTeer is a refrigeration mechanic and Class 1 Gas technician.*



# EXTREME SERIES

SEER 38

SAVINGS UP TO **77%** ON HEATING BILL

**-30°C • +46°C**

- Convenient Access to Controls and Monitoring via Smartphone



SEER	EER	HSPF	COP -20°C
<b>38</b>	<b>16.67</b>	<b>15</b>	<b>4.47</b>

\* performances for the Extreme 9,000 BTU

**10 YEAR** WARRANTY ON COMPRESSOR, PARTS & LABOR



# UNIVERSAL CENTRAL INVERTER DUCTED SYSTEM

SAVINGS UP TO **70%** ON HEATING BILL

- Unmatched Comfort and Quiet
- Constant Monitoring with the *Smart IOT Gateway System*
- Simple & Effective Inventory

## RETROFIT\*

ALL 24V / R410A SYSTEMS \*TXV required



SEER	dB	COP -15°C	COP -20°C
<b>20</b>	<b>56</b>	<b>3.45</b>	<b>2.68</b>

\* performances for the ESI Ultra series

**10 YEAR** WARRANTY ON COMPRESSOR, PARTS & LABOR



# SIDE DISCHARGE CENTRAL INVERTER DUCTED SYSTEM

SAVINGS UP TO **70%** ON HEATING BILL

- Designed for Cold Climate Zones
- Compact Outdoor System
- Easy Installation
- User Friendly Wired LED Thermostat



**COMPACT**  
36,000 BTU UNIT



SEER	dB	COP -15°C	COP -20°C
<b>20</b>	<b>41</b>	<b>3.24</b>	<b>2.40</b>

\* performances for the E-Tech series 36,000 BTU

**10 YEAR** WARRANTY ON COMPRESSOR, PARTS & LABOR

# RADON, CANADIANIZED

Passive systems show promise as mitigation system of choice for colder climates. **BY JILLIAN MORGAN**

**A**s uranium begins its cyclical decay chain in Canadian soil, homes on the surface act like a suction cup and draw in its deadly by-product: radon.

Odourless, colourless and tasteless, radon gas is just one domino in a radioactive cascade that enters structures new and old across the country, contributing to more than 3,300 lung cancer deaths per year.

“It’s the worst thing no one’s ever heard of,” said Anne-Marie Nicol, associate professor at Simon Fraser University’s Faculty of Health Sciences in Burnaby, BC.

As a public health researcher, much of Nicol’s work focuses on environmental carcinogens, specifically radon—the second leading cause of lung cancer in Canada.

“We’ve kind of shrugged this off as a smoker’s condition, but if fewer people are smoking we’re realizing there are other things that cause lung cancer as well,” said Nicol.

The latest technologies in radon remediation and mitigation offer a means to end the reign of this silent killer in homes and buildings, as long as the HVAC contractors behind those structures stay in the know.

## HEALTH RISKS

Canada is the world’s second largest producer of uranium—its soil so rich in the metal that there is always a measurable amount of radon in the air.

Outside, it dissipates and mixes with other gases, so concentrations drop to relatively harmless levels, ranging from 10 Becquerels—a measurement of radioactivity—per cubic metre (Bq/m<sup>3</sup>) to 30.

Inside, however, those levels can vary drastically from one structure to another.

Radon exists, on average, three to four days in an indoor environment before it decays, at which point it gives off radioactive alpha particles in addition to progeny, or “radon daughters.” The metal progeny “stick” to the sensitive lining of the lungs, further decaying and emitting radiation.

“People call radon radioactive, but it’s actually the decaying process that causes the problem,” Nicol said.

In 2007, Health Canada reduced its guideline for radon in indoor air from 800 Bq/m<sup>3</sup> to 200. Comparably, the World Health Organization recommends a 100 Bq/m<sup>3</sup> baseline, and the U.S. standard sits at 150.

“I’d like to see the action level dropped,” said David Innes, sales director at Radon Environmental Management Corp.

Headquartered in Vancouver, BC, Radon Environmental—an environmental and building science company—published the first geology-based radon map of Canada in 2011.

“There was some level of radon awareness in Canada the late 1970s and early 1980s, and it seemed through a government change it just fizzled away. I don’t really have an explanation of why that’s the case but I can say the U.S. is, in my opinion, about 30 years ahead of Canada in terms of radon awareness.”

In 2017, the company partnered with Airwell Technologies to tackle the emerging threat of radon in water, namely from private wells. The jointly released product “off-gasses” radon-contaminated water before it enters a home.

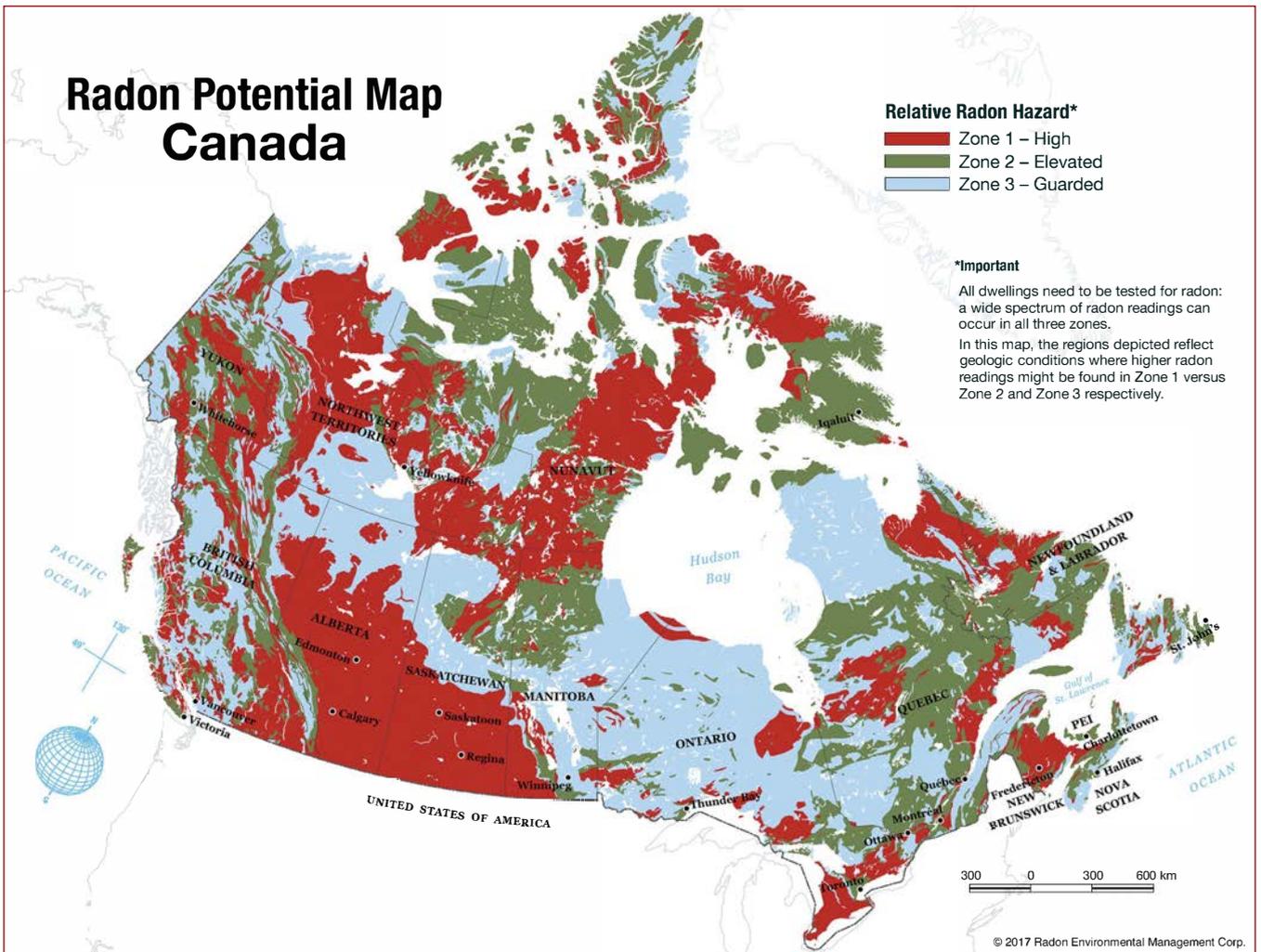
“Dissolved radon can be released into the indoor air through agitation from household use, so showering, dishwashing, etcetera, but generally the contribution of dissolved radon from ground water is a small percentage of the overall airborne radon found in most homes,” said Kelley Bush, manager of radon education and awareness at Health Canada.

Still, there’s a hypothesis that drinking radon-contaminated water could



A typical ASD system.

PHOTOS ROB MAHONEY, RADON WORKS



“impact different parts of the stomach and gastrointestinal system, and possibly bladder,” Nicol said.

“A lot of the things that are done to reduce radon in homes and buildings are the result of how our buildings are built and designed or renovated,” she added. “Raising awareness in [trades] people that what they’re doing is contributing to cancer prevention is really important.”

**SOLUTIONS**

In 2014, Health Canada and the non-profit Canadian Association of Radon Scientists and Technologists formed the Canadian National Radon Proficiency Program (C-NRPP).

C-NRPP offers courses in radon mitigation for accredited contractors, including how to install passive systems and active systems—the latter, more generally used strategy known as active soil depressurization (ASD).

ASD involves connecting a pipe, or “radon stack,” to the foundation floor slab of a home, while an attached radon fan continuously discharges soil gas to the outdoors via the stack’s exit. In the U.S., that stack typically passes through a living space and discharges above the roofline, with the fan located in an uninhabited area, such as an attic. But for America’s

northern neighbour, this configuration presents challenges.

According to monitoring by the National Research Council, soil gas inside the stack sits between 80 and 100 per cent humidity. When temperatures dip well below zero for extended periods of time, ice or snow blockage at the system’s exit is more likely. For this reason, ASD systems in Canadian homes typically exit at the sidewall near ground level, with the fan located in a basement.

“Those strategies are not new, they’re actually very commonly used but we didn’t quite understand their performance and impact in Canada,” said Liang Grace Zhou, senior research officer with NRC’s Intelligent Building Operations Unit and lead for all radon control research projects.

Despite its effectiveness, the Canadianized ASD system can lead to other problems, such as radon fan leakage into habituated areas, introduction of unwanted air and the dispersion of high radon concentrations just above the grade.

In a search for alternatives, NRC has undertaken studies on passive systems, which do not use a fan and instead naturally draw soil gas through the pipe and discharge it outdoors above the roofline via the stack effect.

Continued on p34

## < INDOOR AIR QUALITY

Between September 2017 and March 2018, the organization conducted a test on this system in four Ottawa homes. It monitored indoor radon concentration, as well as airflow, air speed, temperature, RH and pressure within the stack, in addition to pressure from the sub-slab area.

Within the first year, radon levels dropped 40 to 90 per cent.

“This is a solution for Canada,” Zhou said. NRC plans to conduct another field study on passive systems this year in B.C., since the province’s building codes require homes in high-exposure zones to install a full passive stack.

With a push to net zero energy readiness by 2030, NRC has also developed a semi-detached zero energy ready house in Ottawa, which will be used to study alternative radon control systems.

In other building types, such as those with a larger footprint, ventilation can alleviate high radon levels, though this requires a slightly different protocol, Zhou said.

“In the commercial environment, there are many forms of HVAC equipment that in some cases can be manipulated to abate the radon entry,” said Rob Mahoney, owner of Radon Works, an Ottawa-based radon control company.

“Bottom line, there is no such thing as zero radon, any standard structure will have a measureable amount.”

### RADON TESTING

Homeowners test for radon using certified devices, or hire a C-NRPP certified measurement professional. Contractors interested in C-NRPP certification can visit [www.c-nrpp.ca/how-to-become-certified](http://www.c-nrpp.ca/how-to-become-certified).

Radon levels in a home can vary from day to day, so Health Canada recommends occupants take long-term measurements—between three to 12 months in duration, ideally during the heating season.

Long-term measurement devices approved by C-NRPP, and recommended by Health Canada, include alpha track and electret ion detectors. The program also approves continuous radon monitors that record real-time measurements.

C-NRPP-listed radon measurement devices can be found here: [www.c-nrpp.ca/approved-radon-measurement-devices](http://www.c-nrpp.ca/approved-radon-measurement-devices).

### ACTION

“In Ontario, we have Tarion Warranty, which guarantees a home to be less than 200 Bq/m<sup>3</sup>, but unless the occupant tests it goes unnoticed, just like the crack in the foundation behind the finished wall,” Mahoney said.

Despite a slew of C-NRPP approved radon monitoring devices, few homeowners test, so data on radon concentrations in homes and buildings is unstable. Other challenges are presented too, with the rise of green structures that are virtually airtight, meaning newer homes typically have higher levels of radon.

“As codes change, due to product innovations and energy costs and sometimes even common sense... We solve one problem but create another,” Mahoney said.

Each November, the Take Action on Radon network, led by the Lung Association and Scout Environmental with support from Health Canada, hosts Radon Action Month. The campaign aims to raise awareness about the dangers of radon and encourage homeowners to test. This is especially timely as levels can rise in the winter months when homes are sealed up.

Health Canada is also in the early stages of an epidemiological study to find indicators that the body is responding to what it terms, “chronic, low-dose exposures,” Bush said.

“Radon is a very challenging health risk issue to get people to pay attention to,” she added.

“You can’t see it, you can’t smell it, you can’t taste it, so you don’t really believe it’s there... It doesn’t get you angry or worked up because it’s naturally occurring, it’s everywhere in the ground, it’s in every single home and building, so it’s challenging.” <>



COMING...  
SEPTEMBER 19, 2019

## MODERN HYDRONICS SUMMIT 2019

North America’s **LARGEST**  
(and growing!)  
hydronic – only event.



Check [modernhydronicssummit.com](http://modernhydronicssummit.com) for updates

Presented by **HPAC** HEATING  
PLUMBING  
AIR CONDITIONING

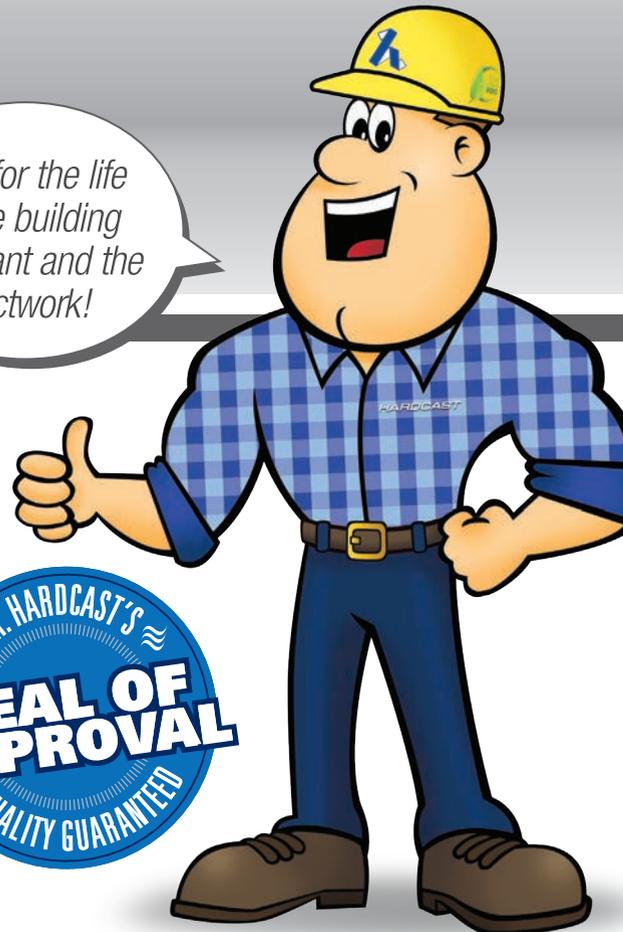
## Safely Sealed for Life



See our full line of  
**GREENGUARD Gold Certified**  
products here:



*Safe for the life  
of the building  
occupant and the  
ductwork!*



### Hardcast Water Based Sealants are UL-GREENGUARD GOLD Certified

Hardcast engineers and formulates duct sealants to perform for the expected life of the ductwork. In addition, Hardcast has now received UL's GREENGUARD Gold\* certification on all its water-based liquid sealants. This rigorous testing complements the proven performance characteristics of Hardcast sealants and gives LEED v4 compliance and an assurance to Specifiers, Distributors, Contractors and Facility Managers of long-term safety for building occupants when using Hardcast water-based duct sealants.





**BOSCH**

Invented for life

# Art of the Install

Your installations are a work of art. Be sure the equipment you install is worthy. Choose Bosch HVAC products to provide worry-free heating, cooling and hot water. You'll be pleased with the ease of installation and your customer will love the comfort and reliability.



Heating



Cooling



Hot Water

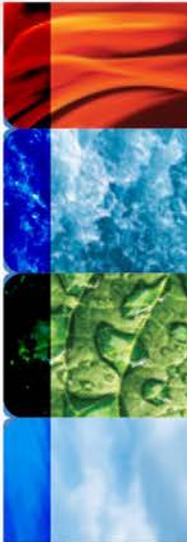


Controls

[BoschHeatingAndCooling.com](http://BoschHeatingAndCooling.com)

## Bosch SSB Stainless Steel Boiler

For maximum efficiency, Buderus SSB Boilers achieve consistent combustion throughout the entire length of the burner tube due to a patented laser perforated design.



## Ciphex West 2018 Show Preview

**BMO Centre, Halls B & C, Stampede Park, Calgary**

**Wednesday, November 7**  
10 a.m. to 6 p.m.

**Thursday, November 8**  
10 a.m. to 5 p.m.

CIPHEX West returns to Calgary, AB where more than 200 exhibitors will be on hand. Produced by the Canadian Institute of Plumbing & Heating (CIPH), the CIPHEX West trade show is a one-stop event for contractors, wholesalers, engineers, building managers and other industry professionals looking for new products and technologies. Attendees will have the opportunity to see the latest product offerings in the plumbing, hydronics, heating, ventilation, air conditioning, refrigeration and water treatment sectors. In addition to the 30,000 square foot industry showcase, delegates may participate in seminars dealing with the most pressing issues facing the industry.

### SHOW FEATURES

The popular New Product Showcase returns in 2018. Exhibitors were invited to participate in this juried competition. Winners in the various product categories will be selected by a panel of industry experts and announced on the first day of the show.

Taking place at CIPHEX West, the Canadian Hydronics Conference, which is presented by the Canadian Hydronics Council, includes workshops by HPAC contributor John Siegenthaler.

CIPH's Calgary Region is hosting the CIPHEX Industry Dinner on November 6. Two-time World Curling Champion John Morris (Johnny Mo) is speaking at the event.

Delegates will have access to the Buildex Calgary exhibit hall with their registration.

[www.ciphexwest.ca](http://www.ciphexwest.ca) [www.buildexcalgary.com](http://www.buildexcalgary.com)

Continued on p38



# Seminar Schedule

## NOVEMBER 7

### History and Benefits of the Thermostatic Mixing Valve

**Time:** 10:30 a.m.–11:30 a.m. **Fee:** \$35

**Speaker:** Rick Proulx, business development director, Reliance Worldwide Corporation (Canada) Inc.

Hot water delivery temperature has been an issue for many years in Canada leading to a National Code implemented in 2010, ensuring protection to the homeowners from scalding and legionella bacteria. This session will cover Codes and applicable product standards, National and Provincial Legislation and compliance as well as the responsibilities of plumbing officials and contractors.

### Planning and Executing Commercial Rainwater Harvesting Systems Based on Scale Driven Designs

**Time:** 11:45 a.m.–12:45 p.m. **Fee:** \$35

**Speaker:** G. Edward Van Giesen, national sales manager, RainCycle (A Watts Company)

Rainwater harvesting systems are used more and more in commercial buildings to offset potable water demands and to reduce storm water outflows. Despite an ever-increasing number of rainwater systems going into service in North America, design consistency remains elusive. This is typically due to the designer's unfamiliarity with best practices and frequent exclusion of key components.

Two key factors that contribute to the success of a rainwater system are early planning and analysis of the system as a whole. While the concept of capturing rainwater is simple enough, there is not one consistent definition as to what constitutes a rainwater system. This ambiguity in system design and planning leads to huge disparities in material and installation costs. As a result, many projects are value engineered.

The session will start with a brief intro on system design and will be followed by an in-depth presentation focusing on the key components. The presenter will analyze inlet pre-filtration, storage options, sizing methods and disinfection strategies. The session will focus on the why's, how's and where's of inlet filters and critical filtration/treatment options.

**EXHIBITOR LIST  
SEE P44**

**PRODUCT SHOWCASE  
SEE P48**



### New Technology Methods for Protecting Homes & Buildings from Toxic Radon Gas

**Time:** 1:00 p.m.–2:00 p.m. **Fee:** Free

**Speaker:** David Innes, director of sales, Radon Environmental Management Corp



Radon is responsible for thousands of lung cancer deaths each year. It affects indoor air quality in all buildings. The exposure risk can be prevented during construction and in the way we maintain our homes and workplaces. Changes to building codes with respect to radon will be covered along with prescriptive measures and performance options. Attendees will also learn about typical radon detection methods used throughout the world. The presentation will also cover current mitigation methods and their inherent pitfalls along with a section on using ventilation as a mitigation method. Case studies will be presented.

### How to Design and Install a Hydronic Snow Melting System

**Time:** 2:15 p.m.–3:15 p.m. **Fee:** \$35

**Speakers:** Erwin Quejano (I), design department supervisor, and Rudy Feddema, senior design & technical support, HeatLink Group Inc.



Learn the key components for designing and installing a hydronic snow melting system including: snowmelt application; snowmelt system components; manifolds to PEX; snowmelt controls; proper installation of PEX and snow/ice detector to ensure system works as per design; and schematic diagrams.

### Challenging Conventional Softener Design to Save Water, Save Salt & Save Money

**Time:** 3:30 p.m.–4:30 p.m. **Fee:** \$35

**Speaker:** Tyler Gamble, commercial product applications manager, Canature WaterGroup

With an increasing number and more severe droughts due to climate change, water conservation awareness is at an all time high. Water softeners are traditionally thought as water wasters and in some parts of the world, their use is heavily regulated due to the elevated waste volumes, and wastewater issues they can produce. New ways of thinking regarding the design and operational use must be considered so that the added benefits of soft water don't conflict with current water conservation strategies. This presentation will show how a shift in thinking about water softeners can reduce the amount of water and salt consumed during softener operation, and therefore increase the operational efficiency of the softener.

Continued on p40



# EXCITED WATER MOLECULES EXCITE ME

MARK MCAFEE, ENGINEERING LAB TECH II, LEBANON, TN

Engineering the world's most advanced high-efficiency boilers and water heaters requires more than just the right parts. It calls for the right people—people like Mark—who have a passion for bringing it all together to deliver optimal efficiency. It's a Lochinvar thing.

Visit [Lochinvar.com](https://www.lochinvar.com) to see the industry's broadest line of high-efficiency boilers and water heaters.





# Seminar Schedule

## Basic Electrical Theory and Control Panel Troubleshooting

**Time:** 10:30 a.m.–11:30 am **Fee:** \$35

**Speaker:** Tim Callander, regional sales manager, SJE Rhombus



This session will provide easy to understand explanations of following schematics and using a voltmeter. The troubleshooting portion is a step-by-step method of moving through a pumping station to determine the source of the problem: electrical services; controls/ alarm circuits; floats; and motors.

## Efficient & Effective Domestic Hot Water Recirculation

**Time:** 11:45 a.m.–12:45 p.m. **Fee:** \$35

**Speaker:** Rick Mayo, residential trainer–Western Region, Taco Comfort Solutions

Insights will be offered on domestic hot water (DHW) recirculation including: DHW and health concerns; mix-down fluid temperatures; DHWR piping options; alternative DHWR control strategies; and near heater piping details.

## Update on the 2020 National Plumbing Code of Canada

**Time:** 1:00 p.m.–2:00 p.m. **Fee:** Free

**Speaker:** Sidney Manning, chief plumbing & gas administrator/inspector, Government of Alberta

This session will go through code updates as we look towards the 2020 version of the National Plumbing Code of Canada, including topics such as water reuse, rainwater harvesting, legionella and more. Bring any questions or concerns you have about radon, hydronic heating, energy efficiency, etc. Ever wonder why plumbing or gas code is written the way it currently is? Ever have a code question no one else could answer? This is the session you need to attend.

## Wall and Ceiling Radiant–The Overlooked Solution

**Time:** 2:15 p.m.–3:15 p.m. **Fee:** \$35

**Speaker:** Steve Gibbs, product manager, trainer, radiant designer, Roth Industries

This session will include: a discussion of heat transfer; rationale for wall and ceiling radiant (supplemental heating and cooling, floor limitations and radiant cooling options); and installation methods for wall radiant and ceiling radiant. Attendees at this session will learn how radiant walls and ceilings can be a comfort solution and how to identify common indicators where wall or ceiling radiant can be used. The instructor will also provide an overview of installation methods and how to identify common indicators where wall or ceiling radiant can be used.

## Retrofitting Air Handling Systems Using ECM Fans

**Time:** 3:30 p.m.–4:30 p.m. **Fee:** \$35

**Speaker:** Luis F. Orellana, bid & spec-business development manager, Rosenberg Fans Canada Ltd.

This session will cover what an ECFan is, how it works, a comparison between AC and EC Motor energy use and controllability. The speaker will clarify energy usage of commercial ventilation systems in Canada, as well as retrofitting outdated AHU, MUS and other ventilation systems. Attendees will learn how to identify energy saving opportunities with ECFans and they will be instructed on how to size a retrofit application using the correct tools.

Continued on p42

All new, even more,  
user-friendly

# ONLINE BUYER'S GUIDE

at [hpacmag.com](http://hpacmag.com)

**CHECK IT OUT**

**HPAC** HEATING PLUMBING AIR CONDITIONING

Follow us on  
**twitter**  
[@hpacmag](https://twitter.com/hpacmag)



CHUM Hospital, Montreal



Tour des Canadiens Condos, Montreal



Centre Videotron Arena, Quebec City

# BIBBY STE-CROIX

## LEAVING A LEGACY FOR GENERATIONS

### CAST IRON SOIL PIPE & FITTINGS



Bibby Ste-Croix's cast iron soil pipe and fittings have been the fundamental product specified in legacy buildings for generations. When you specify our products, you know you're getting a safe, quiet, and green piping solution.

While you may not see what's hidden within the infrastructure of a building, you can rest assured that Bibby Ste-Croix's DWV plumbing systems will stand the test of time. Our fire-resistant pipe and fittings provide life safety as well as excellent sound performance.

**Bibby Ste-Croix—the safe, quiet, and green piping product for DWV plumbing systems.**

**Declare.**

**Cast Iron Soil Pipe and Fittings**  
**Bibby Ste-Croix**  
 Final Assembly: Ste-Croix, Quebec, Canada  
 Life Expectancy: 50 Years  
 End of Life Options: Salvageable/Reusable in its Entirety

**Ingredients:**  
 Recycled Grey Cast Iron: Iron, Carbon, Silicon (Silicium), Residual Nickel, Residual - Chromium, Asphalt, Hydrogen Sulfide

**Living Building Challenge Criteria:**  
 BSC-0001      ENF: 01 DEC 2018  
 VOC Content: N/A      VOC Emissions: N/A

**Declaration Status**  
 LBC Red List Free  
 LBC Compliant  
 Declared

POWER RATED FOR RESIDENTIAL USE ONLY. SEE PRODUCT SPECIFICATIONS FOR FULL DECLARATION.  
 INTERNATIONAL LIVING FUTURE INSTITUTE™: [declareproducts.com](http://declareproducts.com)





# Seminar Schedule

## CANADIAN HYDRONICS CONFERENCE

**NOVEMBER 7**

### Modifying Existing Hydronic System for Lower Water Temperatures

**Time:**

7:30 a.m.–Continental breakfast

8:00 a.m.–11:30 a.m. Workshop

Fee: \$109

**Instructor:** John Siegenthaler, P.E., Appropriate Designs



The performance of many contemporary hydronic heat sources such as modified condensing boilers, solar thermal collectors, heat

pumps, and biomass boilers is significantly improved when they are combined with low temperature distribution systems. This session explains how to modify those systems to lower their required operating temperature, making them more compatible with modern (and future) heat sources.

### Radiant Cooling with Dry Panel Systems

**Time:** 12:30 p.m.–1:30 p.m.

Fee: \$35

**Instructor:** William Werthman, senior technical advisor, Legend Valve & Fitting, Inc.

Dry panel systems can be a good option for many installations; you just need to know when to use them. This learning lab will cover the differences between wet and dry panel systems, when dry panel systems should be installed, control

strategies, and combination systems. If you are looking to add radiant cooling to your service offerings this session is the place to start.

### Heat Up Your Hydronic Sales - Tips to Grow Your Business

**Time:** 4:45 p.m.–5:45 p.m.

Fee: \$35

**Instructor:** Matt Wiesenfeld, program manager, Canadian Hydronics Council

You will leave this non-technical session armed with new ideas and tools to increase hydronic sales. It is all about selling with more confidence.

**NOVEMBER 8**

### Documenting Hydronic Systems

**Time:**

7:30 a.m.–Continental breakfast

8:00 a.m.–11:30 a.m.–Workshop

Fee: \$109

**Instructor:** John Siegenthaler, P.E., Appropriate Designs

Modern hydronics technology can be used to create very sophisticated and elaborate systems. While the original designer understands how the system should be installed and commissioned, the person who installs and maintains the system over its service life may not. Service contractors do not want to deal with the resulting incorrect installations and "orphan systems." Experience has shown that this is all too common with hydronics systems, and represents an impediment to further market acceptance of hydronics technology. This session describes proper system documentation including piping schematics, electrical control schematics, descriptions of operation, initial controller settings, and installation details. You will also learn about relatively inexpensive software tools for creating proper documentation.

# TO THE EXTREME

## CLEAN REAM EXTREME™ PLASTIC PIPE FITTING REAMERS

- Clean leftover pipe and solvent cement residue from PVC, CPVC or ABS fittings.
- **Reduce labor time and materials costs** by reusing the fittings.
- Available in 7 sizes and fit into standard 1/2" drills.



PPR200 in use  
videos.reedmfco.com/ppr

**Available Sizes**

3/4", 1", 1-1/4", 1-1/2", 2", 3", and 4"



PIPE TOOLS & VISES  
SINCE 1896



Kits include a hard case and choice of 4, 5 or 6 reamers.

Reed Manufacturing • Erie, PA USA  
800-666-3691 • www.reedmfco.com



**COMING...  
SEPTEMBER 19, 2019**

North America's **LARGEST** (and growing!) hydronic – only event.

# MODERN HYDRONICS SUMMIT 2019

If you missed the 2017 Summit you missed all the new products and services from:

- ADEY • ADP • Aermec • Amtrol • Amvic • AquaHeat
- AquaMotion • Aquatherm • Armstrong • Axiom
- Bacharach • Bardon • Belimo • BoilerMag • Bosch
- Caleffi • Calefactio • Cash Acme • CB Supplies
- Centrotherm • Chemfax • Conbraco • Dahl • Danfoss
- Desco • Eco-King • EVO • Grundfos • HBX • HeatLink
- Heat Sheet • Hydronic Heating Technologies • IBC
- InsulTarp • Legend • Lochinvar • Maxxon • Navien
- NEXT • NTI • Nudura • Redmond Williams • REHAU
- Rinnai • Roth • Salus • Smith's • Sinus • Spirotherm
- Taco • Tamas • Unico • Transom • Thermo 2000
- Uponor • Utica • Viega • Viessmann • Webstone
- Weil McLain • Wolseley • Wilo • Xylem • Z-Flex

**So don't miss out on 2019!**



**Check [modernhydronicssummit.com](http://modernhydronicssummit.com) for updates**



# Exhibitor List

HIGHLIGHTED COMPANIES ARE ADVERTISERS IN THIS ISSUE.

## A

A. O. SMITH .....	119
A.M.T.S. Limited.....	325
ACO Systems.....	103
ADEY Innovation LLC .....	724
Aimco International.....	455
Allied Engineering Company.....	637
American Society of Plumbing Engineers .....	814
Anvil International Canada .....	204
Aqua-Tech Sales & Marketing Inc.....	736
Armstrong Fluid Technology.....	508
Arndt Motor & Pump .....	828
Arzel Zoning Technology, Inc .....	826
Attersall Marketing Ltd.....	721
Axiom Industries Ltd .....	433

## B

Bay Industrial .....	725
Belanger-UPT .....	252

<b>Bibby-Ste-Croix.....</b>	<b>549</b>
Blanco Canada Inc .....	329
BMI Canada Inc .....	305
<b>Bosch Thermotechnology Corp.....</b>	<b>625</b>
<b>Boshart Industries Inc .....</b>	<b>405</b>
<b>Bradford White Canada Inc.....</b>	<b>536</b>
Brady .....	434

## C

Calefactio .....	315
Caleffi Hydronic Solutions.....	643
Canadian Aqualine.....	552
Canadian Hydronics Council .....	436
Canadian Institute of Plumbing & Heating .....	337
Canadian Water Quality Association..	416
Canature WaterGroup .....	448
Carlo Gavazzi (Canada) Inc .....	355
Cascade Flow Control Solutions.....	432
CB Supplies Limited .....	231
CCTF Corporation .....	804
Centrotherm Eco Systems, LLC .....	730

Chemline Plastics Limited.....	429
Clairitech Innovations.....	615
Component Hardware .....	752
Conbraco/Apollo Valves.....	406
Cool Estate.Com Inc .....	504
Cyclo Vac.....	720

## D,E,F

DAHL VALVE LIMITED .....	334
Deflecto Canada.....	333
DLL Financial Services .....	452
Dobbins Sales Limited .....	248
Eastern Foundry & Fittings Inc.....	335
Emerson .....	157
Emerson Automation Solutions.....	259
Empire Machinery & Tools LTD.....	430
Energcall Sales and Service .....	354
Energy Saving Products Ltd .....	421
Equipco Ltd.....	215
ESAB Group Canada Inc.....	739
Fairview Ltd .....	531



No Matter What Your  
Snow Melt Requirements Are..

**TAMAS HYDRONIC SYSTEMS  
HAS YOU COVERED.**



**CUSTOM, RELIABLE HYDRONIC SYSTEMS**  
Learn more at [www.TamasHydronic.com](http://www.TamasHydronic.com)



# Exhibitor List

Fantech Limited/Kanalflakt Inc..... 629  
 Fernox / Hydronic Agencies Ltd ..... 635  
 Flexcon Industries..... 517  
 Flexmaster Canada Limited..... 714  
 FLIR Systems Ltd ..... 207  
 Fluidmaster Inc..... 652  
 Formadrain Inc ..... 359  
 Franke Kindred Canada Limited..... 225  
 Franklin Electric (Little Giant) ..... 352

## G,H,I

G.F. Thompson Co. Ltd..... 348  
 Gastite ..... 414  
 General Pipe Cleaners ..... 614  
 Gerber Canada ..... 249  
 Giant Factories Inc ..... 336  
 Gripple Canada Inc ..... 202  
 Grundfos ..... 537  
 Hathorn Corporation ..... 255  
 HBX Control Systems Inc..... 532  
 HeatLink Group Inc ..... 525

Hometech Development /Acquaer Pumps ..... 257  
 Honeywell ..... 524  
 HPAC Magazine ..... 800  
 HVAC Xchanger..... 818  
 Hydronic Systems Canada Inc ..... 631  
 IBC Technologies Inc ..... 443  
 Image Inspection Services Ltd..... 254  
 InSinkErator ..... 214  
 Ipex Inc ..... 318  
 IPS - International Power Systems ..... 200

## J,K,L

Jim Pattison Lease..... 806  
 Jobbox Software Inc ..... 456  
 John Guest USA, Inc ..... 107  
 Kleins Enterprises ..... 715  
 Lambro Venting Products Inc..... 306  
 Liberty Pumps Inc ..... 648  
 Lixil Canada Inc ..... 424  
 Lowe Mechanical Sales..... 258  
 LynCar Inc ..... 415

## M,N

M.A. Stewart & Sons Ltd ..... 816  
 Mainline Backflow Products Inc..... 620  
 Marco Industries ..... 400  
 Marking Services Canada ..... 357  
 Masco Canada Ltd ..... 449  
 Mechanical Business Magazine ..... 237  
 Mechanical Contractors Association of Alberta..... 253  
 Mechanical Equipment Sales Co. Ltd. 726  
 Mechanical Systems 2000 Inc..... 643  
 Mifab Manufacturing Inc..... 514  
 Milwaukee Electric Tool ..... 201  
 Mirolin Industries Corp ..... 308  
 Moen..... 409  
 Morris/Lee..... 159  
 Napoleon Heating and Cooling ..... 657  
 Navien Inc ..... 115  
 NCI Canada Inc..... 654  
 Nibco Inc ..... 621  
 Noritz America ..... 535

# SANIFLO®

## CELEBRATING 60 YEARS



**1958**  
FIRST MACERATOR  
IN THE WORLD



**1980's**  
Unveiling of self-contained  
**SANICOMPACT** system



**1988**  
Opening of  
Canadian subsidiary



**1991**  
Launch of first **drain pump**  
system



**1998**  
Opening of  
US subsidiary



**2003**  
Launch of **SANICUBIC**  
entire house system



**2004**  
Launch of **condensate**  
pump range



**2018**  
60<sup>TH</sup>  
ANNIVERSARY



[www.saniflo.ca](http://www.saniflo.ca)

**THANK YOU TO ALL TRADE PROFESSIONALS FOR YOUR LOYALTY AND SUPPORT!**



# Exhibitor List

HIGHLIGHTED COMPANIES ARE ADVERTISERS IN THIS ISSUE.

Northern Alberta Institute of Technology .....	737
NTI (NY Thermal Inc.) .....	503
Nu-Trend Industries Inc.....	208

## O,P,Q,R

Onex Enterprises Inc .....	655
Ontor Limited .....	638
OS & B .....	229
Pentair Canada, Inc.....	418
Plumbing & HVAC .....	149
Primex .....	309
Qualitec Distributors .....	820
Quote Soft.....	353
Ratech Electronics Ltd.....	328
RECTORSEAL .....	515
Reed Manufacturing Company .....	314
REHAU Inc.....	634
Reliance Worldwide Corporation (Canada) Inc.....	220
Rheem Canada Ltd.....	518
Ridgid .....	109
Rinnai America Corporation.....	559
Riobel Inc .....	324
Rosenberg Fans Canada Ltd.....	417
Roth Industries.....	534

## S

Sanbec.....	454
Saniflo Canada .....	317

Selkirk Canada.....	528
Service Roundtable .....	616
ServiceTitan.....	332
Sinus North America Mfg .....	519
Sioux Chief Manufacturing Co .....	330
SJE - Rhombus.....	101
Skills Canada Alberta .....	812
Slant/Fin Ltd/Ltée.....	554
Snap-In Controls Ltd .....	533
Spartan Peripheral Devices.....	321
Spectrum Brands .....	303
Spectrum Sales Agency (1982) Ltd.....	748
SpeedClean.....	555
Sporlan Divison, Parker Hannifin Corporation .....	402
Stanley Black & Decker .....	649
Stelpro.....	209
Stiebel Eltron, Inc.....	633
Stringer Sales.....	516
Stringer Sales.....	517
Sunrise Tradex Corp.....	608
Superior Radiant Products .....	820

## T,U

Taco Comfort Solutions .....	543
Tamas Hydronic Systems .....	435
TAPMASTER INCORPORATED .....	404
Technicraft Product Design Inc.....	256
The Master Group.....	509

Thermal Environmental Comfort Association .....	553
Thermal Hydronics .....	628
Thermo 2000 Inc .....	529
Thermo Manufacturing Inc.....	153
Toto USA Inc.....	216
UEi Canada .....	155
Unified Alloys.....	502
Uponor Ltd.....	437
Vantage Marketing Ltd .....	105
Victaulic Ltd.....	349
Viega LLC .....	548
Viessmann Manufacturing Company Inc.....	143

## W,X,Y,Z

Ward Manufacturing .....	516
Watertiger .....	716
Watts Water Technologies.....	343
Weil-McLain Canada.....	425
West Country Pump and Filtration LTD... 636	
Westcan HVAC Sales Ltd.....	453
Williams Comfort Products .....	235
Wilco Canada Inc .....	624
Winters Instruments.....	233
Woodford & Watco Mfg .....	301
Xylem - Applied Water Systems .....	243
Zoeller Canada .....	517
Zurn Industries Limited.....	358

**www.boshart.com** **1-800-561-3164**

**BOSHART INDUSTRIES**

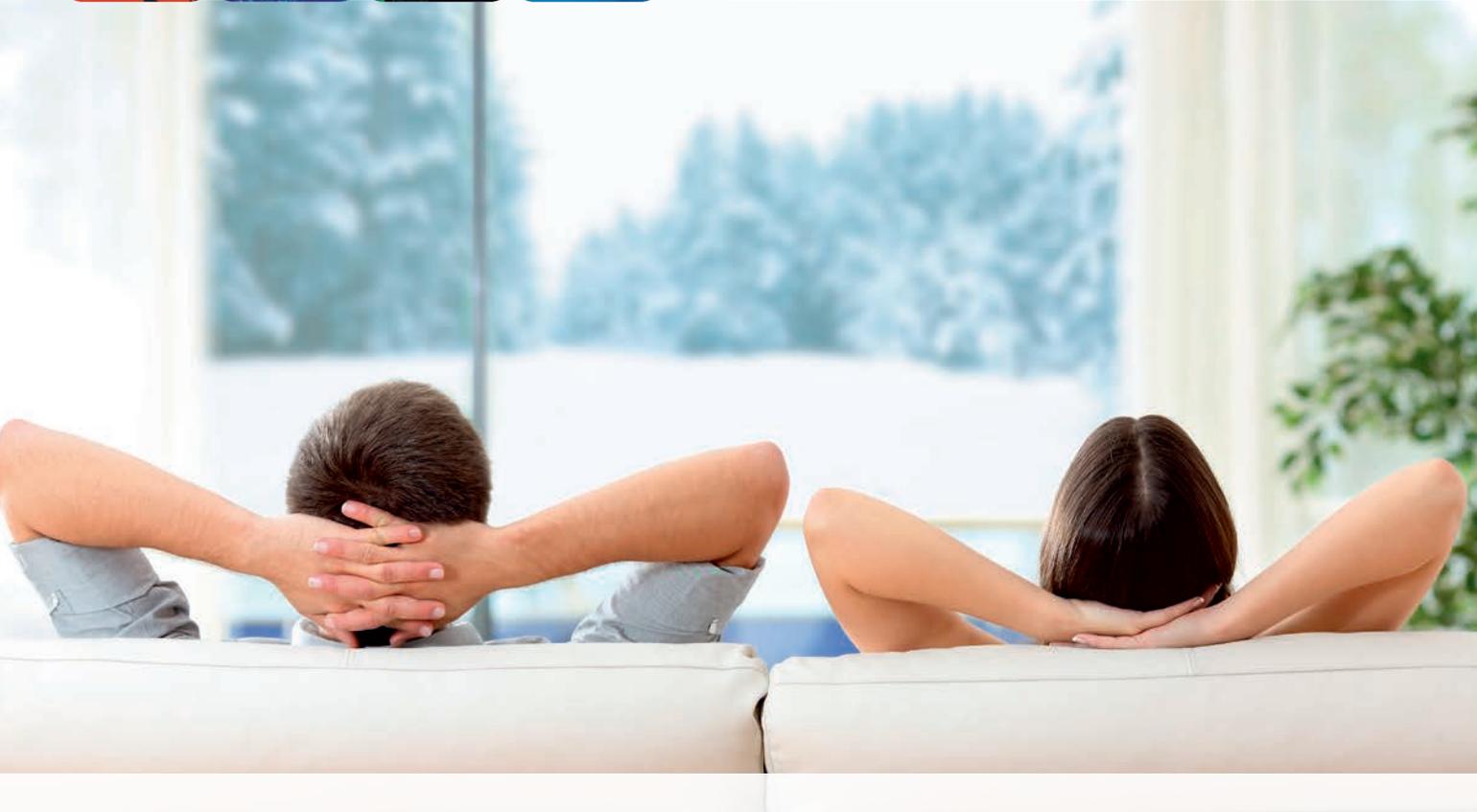


CIPHEX WEST

November 7 & 8, 2018

BMO Centre, Stampede Park, Calgary

**BOOTH**  
**443**



## Comfort made easy

With a 96% AFUE, our SL 10-85 G3 is one of the most efficient boilers in the market.

Our intuitive touchscreen controller makes the boiler easy to set up and monitor, so that Canadians can enjoy their winter worry-free.

Learn more at [ibcboiler.com](http://ibcboiler.com)



*IBC SL 10-85 G3*

**IBC**® Better Boilers

🍁 Proudly Canadian

[ibcboiler.com](http://ibcboiler.com) | 1-844-HEAT-IBC





# Product Showcase



The high-efficiency condensing NFB boiler from Navien is suited to residential and light commercial heating applications. This wall-hung fire-tube boiler comes in two sizes: the NFB-175 and NFB-200. The top and bottom heat exchanger sections

are form-pressed and not welded. The heat exchanger cylinder design allows water to flow all the way to the top of the combustion chamber to eliminate the need to insulate that part of the combustion area. The bottom of the heat exchanger has a non-metallic base.

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



The DC710 flue gas analyzer can operate remotely via Bluetooth using a Smartphone or tablet and the TPI app, which provides on-site reports. Features include a 24-hour real-time clock, magnetic or hook monitoring and a rugged, sealed housing. The device measures CO and temperature differential and calculates CO<sub>2</sub>, CO air free, excess air and combustion efficiency.

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



NCI's commercial valve line includes bronze gate, globe and check valves; cast iron gate, globe, check valves and butterfly valves; and cast iron butterfly valves. The line has CRN numbers for all provinces and territories. Pressure ratings include Class 125, Class 150 and Class 300.

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



Zoeller Company's Shark Series includes, residential, commercial and municipal grinder pumps designed for standard and hazardous duty applications with unidirectional & reversing operation options from ½ HP to 7-½ HP. These pumps feature Zoeller's dual and multi-vane bladed angled cutters which shreds difficult wastewater materials

to a ⅛ in. particle size.

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



Allied Engineering has released new models in its EPJ indirect tank line-up. The 79 and 119 U.S. gallon single coil indirect tanks, along with its 40 and 56 U.S. gallon models, are constructed of 444 stainless steel that has been passivated and pickled. The

casing has been designed using polypropylene plastic for scratch, dent and rust resistance.

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



Aqua-Tech and Lochinvar have introduced the EPIC fire tube boiler and fire tube combi boiler for residential applications. Four boiler models range from 80,000 to 199,999 Btu/hr and three combi models range from 110,000 to 199,999 Btu/hr. In addition to 10:1 turndown and 95 per cent AFUE, the boiler and boiler combi are equipped with Lochinvar's Smart Control and feature an intuitive setup wizard. Control technology with pre-heat and domestic hot water response enables it to deliver hot water almost instantaneously during frequent use cycles.

[www.aquatech-canada.com](http://www.aquatech-canada.com)



The West Country Pump and Filtration reverse osmosis commercial system features a powder-coated steel frame with stainless steel faceplate; multistage pump; stainless steel membrane housing; 20 in. Big Blue-5 micron sediment filter cartridge; permeate flow meter; recycle

meter; low-pressure switch; and more. Available upgrades include an auto flush system, dual probe TDS meter, code-line fiberglass membrane housings and an anti-fouling system.

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



Winters StabilizR dry gauges come with a dampened movement that eliminates pointer flutter caused by vibration and pulsation. This simplifies pressure reading. Gauges can be serviced without the need to drain and then refill the case with fill fluid.

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



ZoomLock flame-free refrigerant fittings from Parker join copper tubing in HVAC/R applications for pressures up to 700 psi (48 bar). Specially designed crimping tools allow technicians to connect the deburred tube ends into the fitting, which has o-rings inside, and press the assembly into place for a leak-free seal. It requires no brazing or adhesives, just the crimping tool and the fitting.

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



# Product Showcase



A. O. Smith TX1 Integrated Tankless on Tank commercial gas water heater offers the on-demand benefit of tankless with dump load benefit of a storage tank. Features include 185F maximum temperature set point for high temperature applications; PermaGlas Ultra Coat liquid slush glass lining; 96 per cent thermal efficiency and ENERGY STAR qualified; and 119 gallon capacity with 199,000 Btu input.

[www.hotwatercanada.ca](http://www.hotwatercanada.ca)



Judo Profimat is an automatic, self-cleaning strainer for domestic water and cooling towers. It removes grit/debris and automatically backflushes itself so that the debris does not build up. The strainer uses very little water to flush, has no consumable parts, and is available in sizes from 3/4 in. to 8 in. pipe. It always provides full flow of filtered water, even during backwash cycle.

[www.watertiger.net](http://www.watertiger.net)



The WARDFlex corrugated stainless steel tubing (CSST) system eliminates multiple service points at turns and connections. It is designed to provide reliable flow from gas meters to appliances, giving professional contractors an alternative to black-steel pipe and other CSST products.

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



Relax-A-Mist steam generators from Leisure Baths Ltd. are offered in four residential sizes from 3,000 to 9,000 watts. Maximum cubic ft. calculated for steam room are 90, 175, 260 and 275 respectively. The steam generators can be installed up to 25 feet away from the steam room. The quick touch timer can be mounted either inside or outside the steam room while the time and temperature control with remote must be installed inside the steam room to read the temperature.

[www.relax-a-mist.com](http://www.relax-a-mist.com)



Brady's BBP30 sign and label printer comes with the Workstation app for pipe marking. This entry-level printer features drop-in consumables with auto setup and no calibration or sensor adjustment. It is compatible with many B30 series tapes and labels for safety and facility labeling applications.

[www.bradycanada.ca](http://www.bradycanada.ca)



The Calbalance hydraulic separator from Calefactio eliminates the need to install automatic air vent and air and dirt separator. It is equipped with a Calvent automatic air vent and is offered with a drain valve. It has a zinc plated steel housing and is provided with a wall bracket. Maximum operating pressure is 150 psi and maximum operating temperature is 100C. Adapted fluids are water and glycol solutions at 50 per cent. Pre-formed insulation is optional.

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



Canature WaterGroup has introduced the Aqua Flo high-efficiency reverse osmosis system. The system is designed to offer a 99.9 per cent recovery rate by collecting purified water in the storage tank and recycling the rinse water back for use throughout the house rather than sending it to the drain. The system also flushes the membrane with pure RO water every time the tank is full to ensure that high total dissolved solids water never creeps through the membrane during low pressure times. After this flush, the controller de-pressurizes the membrane.

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



Franke's Ozo-flo faucet provides an infection control tool to improve hand hygiene and help fight the spread and transmission of bacteria from hospital sink wastes. It employs electrochemical water disinfection to turn water into a safe but effective oxidant. There are no consumables or chemicals added to the water. This faucet is a complimentary product to Franke's Medi-flo basin. When installation costs or space requirements do not allow for the sink to be installed, customers can change the existing faucet to yield many of the same benefits of Medi-flo. The sensor operated hands-free faucet has a 5 litre-per-minute flow rate. A 24VDC plug-in transformer is included.

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



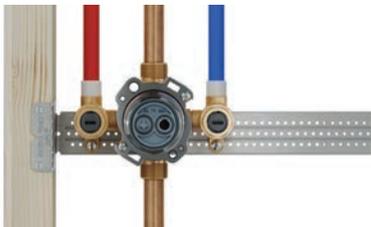
# Product Showcase



Sloan has revamped the Optima commercial faucet line to standardize components, saving time on labour, saving money on replacement parts and speeding up service time. Features include control access below deck and an IR sensor. Choose from brushed nickel, polished brass, polished chrome or brushed stainless finishes. The faucets are available in 4 or 8 in. mounting, centreset or single hole. [www.sloan.com](http://www.sloan.com)



The Sensi wi-fi thermostat from Emerson works with HVAC systems in most facilities, up to 2H/2C for conventional and 4H/2C for heat pump systems. It offers automatic staging for heat pump/gas furnace without the need for outdoor sensor or additional equipment and automatically switches between heating and cooling within the set range. No c-wire is required for most installations. A built-in level simplifies mounting. There is a step-by-step guide in the app to connect to Wi-Fi. Smart alerts notify customer of extreme temperature or humidity levels. [www.emerson.com/sensimanager](http://www.emerson.com/sensimanager)



The Treysta tub and shower rough-in valve body from Gerber accommodates standard, back-to-back and thin wall installations. Intuitive open and close stops allow for easy maintenance. It is fully compatible with Danze by Gerber shower trim kits. It includes rough-in, plaster guard and pressure-test cap, and

has horizontal F1807 inlets and IPS/sweat outlets. Features include intuitive quarter-turn service stops and a forged valve body. It is designed for use with all "TC" series tub/shower trim kits without a diverter on the valve. [www.gerberonline.com](http://www.gerberonline.com)



SpeedClean, has released a Dry Steam Coil & Surface Cleaner, which uses the power of high temperature steam to clean coils and other surfaces. The compact and lightweight design allows technicians to transport the cleaner to every job site. The 265-degree steam combined with 65 PSI pressure penetrates deep into coils, cracks and crevices. It is suited to industry applications ranging from air handlers, mini-splits, condensers and exhaust vents to commercial kitchen ducts, freezer seals, classrooms, labs and more. It weighs 16.5 lbs. and is 13 in. x 13 in. x 19 in. (H x W x D). [www.speedclean.com](http://www.speedclean.com)



Victaulic has launched QuickVi SD Installation-Ready system, a plain end pipe joining technology designed for use on carbon steel commercial and industrial HVAC systems sized 2 in./DN50 and down. The couplings and fittings are installed with common hand tools and feature no loose parts. In a maintenance or retrofit situation, the joints can be disassembled and reinstalled. The gasket is designed not to seal until the coupling or fitting is mechanically secured on the pipe during initial installation. The products can be used on Schedules 10 through 80 carbon steel pipe, with a maximum working pressure of 300 psi/2068 kPa/21 bar and up to 250F/120C (with the EPDM gasket). [www.quickvicds.com](http://www.quickvicds.com)



Unified Alloys offers seamless and welded stainless steel pressure pipe, fittings and flanges. Piping products include stainless steel 304/L, 304/H, 316/L, 316/H, 317/L, 321/H, 347/H, 310, 410; Duplex 2205, Super Duplex 2507, Alloy 254 (6 Moly); Nickel Alloys 20, 200, 400, 600, 625, 800, 825, C276; and Chrome Moly P5, P9, P11, P22, P91. [www.unifiedalloys.com](http://www.unifiedalloys.com)



The Vitotrans 300 is designed for commercial applications requiring high volumes of DHW. Its module works in conjunction with a heating boiler and employs a plate heat exchanger to heat the required water. Used as an extension to any hot water heating system, the on-demand design of the Vitotrans 300 provides a consistent flow rate for systems with varying load requirements. It accurately provides five to 180 gpm of DHW when combined with a DHW buffer tank. [www.viessmann.ca](http://www.viessmann.ca)



Mainline Backflow Products bladder seals work in conjunction with shallow burial backwater valves to provide contractors and homeowners with easier and cleaner access to the valve. The seals also integrate with vapour barrier systems to protect against radon gas. Other benefits include sealing against groundwater flooding and sealing against bug/insects. [www.backwatervalve.com](http://www.backwatervalve.com)

**Liberty Pumps®**

A Family and Employee Owned Company

# StormCell®

## Battery Back-Up Pumps



**UP TO**  
**16 Days\***

### Professional-grade protection.

The new StormCell® series of battery backup pumps from Liberty feature advanced professional-grade chargers, energy efficient pumps for longer run times, and optional NightEye® wireless technology for remote monitoring through your smart device.

- Available in both standard and wireless connected models
- Professional-grade chargers (10 amp and high-output 25 amp)
- Single and dual battery systems
- Energy efficient DC pump (manufactured in the U.S. by Liberty)

\* Model 442-25A, StormCell® Group 31 wet cell batteries. Pump cycling 10 gallons at 10' lift - 4 times per hour.



**NEW! StormCell®**  
*High Performance Batteries*  
Now Available from Liberty Pumps



[libertypumps.com/stormcell](http://libertypumps.com/stormcell)  
**800.543.2550**

**NightEye®**  
Wireless Enabled  
Models Available

Apple® iOS & Android® compatible  
FREE App!



# Product Showcase



The ECO-0550 geothermal heat pump and backup boiler control from HBX Control Systems is designed to operate equipment in a 2- or 4-pipe, single or dual tank hydronic heating and cooling system. The control can accommodate heat pumps, a backup boiler and reversing valve for complete system coverage and extensive flexibility. It allows for outdoor reset or will maintain a set tank temperature. A built in Wi-Fi communication protocol allows users to remotely monitor/adjust parameters and to receive alarm notifications using the HBX mobile app. A setting called EcoSwitch saves on energy consumption. [www.hbxcontrols.com](http://www.hbxcontrols.com)



Uponor offers the ASTM F1960 PEX expansion adapters to copper press, allowing faster transitions from copper to PEX. Available in lead-free (LF) brass for potable plumbing applications, these adapters are suited to PEX expansion systems in sizes from 1/2 in. to 3 in. [www.uponor.ca](http://www.uponor.ca)



Triple-Thread Talon PTFE pipe thread compound is a triple lubricating, all-purpose, non-seizing, VOC free, industrial grade thread sealing compound for all types of metal and plastic threaded connections. The compound

contains graphite, ceramic microspheres, and virgin PTFE for optimal sealing. An anti-galling compound enables disassembly after years of service. It is non-toxic and non-combustible. [www.lyncar.com](http://www.lyncar.com)



Reed's portable pipe beveler with cordless power deburrs and bevels plastic pipe 2-in. and larger diameter. The lightweight tool may be used on most PVC glued joints and some sizes of bell and gasket joints. Adjustable for bevel length, the RBIT1 router bit evenly cuts a 15° external bevel up to 3/8-in. long. The RBIT2 router bit creates 12° bevels up to 1-in. long. To eliminate damage to the gasket, a pipe bevel is required when installing into a pipe bell. [www.reedmfgco.com](http://www.reedmfgco.com)



Coleman's central HC20 heat pump and AC20 air conditioner Echelon Series are offered in 2 to 5 tons with up to 20 SEER. The heat pump performs to -21C. Charge View built-in touch screen displays the system overall condition, including the system pressures and refrigerant charge without the need to attach additional gauges or sensors. Features include a sound reduction system; high efficiency inverter scroll compressor; and a factory installed, solid core liquid line filter-drier. Complete online technical training sessions are available. [www.colemanac.com](http://www.colemanac.com)



The Bock OptiTherm modulating condensing ultra low NOx commercial gas water heater is available with maximum inputs from 125,000 to 500,000 Btu/hr. A Modulating Blue Flame Submerged Burner optimizes

thermal efficiency. An automatic ICCP corrosion protection system eliminates the need for sacrificial anodes. It is available in 99, 100 gallon or 125 gallon capacities and operates on natural gas or propane. Maximum power vent length is 240 ft. in PVC, CPVC or ABS venting. The tank fits through a 36 in. door. [www.bockwaterheaters.com](http://www.bockwaterheaters.com)



Five models (500-, 750-, 1000-, 1300- and 1500-gallon) are offered in Mifab's SuperMax range of H.D.P.E. gravity grease and oil interceptors. They have each passed the ASME A112.14.3, ANSI Z1001 and CSA B481 Standards. The 500-gallon model has also passed the PDI G-101 Standard, 100 GPM flow rate. Models are all listed with I.A.P.M.O. Key features are: a ribbed body design for structural strength to withstand earth load forces when buried; generic 24 in. diameter corrugated pipe for extensions; and corrosion resistant H.D.P.E. material. [www.mifab.com](http://www.mifab.com)



Moen Commercial's modifications to its M•Power below-deck sensor-operated lavatory faucets include an improved AA alkaline battery life and improved programming selections. A field-enabled sentinel flow option eliminates stagnant water in the supply lines every 24 hours after the last use; the metering flow time can be adjusted to fit any market—from a minimum of 10 seconds, for an educational environment—up to a maximum of three minutes for healthcare environments. A no-spout model, when paired with a laminar flow spout, can add increased sanitary protection. Platforms include single-mount, 3-in. centreset and gooseneck. [www.moen.ca](http://www.moen.ca)

# Gen-Eye USB<sup>®</sup>

## Pipe Inspection System



## Inspection Results in a Flash!

General's new Gen-Eye USB<sup>®</sup> Series includes a USB port to record inspections on a flash drive. The Command Module packs the features of the Gen-Eye SD Series into a compact package, including up to 128 GB of USB recording capability, a 10.4" LCD color screen for crisp, clear images and a waterproof keyboard for on-screen titling in wet environments – in a heavy-duty Pelican case to protect your investment.

Interested in adding Wi-Fi to your inspection system? The Gen-Eye USB-W with Wi-Fi transmitter inside the Command Module lets you send video or photos to your smartphone or tablet.



Or upgrade to the Gen-Eye USB-P Premium inspection system with a sunlight readable screen to make it easier to see the monitor outdoors in bright sunlight, a rechargeable battery for remote jobs that lasts up to 4 hours, and Wi-Fi transmitter.

All units include on-screen distance counter, voice-over recording, date and time stamp, LED dimmer control and camera test port.

For more information, call the Drain Brains<sup>®</sup> at 800-245-6200, or visit [www.drainbrain.com/geneye](http://www.drainbrain.com/geneye)



**For a distributor  
in your area**

**Atlantic Canada**  
Rafales Agency, 514-905-5684

**British Columbia**  
West-Am, 877-600-0210

**Calgary**  
Hydro Smart Systems, 403-287-7933

**Edmonton**  
Tom Donaldson Co., 780-486-2288

**Manitoba**  
Tom Beggs Agency, 204-953-190

**Ontario**  
Newgen Sales, 905-895-5999

**Quebec**  
Rafales Agency, 514-905-5684

**Saskatchewan**  
Asta Sales, 306-933-4125

**General**  
PIPE CLEANERS

**The toughest tools down the line.™**



© General Wire Spring 2018



# Product Showcase



The Check-Flo normally open backwater valve from RectorSeal has a large, clear access cap and a clear lid. A stainless steel flapper hinge ensures the flapper rotates freely and a repelling magnetic levitation system is designed to prevent the flapper from sticking. It is certified to CSA B181.1-2015 and ASME A112.14.1-2003 (R2008).

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



The Tribeca tub shower from Mirolin has generous shelving, armrests and a sloped lumbar support. A built-in minimalist grab bar is in a coordinated colour. The tub shower is available in left/right configuration and has an above floor rough-in. It measures 60 in. x 32 in. x 88 in.

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



Ratech Electronics has introduced 5/16-in. diameter micro camera. It is tiny enough to inspect kitchen sinks and toilet p-traps. Made for 1 in. to 4 in. pipe inspections, it manoeuvres around bends and turns smoothly. It is adaptable to any Ratech pipe inspection camera system. The camera has four LED lights for a superior colour picture.

[www.ratech-electronics.com](http://www.ratech-electronics.com)



The ADEY MagnaClean DRX magnetic dirt filter provides a cost-effective and compact solution for removing debris and black iron oxide sludge from commercial hydronic heating systems. Its design allows it to be installed in-line or side-stream and in either a vertical or horizontal orientation. The filter consists of an external magnetic belt with dozens of neodymium magnets, wrapped around a precision-engineered, stainless-steel canister. It is available in 2-in. (with 48 magnets), 3-in. (64) and 4-in. (80) pipe dimensions.

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



Dual-Tech condensing combination boilers provide high efficiency central heating and meet a larger demand for domestic hot water. Features include on-board indirect fired storage tank, combi-tech coaxial heat exchanger

design with an integrated indirect fired storage format, dual-coil stainless steel heat exchanger and 10-1 modulation. It is Wifi ready and is designed to offer continuous one-hour flow rates ranging from 221 to 267 GPM.

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



Toto has added the Aquia IV One- and two-piece ultra high-efficiency dual-flush toilets with its DynaMax Tornado Flush Technology and rimless bowl design. These one- and two-piece toilets enable users to select the level of water used each time the toilet is flushed: 1.0 gpf for solid waste or 0.8 gpf for liquid. TOTO's seeks always is to optimize water conservation, while setting a high bar in quiet world-class flushing

performance. The flush technology cleans the entire bowl and rim with 360-degrees of cyclonic rinsing action. The smooth CeFiONtect nano-technology glaze prevents particulate matter from adhering to the bowl's surfaces.

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



Rheem's Professional Prestige hybrid electric water heater has a 3.50 EF. It delivers hot water at a rate of 67 US gallons first-hour delivery for 50-US gallon model, 75 gallons FHD for 65-US gallon model and 89 gallons FHD for 80-US gallon model. The water heater has an ambient operating range of 37F to 145F and is designed to meet the Northern

Climate Spec (Tier 3). Features include an LCD Screen with built-in water sensor alert with audible alarm and integrated EcoNet wifi-connected technology.

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



Spirotherm has added press connections to its entire brass product line, sizes 3/4 in. through 2 in. The Spirovent air eliminator and combination air/dirt eliminator, use the patented Spirotube

coalescing medium to eliminate the free air, the entrained air and most of the dissolved air from the system. The Spirovent Quad combines the advantages of the Spirovent Air/Dirt Eliminator with the functionality of a hydraulic separator.

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



Turbomax instantaneous indirect domestic water heater features Thermo 2000's patented technology to produce instantaneous hot water at a high efficiency rate and to help reduce the accumulation of scale deposits that diminish the efficiency of traditional water heaters.

[www.thermo2000.com](http://www.thermo2000.com)

# Master

## NOW SERVING WESTERN CANADA

MASTER IS NOW EXPANDING WESTWARD  
WITH A SERIES OF OPENINGS TO COME IN 2018 AND 2019  
IN ALL FOUR WESTERN CANADA PROVINCES

**NOW  
OPEN**

2065 LOGAN AVENUE, UNIT 7, WINNIPEG

602 48<sup>TH</sup> STREET EAST, SASKATOON (DAVIES SUPPLY)

2 - 1710 36<sup>TH</sup> STREET N, LETHBRIDGE (DAVIES SUPPLY)

6 - 2320 35<sup>TH</sup> AVENUE NE, CALGARY (DAVIES SUPPLY)

- + ALL CONVENIENTLY LOCATED
- + EXPERIENCED AND KNOWLEDGEABLE STAFF
- + LARGE INVENTORY FEATURING RENOWNED BRANDS

MORE  
TO COME

CALGARY  
LETHBRIDGE

SASKATOON

WINNIPEG

**Davies**

DAVIES SUPPLY GROUP IS NOW PART OF  
THE MASTER FAMILY WITH 3 BRANCHES  
IN CALGARY, LETHBRIDGE AND SASKATOON.

**Master**  
AIR CONDITIONING | REFRIGERATION  
VENTILATION | HEATING

CANADA'S BEST  
MANAGED  
COMPANIES  
Platinum member

Proudly CANADIAN  
65  
YEARS IN BUSINESS

MASTER IN COMFORT.  
EXPERT IN TOP BRANDS.  
VISIT US AT MASTER.CA.



# Product Showcase



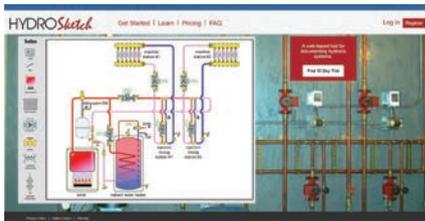
Superior Radiant Products has introduced the SRP Stealth, a condensing system classified as a Category IV radiant tube heater. The patent-pending design of this positive vented infrared heater utilizes a microchannel flue gas heat exchanger along with a single canopy over SRP's twin 100 per cent parabolic reflectors to achieve thermal efficiencies up to 93 per cent. The model THE14N heater provides optimal comfort with SRP's two-stage technology allowing quick recovery on the high fire 135,000 Btu/hr and economical steady operation on the low fire 85,000 Btu/hr.

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



The MegaPress press-in branch connector from Viega is a way to create branches from main runs or to install instrumentation onto existing piping. It installs onto 1 1/2 in. through 4 in. and 6 in. ASTM Schedule 10 or Schedule 40 carbon steel pipe and has a 3/4 in. FPT outlet. The connector can be installed on partially drained systems and is approved for use in hydronic heating, cooling water applications, compressed gases and other due to a variety of sealing elements.

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



HydroSketch is a cloud-based software tool from Appropriate Designs, in collaboration with Capraro Technologies, Inc. It is designed for those who have had little if any previous experience with computer drawing software. HydroSketch comes preloaded with symbol libraries (based on the textbook "Modern Hydronic Heating" 3rd Edition, by J. Siegenthaler) for both piping and electrical components. Users may also create their own custom component symbols. The software comes with basic system templates that can serve as starting points for further system layouts.

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



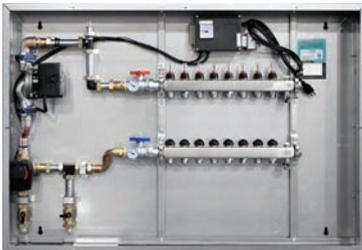
ServiceTitan is a mobile, cloud-based software platform designed to help home services companies streamline operations, improve customer service, and grow their business. This end-to-end solution includes CRM, intelligent dispatch, custom reporting, marketing automation, mobile solution for field techs, and accounting integration with Intacct and QuickBooks.

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



The Taco LeakBreaker protects against flood damage from water heater leaks. It consists of a control unit and a valve with actuator and sensor. This resettable, testable device can be installed on any style water heater to shut-off the incoming water supply, preventing additional water flow to a damaged water heater. The multi-color LED light and audible alarm lets you know the status of LeakBreaker. It is available with and without eLink capability. eLink uses Wi-Fi to communicate with the cloud, enabling status alerts to be sent directly to the users.

[www.taco-hvac.com](http://www.taco-hvac.com)



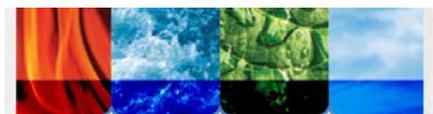
Tamas Hydronic's three-way mixing manifold panel is offered with a mixing control and actuators, and features a plug and play design for simplified installation. The panel features a compact design and customization options from various mixing devices, pump sizes, loop actuators and manifolds. The panels are also available in various enclosure materials, sizes and with snowmelt control.

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



Water Hero is a Wi-Fi-based water monitoring and shutoff system analyzes minute-by-minute water consumption data collected from the water meter and sends real time alerts to the homeowner's cell phone notifying them of water leaks. The water can be shut off remotely from a cell phone or if there is no response, the system will shut off the flow at a predetermined time. The system also provides temperature monitoring, which can be set up to send alerts for low or high temperature situations.

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



**STOP BY AND SEE HPAC  
AT BOOTH 800**

GERBER®

# WORK SMARTER, NOT HARDER.

## Introducing the New Treysta™ Valve by Gerber.

Engineered with the experts in mind, the Treysta™ tub and shower valve is Gerber's most innovative valve yet. Powered by more than 85 years of Gerber performance, Treysta provides flexibility based on the specific requirements of each installation. From the intuitive service stops to the innovative test cap and plaster guard, Treysta lets you get the job done quickly and confidently.

Learn more about how you can save time and money on your next installation at [gerberonline.ca](http://gerberonline.ca)

Compatible with tub and shower trim kits from:

**danze**  
by GERBER





# A BREATH OF FRESH AIR

In loo of full renovations, small fixes make waves.

BY JILLIAN MORGAN

**M**ore than a fresh coat of paint, small-scale renovations have the potential to transform a bathroom or powder room—making a costly and daunting overhaul unnecessary.

Opting for these simpler fixes, nearly half of Canadians plan to undertake a home renovation before the year is out, with the bathroom coming in third for the country's top planned projects, according to the annual CIBC Home Renovations Poll.

"Canadians continue to see the value of investing in their homes, but they're taking a very practical approach by focusing on lower-cost projects this year," said Edward Penner, executive vice-president of CIBC Personal and Small Business Banking.

On average, Canadians plan to spend roughly \$11,000 this year on renovations—down from \$11,800 in 2017—with Ontarians spending the

most and Albertans the least. The poll also found that the vast majority of homeowners 55 and older plan to renovate as opposed to sell. Even more, almost half of those homeowners prefer to hire a contractor than do the work themselves.

"People want their bathrooms to be their personal spas, where they can de-stress and relax after a long day of work," said Kenana Al Yakobi, Pfister Canada channel manager for Spectrum Brands Inc. "With our living spaces becoming smaller, that space needs to be used efficiently but still provide that luxurious look and feel."

A mix of contemporary and traditional design, modern finishes and technology advancements with a focus on customization and comfort offer an opportunity to leverage these small changes for a big impact.

## FIXTURES

"From a plumbing point of view, updating just the lavatory faucets on the sink can give the room a breathe] of fresh air," Al Yakobi said. "Changing the finish... and keeping core furniture and til-



The hansgrohe Metropol collection is available in chrome and brushed nickel. The collection offers multiple faucet heights and handle options, intended for customization and configuration in small spaces.



Crosswater London's Waldorf freestanding bathtub, part of a collection that includes faucets, shower valves, tub sets, showerheads, a back-to-wall bathtub, basins, a toilet and accessories.



Inspired by Japanese hot springs, the Aqua Moment bath from DXV, features a curtain-flow waterfall and LED lighting in the spout. It offers drop-in installation, an inline heated air blower and a variable speed pump.



The Neorest flotation tub from Toto includes a zero gravity bathtub, featuring zero dimension technology that mimics the position of astronauts sleeping in zero gravity. Massage jets are located along the body, and LED lighting along its base.

The Dorrance faucet from Newport Brass is offered with lever or cross handles and offers a flow rate of 1.2 gallons per minute. Available in 27 finishes, the collection includes tub fillers, shower and bidet sets, as well as a wall mounted faucet variation.



ing the same can materially change the look, feel and style of a bathroom.”

Sleek fixtures that opt for geometrical and rectangular lines—such as those seen in the Metropol collection by Hansgrohe, a Masco brand, and Crosswater London’s Waldorf collection—are a growing trend, along with single-handle faucets.

“A single handle lavatory faucet provides quick and easy temperature control and, with the right product, can become the focal point in a bathroom desperate for a design pick-me-up,” said Maria Bosco, director of product marketing at LIXIL Canada Inc.

Pairing upgraded lavatory hardware with accessories of different shapes and sizes can brighten a space and take the small-scale upgrades one step further, according to Brad Campeau, business development manager at Masco Canada.

“We’re also seeing designers and homeowners incorporate mixed metal finishes to add a level of sophistication and warmth to their spaces,” Campeau said. “These trends nod to contemporary design techniques often seen in European spaces.”

Inline with a focus on the lavatory, powder rooms are a growing area of concentration, Al Yakobi said, since these rooms can be more easily—and cost-effectively—refreshed.

Moen’s M-Pact common valve system is one product that aims to simplify these small-scale renovations. The system allows plumbers to upgrade the trim’s style or swap out fixtures without replacing the valves.

“The faucet is also the most used item in the bathroom, so the look of the fixture can essentially set the tone for the entire space,” said Garry Scott, vice president of marketing and e-commerce at

Continued on p60



Kohler’s HydroRail-R arch shower column kit features the Moxie rain head, Flipside hand shower and a metal hose. It has a portable, wireless speaker that pairs wirelessly with Bluetooth-enabled devices. Flipside offers multifunction spray head pivots on its axis to switch between four spray types. It has an 8-in. sprayface with 80 nozzles and operates at 2 gallons per minute.

## < BATHROOM SHOWCASE



The Studio S collection of bathroom faucets and accessories in matte black from American Standard.



Pictured, Moen's Align faucet features a single-hole mount and aerated flow. It offers  $\frac{3}{8}$ -in. compression fittings and maximum flow rate of 1.2 gallons per minute.



The Deckard collection from Pfister is available in polished chrome, brushed nickel or matte black.

Moen Canada. Though, the bath and shower are not taking a back seat.

"Upgrade the showerhead or shower system with a product that performs well and allows the user to benefit from multiple shower patterns," Bosco recommends. "A rain pattern provides a luxurious shower experience, while a massage spray will invigorate the entire body, and a concentrated spray will wash out the shampoo or clean the shower stall with ease."

Kohler's HydroRail-R arch shower column kit is one product that offers this technology, along with American Standard's Spectra+ Touch or eTouch showerheads, which allow the user to

change spray patterns by touching the showerhead or using a remote.

### COLOUR

"Black is becoming the second hottest finish to chrome, due to its neutral statement yet impactful change," Al Yakobi said. "The other colour gaining momentum in upper scale renovations is brushed gold. Elegance with a refined sense of pop that the long standing second most popular brushed nickel finish does not offer due to its muted feel."

She added that brushed gold fixtures add dimension and depth to muted and cooler paint colours common in modern spaces, while matte black fix-

tures contrast the colourful tile designs currently on-trend.

"Moen's brushed gold finish was developed to work well with a multitude of lighting and hardware finishes commonly found throughout the bath, including a range of different golds, ensuring the brushed gold fixtures harmonize with the rest of the home's décor," Scott said.

"Consumers are becoming more adventurous in regards to experimenting with colour, especially gold," he added. "In the past, gold fixtures have been associated with traditional design, but now, the finish is also being incorporated into homes with a modern aesthetic, for a fresh take on a classic finish." <>



The Neorest NX 2 intelligent toilet with Actilight, and NX 1 with eWater+, feature an integrated personal cleansing system with aerated water, a warm air dryer and heated seat, as well as auto open/close and auto flush and in-bowl catalytic deodorizer.



Pressure-assisted toilets from Sloan feature Flushmate technology, designed to reduce backups or clogs. They offer flush volumes at 1 gallon per flush (gpf), 1.28 gpf, and 1.6 gpf in standard and ADA-compliant models. They have a three-point tank mounting system and an insulated tank.



The An Oasis at Home: Bathroom Inspirations brochure from Geberit North America features 28 pages of bathrooms in different styles using the company's in-wall installation systems and bath waste and overflows, as well as technical information, including dimensions for the in-wall systems and flush actuator plates.

Noble is proud to be celebrating **25 years** in business  
as Ontario's leading wholesale supplier.



Thanks to our valued customers, team members and vendor partners  
for working with us to build the landscape for the past 25 years.

PLUMBING  
HVAC  
HYDRONICS  
INDUSTRIAL  
FIRE PROTECTION



noble.ca | 1-800-529-9805

Follow Noble Corporation  

# TEAM BUILDING ON A WHOLE NEW SCALE

Work on a sustainable volunteer development project proved to be life changing. **BY STEVE GOLDIE**

Considering how much time the average person spends at work, it helps when you are part of an organization that looks beyond the bottom line and outside the confines of its real estate and holdings. This requires a people centric management strategy, which strives not simply to be a successful business enterprise, but also seeks to be integral to customers, each and every employee, and the communities we live, work and play in, both locally and globally.

I experienced this first hand earlier this year when I, along with a group of co-workers, travelled to Ecuador on a trip with the Me to We organization—an opportunity facilitated by our employer.

Me to We is an innovative social enterprise, part of a family of organizations with the lofty goal of making the world a better place, and inspiring as many of us as possible to be more community minded, to make us think less about the individual “me” and more about the collective “we.”

One of the ways in which they seek to accomplish this is through offering individuals, families, or groups the opportunity to travel and work on a sustainable volunteer development project. Our group travelled on one such trip to Ecuador, which is one of three locations where Me to We has partnered with communities and operates these types of trips. The trips are available to individuals, families, organizations and businesses, with the vast majority of those participating being student groups.

Our group of 15 consisted of 12 employees, our company’s principal owner, his son and his son’s friend. We were a diverse group, ranging in age from 13 to 57 and included both inside and outside sales people, warehouse employees, a driver, three people from a somehow over represented quotations department, three teenagers, one grandfather, several middle-aged men and one brave young woman, an underrepresented gender in the group.

Some of us had known one another for many years, while others were barely more than strangers. None of us quite knew what we were in for and all of us were excited for the adventure that lay ahead, unanimous in our desire to work hard at whatever we would be asked to do.

So, off we flew to the second highest capital city in the world, Quito. Our ultimate destination would be the Me to We



Steve Goldie (r) in Ecuador as part of Me to We development project.

village located on the Napo river, the largest tributary river to the Amazon. First however, we would be spending three days travelling to various regions of Ecuador in a comfortable tour bus with our guide Rocco educating us about the history, geography, peoples and culture of this incredibly beautiful and diverse country.

Ecuador is in fact the most biodiverse country in the world by square footage. There are mountains and the highest concentration of active volcanoes in the world, as well as vast jungles and river basins, coastal regions and the Galapagos Islands.

Together we travelled hundreds of miles of winding moun-



Participants ranged in age from 13 to 57. The Me to We sustainable volunteer development projects are open to individuals, families or groups.

tain roads, we went rock climbing together and we filled three white water rafts and rode the rapids together. We pushed ourselves, some beyond their previous comfort zones, flying down into a vast river canyon on zip lines, only to find out upon arrival that the only way out was to scale the sheer rock face hundreds of feet back up.

We repelled together down beautiful mountain waterfalls, and we dined together sampling delicious local cuisine. Our diverse group started to become a team as new friendships formed and existing ones deepened.

After three days filled with a lifetime's worth of adventure, it was time for phase two of our great adventure. We boarded the tour bus once again and Pedro expertly negotiated the narrow twisting mountain roads. The roads in Ecuador may well have been the most precarious adventure of all—we were grateful for Pedro's skill.

Several hours later we arrived at the Napo River where we boarded a long motorized canoe, the standard mode of transit in this region, and travelled about 20 minutes down the river to the Me to We village, Minga Lodge. Minga is an ancestral word from the Quechua language of the Incas, the indigenous people of this part of South America. It refers to a concept of community cooperative efforts.

A minga is an initiative whereby friends, neighbours and community members come together to build or achieve something that will benefit the community as a whole. It is an apt and obviously intentional name for the Me to We village, which exists to bring people together from all over the world with the objective to improve the lives of the people in the many villages in and around them.

Me to We has a multi-faceted approach to the work they do in all the countries they work in, a five-pillar approach as they call it. These five pillars are education, water, health, food and opportunity and are designed to combat and the five pri-

mary causes of doing this work.

Minga Lodge is one of nine We Villages that Me to We operates globally, and one of three where it operates the volunteer tourism programs such as the one we participated in. The organization seeks to work collaboratively with the local people and communities to develop the five pillars.

The education goes both ways, as visiting individuals and groups do not simply parachute in, do some good work, then fly home feeling good about themselves. The goal is to get immersed in the local life and culture and to become more aware and educated by working together on whatever local improvement projects are going on at that moment. In the end, participants are energized and inspired to take the minga philosophy back home.

Me to We has been active in this region since 2012 and so far it has built many schoolhouses and health clinics. Most significantly, it has provided a safe drinking water system, something local politicians had been unable to do for decades.

The region is made up of numerous villages, many of which had projects in progress. In our case, we worked everyday in the village of Bellavista—a short motorized canoe ride up the river. We helped build a communal kitchen for the village school, as well as washrooms for individual homes in the village.

The first day we had breakfast as scheduled at 8 a.m. at the Minga Lodge before travelling to Bellavista for a 9 a.m. start. Some of us dug eight foot square and five feet deep holes for the bathrooms. Others cut and bent rebar for the concrete foundations of the communal kitchen.

Unlike building sites in North America materials such as sand and stone for concrete are not ordered and delivered by dumptruck in Bellavista. They are dug, loaded in sacks and transported by canoe and wheelbarrow. It was physically demanding and exhausting work, especially in the hot humid

Continued on p64

weather of the Amazon rainforest.

Without exception, our group worked diligently and with no complaints. After day one, we voted unanimously to have breakfast one hour earlier each subsequent day in order to get to the village earlier to work longer and harder. The local children became more and more comfortable and welcoming, excitedly shouting "ola!" from all corners of the village, and happily hitching rides in the wheelbarrows we pushed back and forth.

I was very proud to be a part of such a dedicated team that worked through heat exhaustion, vomiting, diarrhea and the like, and greatly exceeded the expectations of the Me to We team members.

We worked each day until noon, returning to the Minga Lodge for welcome showers and lunch and each afternoon we had different cultural experiences.

We met with local farmers and heard

their stories. One told us of how he had fought for years to get clean water as he had lost his 13-year-old daughter in 1997 as a result of unsafe drinking water. One day we met with a local Shaman who explained local customs and beliefs and we got to try our hands at using the traditional hunting spears and blow dart guns. We also met with the women's group who worked to make bracelets sold in Me to We stores, part of the opportunity pillar, which is specifically targeted to give economic opportunities to women.

Sadly, I do not have space or the right words to fully tell the story of our great adventure, grub eating, chocolate making and tasting, and on and on I could go. I do know that we went out as a group of people who worked for the same company, and we came home as a close knit family, forever changed

by what we observed, endured, learned and accomplished together.

I am grateful for each and every member of our team, enriched by the guides and local people we met, and very thankful to be working for someone with the vision and generosity to make such a trip possible. If you ever have an opportunity to participate in your own minga do not hesitate to jump right in—you will not regret it. <=>



Steve Goldie learned his trade from his father while working as plumber in the family business. After 21 years in the field, he joined the wholesale side of the business in 2002. His expertise is frequently called on to troubleshoot systems and advise contractors. He can be reached at [sgoldie@nextsupply.ca](mailto:sgoldie@nextsupply.ca).

## PRESSURE BOOSTING SYSTEM SIMPLIFIES INSTALLATION

The Franklin Electric Inline 1100 SpecPAK™ Pressure Boosting System connects easily to nearly any commercial, industrial, or multi-residential plumbing configuration to provide an easy-to-size water pressure boosting solution. Contractors simply determine how much water is required to be boosted to the desired constant pressure output, and the system comes properly packaged. The pump itself, the Inline 1100, is a quiet, all-in-one constant water pressure system that contains the pump, motor, and drive in a compact package.

Franklin Electric/Little Giant  
[www.littlegiant.com](http://www.littlegiant.com)



Franklin Electric





# ONE:

- > Integrated Software Suite
- > Trusted Set of Data
- > Easy Way to Access Technology
- > Partner for the Future

# VIEWPOINT

ViewpointOne brings together the industry's best finance and HR applications with fully integrated project management and mobile field tools to connect all the parts of your business.

[VIEWPOINT.com/ViewpointOne](http://VIEWPOINT.com/ViewpointOne)



© 2018 Viewpoint, Inc. All rights reserved.

# MECHANICAL SUPPLY NEWS

MANUFACTURERS • DISTRIBUTORS • WHOLESALERS

## VISSMANN CHARITY MOTORCYCLE TOUR RAISES \$25K FOR NON-PROFIT AIR AMBULANCE ORGANIZATION

Viessmann Canada's first annual 2018 Ride for Comfort charity motorcycle ride raised over \$25,000 in support of STARS air ambulance of Calgary, AB.

STARS—the Shock Trauma Air Rescue Society—is a non-profit helicopter air ambulance that provides emergency medical transport for the critically ill and injured.



The beginning of Viessmann Canada's 2018 Ride for Comfort charity motorcycle ride, attended by industry friends, at the STARS air ambulance hangar.

The motorcycle tour included 17 riders. It departed Calgary on July 19, 2018, making a stop in Banff, AB and at several locations throughout British Columbia.

Special stops included a visit to Fink Machine in Enderby, BC for a tour of a Viessmann wood biomass district energy system, as well as Burrowing Owl Winery in the Okanagan Valley, BC, which features the company's solar thermal collectors.

[www.viessmann.ca](http://www.viessmann.ca)

## FORMER TACO CEO BACK AT THE HELM AFTER VANDEWIEL MOVES ON

John White, Jr., Taco Comfort Solutions CEO, will resume his role at the company following the departure of Wil Vandewiel. Vandewiel took over as CEO in January 2017 with the mandate to expand Taco's presence in Europe.

"With Taco well on its way to meeting those goals, Wil has decided that he would like to pursue other opportunities and I have accepted his decision," White said.

Taco also announced that John White III and Benjamin White have been named vice presidents of the company.

[www.taco-hvac.com](http://www.taco-hvac.com)



John White, Jr.

## TESTO OFFERS VIDEO BORESCOPE WITH COMBUSTION ANALYZER PURCHASE AS PART OF FALL PROMOTION

As part of its fall promotional campaign, Testo, Inc. is offering customers the opportunity to receive a free video borescope with the purchase of a 320 or 330 series combustion analyzer.

The offer is valid for purchases from September 1, 2018 through December 31, 2018, with redemption accepted through January 31, 2019.

The video borescope is a high-resolution video inspection camera capable of saving images and recording video on an external memory card. The borescope can be used on heating and refrigeration technology, engines and turbines.

Testo's 320 and 330 combustion analyzers are designed for tuning and troubleshooting on residential and commercial applications. The analyzers include pre-calibrated user-replaceable sensors and full-colour graphic displays.

[www.testo.com/promo](http://www.testo.com/promo)



## HONEYWELL HOMES SPINOFF COMPANY, RESIDEO, TO BE OPERATIONAL END OF YEAR

Ahead of its planned spinoff from Honeywell, Resideo Technologies, Inc. announced the selection of its chief financial officer (CFO) and board of directors.

Former Ferroglobe PLC CFO Joseph Ragan will serve as executive vice president and CFO of the company. Roger Fradin, retired 2017 vice chairman of Honeywell, will take over as chairman of the board.

Mike Nefkens, president and CEO of Honeywell Homes, will take over as president and CEO of Resideo following the spinoff, expected to be complete by the end of the year.

Products from Resideo—a combination of the words "residence" and "presidio," meaning fortress – will go to market under the Honeywell Home brand as part of a long-term licensing agreement with the company.

Resideo, an independent company, will include a network of 110,000 contractors, 3,000 distributors and 1,200 original equipment manufacturers.

ADI Global Distribution has more than 200 physical locations in nearly 20 countries, in addition to a network of more than 100,000 contractors. It will retain its name and remain as a freestanding distribution business of Resideo.

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

Continued on p68

RETURNING TO  
ATLANTA FOR  
THE FIRST TIME  
SINCE 2001!



# AHREXPO<sup>®</sup>

## Atlanta

JANUARY 14-16 • 2019  
GEORGIA WORLD CONGRESS CENTER

THE WORLD'S LARGEST HVACR MARKETPLACE

- ▶ **2,100+ Manufacturers & Suppliers** from all over the world
- ▶ **60,000+ Attendees** representing every facet of the industry
- ▶ **ASHRAE Winter Conference** held alongside the Show
- ▶ **Robust Education Program** including for-credit courses

CO-SPONSORS



**FREE REGISTRATION** at [AHREXPO.COM](http://AHREXPO.COM)



**NOBLE ACQUIRES ORANGEVILLE SUPPLIER, ANNOUNCES NEW BRANTFORD BRANCH**

Noble has purchased the assets of Orangeville, ON-based Brampton Plumbing, Heating and Industrial Supplies Ltd.

When the transaction closes, Brampton Plumbing, Heating and Industrial Supplies will operate under the Noble banner.

The acquisition is part of Noble's strategy to expand its business in "key markets across Ontario." The company also opened a new location in Vaughan, ON earlier this year and will be opening a new location in Brantford, ON this fall.

Noble Brantford will be located at 576 Elgin Street, Unit C.

[www.noble.ca](http://www.noble.ca)



**DIVERSITECH COMPLETES ACQUISITION OF HILMOR**

DiversiTech Corp. has completed its acquisition of HVAC/R tools supplier hilmor nearly two years after the brand, along with Irwin and Lennox, was purchased by Stanley Black & Decker for \$1.95 billion.

The acquisition is one of 10 undertaken by DiversiTech in the past two years.

"Several key hilmor personnel, including all current hilmor sales reps, will be joining the new business under DiversiTech," said Bud Sjogren, chief sales and marketing officer at DiversiTech.

Contractors and wholesalers with questions are encouraged to contact their DiversiTech or hilmor regional sales manager. [www.diversitech.com](http://www.diversitech.com) [www.hilmor.com](http://www.hilmor.com)



Inside Daikin's Owatonna, MN facility. The company said it explored other site options outside of the U.S., in different regions of the U.S. and in different Minnesota locations.

**DAIKIN GETS GREEN LIGHT TO OPEN \$40.3M MANUFACTURING FACILITY**

Daikin has set its sights on a 300,000 square-foot warehouse in Southern Minnesota, north of Faribault, MN.

The company, which currently has two U.S. plants in Faribault and Owatonna, MN, respectively, will receive a \$750,000 Minnesota Investment Fund loan and a \$1.6 million Job Creation Fund rebate grant from the state to renovate the building into a manufacturing facility.

The funding, to be received after Daikin meets investment and hiring requirements, will allow the \$40.3 million factory to come online in 2019.

Will Fort, vice president and general manager of operations at both Minnesota plants, will spearhead the development of this new factory. [www.daikin.com](http://www.daikin.com)

**EMERSON COMPLETES \$8M IN UPGRADES TO INDIANA FACILITY**

Emerson has completed \$8 million in upgrades to its Rushville, IN plant. The company invested \$13 million in the plant since 2013, with a series of upgrades completed since 2015.

Those upgrades include the addition of Okuma machine centres with an auto-load system; a switch to cellular assembly with various compressor sizes on one line; and installation of a new parts washing process.

Future projects include the introduction of metrology equipment for targeted equipment replacements.

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



**THE EASY WAY TO BOOST PRODUCTIVITY.**

Adrian Steel's Drop Down and Grip Lock Ladder Racks are designed with ergonomics and user safety in mind. Whether you're upfitting a single van or an entire fleet, Adrian Steel has just what you need. Increased efficiency starts now.



[AdrianSteel.com](http://AdrianSteel.com)

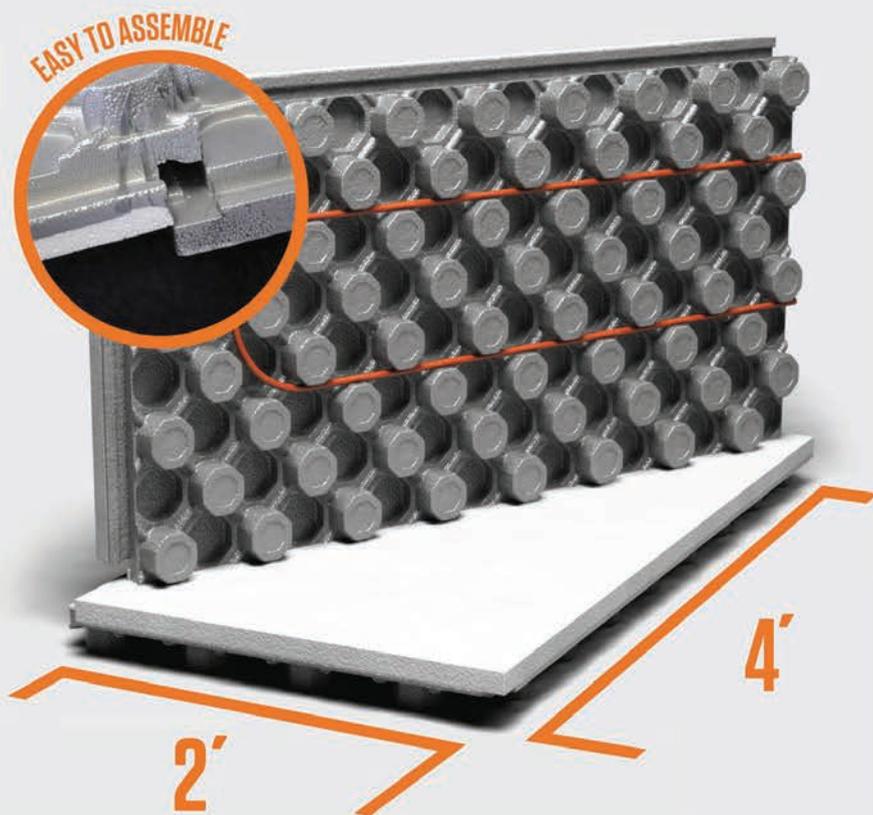
© Adrian Steel Company 2018, all rights reserved. Adrian Steel Company is an independent equipment manufacturer, prices may vary. Please visit [AdrianSteel.com](http://AdrianSteel.com) to contact your local distributor for further details.

Continued on p70

# EASIER, FASTER INSTALLATION OPTIMUM PERFORMANCE DESIGN

## AMVIC INSULATED RADIANT PEX FLOOR PANEL

Amvic Insulated Pex Panels are an efficient heating alternative for hydronic radiant floor heating systems in new construction and renovations. Ideal for basements, bathrooms, other living areas, exterior use for snow and ice melt applications on driveways & walkways.



- SAVE TIME, LABOUR AND MONEY
- WALK IN INSTALLATION
- NO STAPLES OR TIES REQUIRED
- SUPERIOR TUBE INSULATION
- INTEGRATED VAPOR BARRIER
- AVAILABLE FOR RESIDENTIAL AND COMMERCIAL
- SUITABLE FOR MULTIPLE PEX TUBE DIAMETERS

**R10**

also available in  
R12, R14  
& R16  
30 & 45 PSI

VISIT [AMVICSYSTEM.COM](http://AMVICSYSTEM.COM)  
OR CALL 1.877.470.9991

 **amvic**  
building system



From left to right: Kevin Fancey, president, Wolseley Canada; Keith Strachan, general manager of the Western Region for Wolseley Canada; Rick James, branch manager, James Electric Calgary; Dave Pratt, regional sales manager, Wolseley Canada Western Region; Ron McElroy, assistant branch manager, James Electric Calgary.

**WOLSELEY ACQUIRES CALGARY PUMP AND MOTOR DISTRIBUTOR**

Wolseley Canada Inc. has acquired Calgary, AB-based sales and distribution company James Electric Motor Services Ltd.

All 64 James Electric employees will join Wolseley, in addition to the company's president, Rick James, who will continue in his current role.

Specializing in pumps and motors, James Electric will continue to operate under its brand for the foreseeable future.

[www.wolseleyinc.ca](http://www.wolseleyinc.ca) [www.jameselectric.ca](http://www.jameselectric.ca)

**BRADFORD WHITE PARTNERS WITH BUSINESS EXPERT ELLEN ROHR TO DELIVER VIDEO SERIES**



Other topics for the series are yet to be released.

Ellen Rohr, president of Zoom Drain and Sewer, LLC, will host an exclusive business development video series on Bradford White's For the Pro website.

Titled Ellen's Corner, the video series will cover

topics such as developing a business plan and pricing services.

Rohr is the author of the Bare Bones Business Basics series and founder of Bare Bones Biz, a venture capital and consulting company. Her advice is focused on making business growth less complicated.

"Ellen's passion for our industry and desire to help plumbing and heating professionals grow their business is completely aligned with our own philosophy here at Bradford White," said Carl Pinto, director of marketing at Bradford White Corporation.

The company's For the Pro site, launched in 2017, provides training and troubleshooting videos to Bradford White contractors. [www.forthepro.bradfordwhite.com](http://www.forthepro.bradfordwhite.com)



Jørgen Mads Clausen (left) and Danfoss president and CEO Kim Fausing (right) celebrate the world's first radiator thermostat at the company's factory in Silkeborg, Denmark.

**DANFOSS MARKS ANNIVERSARY OF RADIATOR THERMOSTAT INVENTION**

Danfoss is celebrating the 75th anniversary of the world's first radiator thermostat, invented by its founder Mads Clausen in 1943.

"The first prototype... was tested in my father's office," said Jørgen Mads Clausen, chairman of the board at Danfoss.

"The actual marketing began in 1952, when the radiator thermostat was launched as a device that saves money and makes centrally heated rooms more comfortable, and from there on it just took off," added Clausen.

Since its invention, approximately 350 million thermostats have been produced on the company's production line. The latest version, Danfoss Eco—an intelligent radiator thermostat—has earned the company a Red Dot award and a Danish Design Award. [www.danfoss.com](http://www.danfoss.com)

**AQUATHERM ADDS DESCO TO DISTRIBUTION ROSTER**

Etobicoke, ON-based Desco Plumbing and Heating Supply is the latest distributor for Aquatherm polypropylene-random pipe.

"We are seeing the demand for Aquatherm growing in our markets," said Jon Leeson, Desco vice-president and general manager. "We are confident that the Desco team will be able to help support Aquatherm's future success in Ontario."

Aquatherm also launched its latest training initiative, which consists of three programs: Aquatherm Training Professional (ATP), a Trainer Refresh course, and sales training for the company's reps and distributors.

ATP is a replacement for the company's Master Training program, which ended in June. The three and a half-day course will be offered at the company's North American headquarters in Lindon, UT.

The one-day Trainer Refresh and one-day sales training will be conducted locally/in the field.

Course materials for the socket and outlet, butt fusion and electrofusion courses have been updated to reflect the changes made in the ATP course.

[www.desco.ca](http://www.desco.ca) [www.aquatherm.com](http://www.aquatherm.com)



ENTER **WIN**<sup>\*</sup>  
FOR YOUR  
CHANCE TO

**THE ULTIMATE  
HOCKEY  
EXPERIENCE**

## Cheer your team on... anywhere in North America!

Catch a professional regular season hockey game  
in Canada or the U.S.A.

### The Grand Prize includes:

- 2 PREMIUM TICKETS
- 2 AUTHENTIC JERSEYS
- FLIGHTS AND ACCOMMODATIONS  
FOR 2 PEOPLE
- \$500 CAD SPENDING MONEY
- PRE-GAME DINNER FOR 2 PEOPLE

\* Maximum total retail value approximately \$6,000 CAD

**Plus** 5 secondary prizes of \$100 CAD Rona® gift cards

When IPEX introduced the first ULC S636 certified PVC & CPVC flue gas venting systems in 2007, we dedicated ourselves to earning your confidence. We continue to provide training seminars, installation manuals, and an expansive certified product range with a coast-to-coast distribution network. IPEX is committed to supporting you with the most complete product line to get the job done on-time and to the finished quality you expect.



Enter online at [Scorewithsystem636.com](http://Scorewithsystem636.com) or visit your  
local participating System 636 Distributor for a ballot.

\*Some restrictions may apply. See [Scorewithsystem636.com](http://Scorewithsystem636.com) for complete Rules and Regulations.  
Contest starts on Monday, October 22, 2018 and ends on Friday, December 7, 2018.



[YouTube/ipexvideos](https://www.youtube.com/ipexvideos)

System 636® is a registered trademark.

# Western Canada's biggest show for plumbing, hydronics, HVACR and water treatment

Wednesday, November 7 | 10 am to 6 pm  
Thursday, November 8 | 10 am to 5 pm

BMO CENTRE, STAMPEDE PARK, CALGARY

250+ Exhibitors

1000s of Products

14 Seminars & Workshops

REGISTER NOW

[ciphexwest.ca/register](http://ciphexwest.ca/register)



New Products  
New Technologies  
Design Ideas

Installation Solutions  
Technical Experts  
Fantastic Networking

PLUS



CANADIAN  
HYDRONICS  
CONFERENCE

Save \$15. Use this Promo Code for free trade show admission, compliments of HPAC: **HPAC18**

**BUILDEX**  
CALGARY

NOVEMBER 7 & 8, 2018

BMO CENTRE, CALGARY

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

**DON'T MISS OUT – CIPHEX West is Co-Located with BUILDEX Calgary in 2018!**

BUILDEX is pleased to offer complimentary BUILDEX trade show access to all CIPHEX West delegates. Transforming business-to-business interaction. BUILDEX is Western Canada's event for education, information, and networking in the Construction, Renovation, Architecture, Interior Design and Property Management industries.

Anthony Tippins has been named president of CoolSys Energy Solutions. As the founder of Axiom Energy Solutions, acquired by CoolSys, Tippins will lead the energy solutions business. Prior to establishing Axiom Energy Solutions, Tippins was the president, COO and a founding partner at Aztec Energy Partners.



Tippins

WaterFurnace International, Inc. has hired Bruce Cole as vice president of residential sales and marketing. Prior to this role, Cole served as vice president of global sales at Tuthill Corporation. In that role he oversaw profit and loss, e-business development and sales management.



Cole

Lixil Canada Inc. has named Gina Flinton senior director of marketing for American Standard, DXV and Grohe brands. Prior to this role, Flinton has worked at Whirlpool, Canadian Tire and Mattel. As senior director of marketing, she will manage and develop marketing strategies for all three brands in Canada.



Flinton

Fujitsu General America, Inc. has named Karim Yasin director of product management for North America. Yasin is responsible for the support and expansion of commercial and residential portfolios. He has 14 years of experience in the HVAC industry.



Yasin

Regis Saragosti has been named North American CEO for SFA Saniflo. He served as the CEO of Saniflo USA for more than 10 years. In this new role, Saragosti will oversee national sales representatives, advertising and marketing, online sales and new products, among other responsibilities. Saniflo's Canadian arm also appointed Alexandra Motts to the position of national sales manager.



Saragosti



Motts

Christopher and Stephen Schroeter will take over the family business at Napoleon as co-CEOs. Sons of the company's founders, they have worked at Napoleon for 18 and 15 years, respectively. Most recently, Christopher served as senior vice president of operations, research and development, while Stephen held the title of senior vice president of sales, marketing and administration.



C. Schroeter



S. Schroeter

Taco Comfort Solutions has appointed Jeffrey Bredeson to president of its Tennessee-based subsidiary, Hydroflo Pumps. Prior to this position, he served as vice-president of sales for Taco's wholesale and commercial HVAC solutions.



Bredeson

The Canadian Institute of Plumbing and Heating (CIPH) has hired Natalie Petra as program manager. Petra will be responsible for overseeing activities of the institute's Pipe, Valves and Fittings Council, Education and Training Council, Membership Committee and Canadian Water Systems Council.



Petra

Weil-McLain Canada has hired Simon Sorouri as commercial sales applications engineer. In partnership with the company's sales network, Sorouri will focus on applications for Weil-McLain's stainless vertical firetube boiler among engineers and large commercial contractors in the Greater Toronto Area.



Sorouri

Ron Retaleato has been named national sales director of Crosswater London for the North American market. He will continue to maintain his existing sales territory in the U.S. southeast. Retaleato joined Crosswater London in August 2017.



Retaleato

William Christensen, formerly chief marketing officer, has been appointed to the position of CEO at REHAU. The company also tapped Kurt Plattner to take over as chief financial officer. Plattner previously held the title of head of treasury, controlling and finance at the company's head office in Muri, Switzerland.



Christensen



Plattner

DiversiTech Corp. has appointed Franco Daino to the position of vice president, product line and marketing. In the newly-created position, Daino will be responsible for overseeing the company's product development and executive functions, including product management, engineering, marketing and pricing. Prior to joining DiversiTech, he held the title of vice president and general manager of Fypon.



Daino

Follow us on  @hpacmag

# THE HYDRAULICS OF HYDRONICS: A balancing act for individual zones

If a designer is only doing a handful of calculations, what kinds of inefficiencies are being designed into systems that will shackle the building and its owner for life? **BY ROBERT BEAN**

**S**olving comfort and energy problems in hydronic systems most always comes down to the hydraulics. It is the field verification of differential pressure specifications in zones and distribution networks and ensuring it is all done using the least amount of electrical energy. Balancing is one of the few tried and true methods for commissioning an existing or new system to perform as calculated.

Balancing is all about ensuring the design zone flow occurs under design conditions so the operation of a control valve or circulator does not create unbalance somewhere else in the system. At less than design conditions, the fluid temperature should be adjusted down or up so that control valves remain open.

When valves do close the differential pressure controlled circulator or pressure bypass valve will deal with the pressure fluctuation and by doing so ensuring overflow or underflow does not occur.

Herein lies an important statement: control valves do not open to give heating or cooling, they close to prevent overheating and overcooling. Thus balancing is done with control valves open as if the system were under maximum load... as per the design.

## THE PROCESS

If you do not ignore (or heaven forbid assume) the details, there are essentially 48 steps in the evaluation of hydraulics for a hydronic system. Yes 48 and that does not include the design of the heat terminal unit. Such a detailed analysis will likely come as a shock even to seasoned designers who think there might be just a handful of steps.

The following are the necessary line-by-line steps from my spreadsheet tool for specifying service, control and balancing valves, and circulators. A case study is presented at the end and for guidance notes are provided to help you create your own tool.

The first steps are to convert loads into flows, establish temperature profiles and determine expansion rates of pipes. Line 1 is self-explanatory (if you have not been trained in doing load calculations begin there).

Both line 2 and 3 are used in the line 8 flow calculation and are often defaulted to 8.34 lb/gal and 1 Btu/lb•°F, which when multiplied by 60 min/hr result in the rule of thumb value of 500. Perhaps you have been taught to determine flow by dividing the load (Q) by (500\* Δt). Now you know where the 500 is from. As long as you are using water at approximately room temperature it is

reasonably accurate. But for other temperatures and mixes such as water/glycol you need to use the proper values obtained from fluid vendors. That is why I teach students to avoid using rules of thumb because such a habit can come back and bite you in the butt.

Line 4 will come typically from the manufacturer's or industry design nomographs. To enable efficiency in the heating and cooling plant this value should be the highest in cooling (that is >55F) and the lowest in heating (that is <90F). Values lower and higher than recommended will be parasitic on the potential system efficiency, which resides with the building forever, so work really hard to get these values right (see *HPAC* December 2016, The effect of heating coil performance on boiler efficiency and system complexity, [www.hpacmag.com](http://www.hpacmag.com)).

Many software programs and designers allow a default of 20F Δt (line 5) to carry through the flow (Q) calculations in line 8, unaware that the consequences include failure to optimize the heat terminal units for plant efficiency, the circulator for power efficiency, and piping and control systems for distribution efficiency.

For example, most fan/coils can easily handle a 30F Δt, radiant heated industrial storage facilities can use 40F Δt, radiant cooled offices less than 8F Δt and small zones such as radiant heated bathrooms and kitchens installed in a thin pour less than 6F Δt. Selecting the Δt is an important strategic element with consequences and

Description	Symbol	Unit (IP)	Notes	1st Solution			2nd Solution			3rd Solution			
				Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	
1	zone load	qz-n	Btu/hr	from heat loss/gain calculation	100000.00	90000.00	80000.00	100000.00	90000.00	80000.00	100000.00	90000.00	80000.00
2	fluid density	ρ	lb/gal	from fluid property tables for a given temperature	8.34	8.34	8.34	8.34	8.34	8.34	8.34	8.34	8.34
3	fluid specific heat	cp	Btu/lb•°F	from fluid property tables for a given temperature	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Description	Symbol	Unit (IP)	Notes	1st Solution			2nd Solution			3rd Solution			
				Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	
4	average fluid temperature	tavg	°F	determined by designer based on selection or design of the heat terminal unit: objective is to get the lowest practical value through building enclosure design and heat terminal unit optimization (fin efficiency)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
5	differential temperature	Δt	°F	specified by designer: objective is to use the greatest value without compromising comfort or effectiveness	<b>20.00</b>	<b>20.00</b>	<b>20.00</b>	<b>20.00</b>	<b>20.00</b>	<b>18.00</b>	<b>30.00</b>	<b>30.00</b>	<b>30.00</b>
6	return fluid temperature	tr	°F	tr = ts - (0.5 * Δt), establishes operating efficiency for the heat pump, boiler, solar system etc.	90.00	90.00	90.00	90.00	90.00	91.00	85.00	85.00	85.00
7	supply fluid temperature	ts	°F	ts = ts + (0.5 * Δt), establishes target temperature for control system	110.00	110.00	110.00	110.00	110.00	109.00	115.00	115.00	115.00
8	zone flow	Qz-n	gpm	Qz-n= q/(60min/hr * p * cf * Δt), sum of all zone flows is used for selecting circulator	9.99	8.99	7.99	9.99	8.99	8.88	6.66	6.00	5.33
9	length of supply + return lines for the zone	Lz-n	ft	combined run out distance to each heat terminal unit (ex. radiant manifold, fan/coil, panel radiator etc.) includes allowance for fittings	<b>200.00</b>	<b>100.00</b>	<b>100.00</b>	<b>200.00</b>	<b>50.00</b>	<b>50.00</b>	<b>200.00</b>	<b>100.00</b>	<b>100.00</b>
10	start up or fill temperature (lower of the values)	tf	°F	temperature of the fluid at start up (typically slab temperature)	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
11	supply fluid temperature	ts	°F	temperature of fluid at operating conditions (= line 7)	110.00	110.00	110.00	110.00	110.00	109.00	115.00	115.00	115.00
12	differential temperature for expansion	Δtexp	°F	Δtexp = ts - tf	60.00	60.00	60.00	60.00	60.00	59.00	65.00	65.00	65.00
13	coefficient of expansion	a	in/100ft /10°F	from piping manufacturer	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
14	expansion length (per zone)	le	in.	le = Lz-n/100 * (Δtexp /10) * a use this value to select and specify expansion methods to prevent physical stress in piping systems and noise	13.20	6.60	6.60	13.20	3.30	3.25	14.30	7.15	7.15
15	distribution pipe size	ddist	in.	specified by designer for acceptable velocity and head per 100 ft, ex.: 1.5 to 5 fps & 1 to 4ft/d/100ft of pipe. Ideally flow should be laminar in distribution pipes	<b>1.50</b>	<b>1.50</b>	<b>1.50</b>	<b>1.50</b>	<b>1.00</b>	<b>1.00</b>	<b>1.25</b>	<b>1.00</b>	<b>1.00</b>
16	inside loop diameter of distribution piping	di-dist	in.	from piping manufacturer	1.24	1.24	1.24	1.24	0.86	0.86	1.054	0.86	0.86

should be thoroughly considered rather than accept the defaults.

Remember anytime the Δt is doubled, the flow is reduced by 50 per cent, the pressure goes down by 75 per cent and the power goes down by 87 per cent. If I were concerned by long term power use I would sure want my designer to be looking at this stuff. There is very little guidance about this subject in the manufacturer's manuals but it is in the ASHRAE Handbooks and is covered in my Integrated Design Course.

In addition, when multiple Δts of different values are used, the designer will need to calculate the weighted re-

turn temperatures from mixed flow. This is described in industry manuals.

By selecting an acceptable Δt (line 5 above) the return (line 6) and supply (line 7) temperatures below become set. Their importance is described in the notes.

Line 14 is rarely calculated but it is a must if piping stresses, which show up as annoying sounds, are to be controlled (see *HPAC* August 2018, [www.hpacmag.com](http://www.hpacmag.com)).

The next set of calculations move the design from a thermal analysis to a hydraulic analysis. Line 15 is also where the philosophy of sustainability kicks in. If your mission is to create the lowest

cost system, then you are going to be selecting small diameter, high velocity systems. That approach might serve you as a competitive, "cost is everything" bidder, but such a philosophy permanently handcuffs the building and its owner with higher than necessary energy use.

Heat transfer from a pipe is in part a function of its flow characteristics. Laminar flow will transfer less heat than turbulent flow. Smaller pipes (line 16) selected for low cost will have higher velocities (line 17) and higher head losses, require more horsepower and have a higher probability of being in turbulent

Continued on p76

Description	Symbol	Unit (IP)	Notes	1st Solution			2nd Solution			3rd Solution			
				Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	
17	velocity in distribution piping	vdist	ft/sec	$v = (0.4085 \cdot Q) / di2$ check for good practice, ex.: 1.5 to 5 fps, lower velocities = less horse power but require greater pipe sizes = greater costs	2.64	2.37	2.11	2.64	4.94	4.91	2.45	3.31	2.94
18	ft of head per 100 ft for distribution piping	$\Delta p/100$	ft hd /100ft	$\Delta p/100 = 0.2083 \cdot ((100^{1.852}) / (150^{1.852})) \cdot (Q^{1.852} / (di^{4.8655}))$ , Hazen Williams formula, good practice is 1ft hd to 4ft hd per 100 ft of pipe	2.41	1.99	1.60	2.41	11.83	11.69	2.55	5.65	4.54
19	differential pressure in supply and return	$\Delta p_{dist}$	ft hd	$\Delta p_{dist} = L/100ft \cdot \Delta p/100ft$ (include fitting allowance)	4.83	1.99	1.60	4.83	5.91	5.85	5.10	5.65	4.54
20	# of radiant loops	qty	-	designer specified, less loops = longer loops = greater hd but lower manifold costs.	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
21	flow rate per zone	Qzone	USgpm	equal to the zone flow Qz-n (line 8)	9.99	8.99	7.99	9.99	8.99	8.88	6.66	6.00	5.33
22	flow rate per loop	Qloop	USgpm/loop	Qzone / qty of loops	1.00	0.90	0.80	1.00	0.90	0.89	0.67	0.60	0.53
23	radiant pipe size	drad	in	specified by designer for acceptable velocity and head per 100 ft, ex.: 1.5 to 5 fps & 1 to 4ft hd/100ft of pipe. Ideally the flow should be turbulent in all heat terminal units	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
24	inside loop diameter of radiant pipe	di-rad	in	from piping manufacturer	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
25	velocity in radiant piping	vrad	fps	$v = (0.4085 \cdot Q_{loop}) / di2$ check for good practice, ex.: 1.5 to 5 fps	1.81	1.63	1.45	1.81	1.63	1.61	1.21	1.09	0.96
26	ft of head per 100 ft for radiant piping	$\Delta p/100$	ft hd /100ft	$\Delta p/100 = 0.2083 \cdot ((100^{1.852}) / (150^{1.852})) \cdot (Q^{1.852} / (di^{4.8655}))$ see: Hazen Williams formula	3.67	3.02	2.43	3.67	3.02	2.95	1.73	1.43	1.15
27	length of longest radiant loop in the zone	Lrad	ft	from the piping schematic	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
28	differential pressure in longest radiant loop	$\Delta p_{rad}$	ft hd	$\Delta p_{rad} = L_{rad}/100ft \cdot \Delta p/100ft$ (include allowance for manifold) if other heat terminal unit insert head loss through device at design flow rate. Shorter loops should be balanced for flow to the highest head loop	7.35	6.04	4.86	7.35	6.04	5.91	3.47	2.85	2.29

flow and thus potential for greater parasitic heat transfer. Larger pipes (line 16) with greater cost will have lower velocities (line 17) and lower head losses (line 18), require less horsepower and have a higher probability of being in laminar flow and thus potential for lower parasitic heat transfer.

When selecting pipes, do so using good practice as noted in the comments. An exception exists: there are cases where short lengths of pipe can be at the upper end of acceptable velocities with aggressive pressure drops. So long as the pressure drop in these short sections does not affect the overall circulator selection it is acceptable to let these cases stand as designed.

Line 19 is the head loss for the fluid travelling from the prime manifold to say the radiant manifold and back again. It does not include the radiant tubing and manifold but does include an allowance for the fittings. For simple systems designers can use 50 per cent of the line loss as losses for fittings with rea-

sonable accuracy. For compact systems use the fitting equivalent method described in industry handbooks.

Line 20 through to line 28 are for establishing the flow rate and pressure drop through the heat terminal unit (HTU). In this case I am giving an example of a radiant floor system where the flow rate per loop is used to establish the head loss through the longest loop. If it were a fan/coil or section of baseboard one would use the flow rate for that equipment.

Line 29 is the round trip head losses for the zone—without the losses for the service, balancing and control valves. With multiple zone systems, the circulator will be selected based on the combined flow rates served by the circulator (line 8) at the highest differential pressure required from the number of zones served by the circulator (line 43).

Line 30 is simply a conversion of the zone piping and HTU head loss from feet of head (ft. hd.) to psi. The reason for this is valve pressure differentials and selection requires the use of the valve's

Description	Symbol	Unit (IP)	Notes	1st Solution			2nd Solution			3rd Solution			
				Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	
29	differential pressure sub total of distribution supply and returns plus HTU ( ex. RFH)	$\Delta pLz-n$	ft hd	$\Delta pLz-n = \Delta p_{dist} + \Delta p_{rad}$ units in ft hd	12.17	8.03	6.45	12.17	11.96	11.75	8.57	8.50	6.83
30	differential pressure sub total of distribution supply and returns plus HTU ( ex. RFH)	$\Delta pLz-n$	psi	$\Delta pLz-n = \Delta p_{dist} + \Delta p_{rad}$ units in psi (use this value when selecting control valve and balancing valve Cv's)	5.27	3.48	2.79	5.27	5.18	5.09	3.71	3.68	2.96
31	service valve, Cv	Vscv	Cv	from manufacturer, typically a full port valve with minimal pressure loss, ex. < 2.31 ft hd (1 psi)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
32	differential pressure, service valve	$\Delta pVs'$	psi	$\Delta pVs = (Q_{zone}/V_{scv})^2$	1.00	0.81	0.64	1.00	0.81	0.79	0.44	0.36	0.28
33	differential pressure in zone w/o control & balancing valve	$\Delta p_{zone}'$	psi	$\Delta p_{zone}' = \Delta pLz-n + \Delta pVs'$	6.27	4.28	3.43	6.27	5.99	5.88	4.15	4.04	3.24
34	authority multiplier	B	-	1.0 = 50%, 0.66 = 40%, 0.43 = 30%, specified by designer, the higher the value the better the control but the higher the pressure drop and greater the load on the circulator, minimum is 30%	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.43</b>	<b>0.63</b>
35	desired differential pressure in control valve	$\Delta pV_{ctrl}'$	psi	$\Delta pV_{ctrl}' = B * \Delta p_{zone}'$ , note pressure drops across control valves exceeding 3 to 4 psi are considered aggressive, check actuator torque, adjust $\Delta t$ , B, pipe dia or lengths if necessary to reduce $\Delta p$	2.69	1.84	1.48	2.69	2.57	2.53	1.79	1.74	2.04
36	Cv required for control valve	Vctrlcv	Cv	$V_{ctrlcv} = Q z-n / \sqrt{\Delta p_{zone}'}$	6.09	6.63	6.58	6.09	5.61	5.59	4.98	4.55	3.73

flow coefficient (Cv) and this calculation is always done in psi.

Lines 31, 32 and 33 establish the required pressure differentials in the zone with the service valve but without the control and balancing valve.

Lines 34 through to line 38 are the “DNA” for control and balancing valve section theory. This is not taught in most trade and technician curricula, which is a shame as it is not that complicated. The short strokes are—having no pressure drop across a control valve is no different than trying to use your garden hose to water a large flowerbed without having your thumb for back pressure. By placing your thumb over the end of the hose you have flow control. No back pressure, no control.

So how much pressure differential (control) do we need to have so the valve has authority over the zone? Between 30 per cent and 50 per cent of the zone head loss should be in the control valve (line 34). This is true for all applications except those using on/off valves. In the case of on/off valves the Cv should be picked to have at least 1 psi (2.31 ft. hd.) pressure drop. It is beyond this article to get into valve characteristics but designers should know you should never use on/off valves on any fin/tube heat terminal, which employs a fan such as fan convectors, force flows and fan/coils. I know

it is done all the time but it is one of the reasons for two of my favourite sports: system cycling and valve hunting.

For high temperature low mass fan assisted systems only modulating equal percentage valves should be used and the logic of valve authority described here should also be followed. Doing so will linearize the systems so that (for example) at 50 per cent flow there will be 50 per cent output.

Modulating linear characteristic valves should be used on medium temperature medium mass systems such as thin pours, baseboards and panel radiators. On/off valves (and modulating) are fine on heavy mass systems including swimming pools, storage tanks and concrete radiant systems.

Control enhancement is always encouraged through the use of weather compensation (indoor/outdoor controls). To determine the necessary pressure drop across the control valve (line 35) it is simply a matter of selecting an appropriate authority value (line 34) and multiplying it against the head loss of the zone (line 33). Line 36 converts the required pressure drop into a valve Cv. Once you know what Cv you need, you can pick from the manufacturer’s product offering.

And so we finally get to the principles of using balancing

Continued on p78

Description	Symbol	Unit (IP)	Notes	1st Solution			2nd Solution			3rd Solution			
				Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	
37	Cv from manufacturer	Vcntrlcv'	Cv	from manufacturers data sheets, be sure to select valve with inverse characteristics of the heat terminal unit it is controlling	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
38	actual differential pressure in control valve	$\Delta pVcntrl''$	psi	$\Delta pVcntrl'' = (Q/Vcntrlcv')^2$	1.23	1.00	0.79	1.23	1.00	0.97	0.55	0.44	0.35
39	difference between desired and actual	$\Delta p\Delta v'-v''$	psi	$\Delta p\Delta v'-v'' = \Delta pVcntrl' - \Delta pVcntrl''$ this value is what the balancing valve must provide	1.46	0.84	0.69	1.46	1.58	1.55	1.24	1.29	1.69
40	balancing valve, differential pressure required	$\Delta pVb'$	psi	$\Delta pVb' = \Delta p\Delta v'-v''$ note: there should be at least a 1 psi $\Delta p$ across the balancing valve for measurement purposes	1.46	0.84	0.69	1.46	1.58	1.55	1.24	1.29	1.69
41	balancing valve, Cv (exception: see below)	Vbcv	Cv	$Vbcv = Q z-n / \sqrt{\Delta pVb'}$	8.26	9.79	9.64	8.26	7.17	7.13	5.99	5.27	4.10
42	total hd, HTU/RFH, SR, SV, BV, CV	$\Sigma \Delta pzone'$	psi	sum of the pressure drops (psi) through the distribution piping + heat terminal unit/radiant floor heating + service valve + balancing valve + control valve	8.96	6.13	4.91	8.96	8.56	8.40	5.94	5.77	5.28
43	total hd, RFH, SR, SV, BV, CV	$\Sigma \Delta pzone$	ft hd	sum of the pressure drops (ft of hd) through the distribution piping + heat terminal unit/radiant floor heating + service valve + balancing valve + control valve. The greater of the head losses amongst all the zones is for circulator selection	<b>20.70</b>	<b>14.15</b>	<b>11.34</b>	<b>20.70</b>	<b>19.77</b>	<b>19.41</b>	<b>13.72</b>	<b>13.34</b>	<b>12.21</b>
44	valve authority check (N/A using on/off valves)	B'	-	$B' = \Delta pVcntrl'' + \Delta pVb' / \Sigma \Delta pzone'$ this value should be equal to or greater than 30%	30%	30%	30%	30%	30%	30%	30%	30%	39%
45	Circulator flow				26.98			27.87			17.99		
46	Circulator head				20.70			20.70			13.72		
47	Circulator efficiency				61%			61%			58%		
48	Circulator estimated annual power consumption				522 kWh/yr			538 kWh/yr			364 kWh/yr		

If the circulator has to overcome 20ft due to the worst case scenario then adjust piping diameters down to increase velocity and head losses in the best case scenarios. By doing so you balance out the systems while reducing costs.

**Adjusting one or more of the following will affect the differential pressure and balance of a multi zone system:**

- Changing enclosure design which affects the load and thus the flow
- Change the delta t which affects flow and thus velocity and delta p
- Relocate the radiant manifold or heat terminal unit which changes the distribution pipe Distance and thus the pressure differential
- Change the diameter of the distribution piping which will affect velocity and pressure drop
- Change the control valve authority

valves. In the perfect world designers would be able to find the correct Cv each and every time but rarely does this happen. Any shortage in pressure differential needs to be made up with resistance dialed in by the balancing valve. This is described in lines 39, 40 and 41.

If you can find the right Cv an argument can be made to not install a balancing valve. It has been my experience such practice is riding a little close to the sun. Sans a discussion on pressure independent control valves (PICV) (an entire article on its own), there is no margin for error with such an approach.

Finally, we get to the place where the total head loss is determined in line 42 and 43. The highest of these, amongst all the zones served by the circulator, will be used along with the sum of all the flows (line 8) in the selection of the circulator.

Line 44 is simply a check to ensure that your choice in valve authority meets with your preference.

Once you have added up all the flows and selected the zone with the greatest head loss you must then select a circulator for the highest efficiency and lowest annual power consumption. This step is very important and is an integral part of calculating the distribution efficiency

(see John Siegenthaler HPAC August 2018 article, [www.hpacmag.com](http://www.hpacmag.com)).

**CASE STUDY**

Table 1 shows the key results from three solutions for three zones in a radiant heated industrial building. To demonstrate the theory of control valve authority I have used modulating valves.

The first solution is based on using typical default values. The second solution tweaks the Zone 3  $\Delta t$  in line 5 to illustrate a means of increasing flow so the  $\Delta p$  is more closely matched with zone 2 and 3. It also demonstrates the relocation of manifolds resulting in

Line	Description	1st Solution			2nd Solution			3rd Solution		
		Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
1	zone load	100000	90000	80000	100000	90000	80000	100000	90000	80000
5	differential temperature	20.00	20.00	20.00	20.00	20.00	18.00	30.00	30.00	30.00
8	zone flow	9.99	8.99	7.99	9.99	8.99	8.88	6.66	6.00	5.33
9	length of supply + return lines for the zone	200.00	100.00	100.00	200.00	50.00	50.00	200.00	100.00	100.00
16	inside loop diameter of distribution piping	1.24	1.24	1.24	1.24	0.86	0.86	1.054	0.86	0.86
33	differential pressure in zone w/o control valve	6.27	4.28	3.43	6.27	5.99	5.88	4.15	4.04	3.24
34	authority multiplier	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.63
35	desired differential pressure in control valve	2.69	1.84	1.48	2.69	2.57	2.53	1.79	1.74	2.04
36	Cv required for control valve	6.09	6.63	6.58	6.09	5.61	5.59	4.98	4.55	3.73
37	Cv from manufacturer	9.00	9.00	9.00	9.00	9.00	9.00	6.30	6.30	4.70
38	actual differential pressure in control valve	1.23	1.00	0.79	1.23	1.00	0.97	1.12	0.91	1.29
39	difference between desired and actual	1.46	0.84	0.69	1.46	1.58	1.55	0.67	0.83	0.76
40	balancing valve, differential pressure required	1.46	0.84	0.69	1.46	1.58	1.55	0.67	0.83	0.76
41	balancing valve, Cv (exception: see below)	8.26	9.79	9.64	8.26	7.17	7.13	8.15	6.58	6.13
43	total hd, RfH, SR, SV, BV, CV	20.70	14.15	11.34	20.70	19.77	19.41	13.72	13.34	12.21
45	circulator flow	26.98			27.87			17.99		
46	circulator head	20.70			20.70			13.72		
47	circulator efficiency	61%			61%			58%		
48	circ est annual kWh/yr	522 kWh/yr			538 kWh/yr			364 kWh/yr		

TABLE 1 Key results: three solutions for three zones in a radiant-heated industrial building

shorter distribution lines (line 9, zone 2 and 3). I have also reduced the pipe size in zones 2 and 3 on line 16. This was done to show that if the second solution zone 1  $\Delta p$  establishes the circulator selection, you may as well try to reduce capital costs where possible without compromising performance. In this case using less pipe of a smaller diameter for zones 2 and 3. Both the first and second solution have almost identical circulator requirements with the same efficiency and annual power use.

At this point there is a big opportunity to improve boiler efficiency, reduce capital costs and lower annual power use for a small sacrifice in electrical efficiency. Note that in the third solution the  $\Delta t$  is increased to 30F. This is possible since it is an industrial building where workers are wearing safety boots and coveralls and will have a high metabolic rate. They won't know or care about the less than ideal thermal efficacy of the floor surface.

Look what happens to the flow on line 8 when the  $\Delta t$  is bumped up. The

larger  $\Delta t$  also means we will have a lower return temperature enabling us to extract a higher efficiency from the heating plant. We can now also reduce the distribution piping size in zone 1 and get lower  $\Delta p$ s across all zones. Because the  $\Delta p$ s are lower we can use a smaller service valve, control valve and balancing valve.

Since everything is lower notice the circulator selection on line 45 and 46. Notice how the power use has dropped almost 30 per cent for a small efficiency penalty of three per cent (from manufacturer's software). Further reductions would be possible if the client would consider improving the enclosure performance to reduce the heating loads in line 1.

### FINAL THOUGHTS

The entire exercise of going through balancing calculations exposes the potential to optimize systems to improve the efficiency of the heating and cooling plant, and lower capital costs while reducing power use (third solution).

What is not to like about any of that? Such an exercise should be mandatory on every system design. However in the drive to reduce design costs typically only first solutions are used, which results in inefficiencies, higher than necessary capital and greater operating costs. None of it is congruent with the philosophies of sustainability.

Further there is a segment of the market that undervalues, hides or gives away its design fees in order to sell equipment and does not validate calculations through commissioning. Another segment competes for fees without selling equipment. To minimize risk of losses and improve profits this segment tries to do the least amount for the highest fee.

Using this one case study you can hopefully appreciate the impact these approaches are having on society's energy systems and resource utilization when hundreds of designs are done each day. The world of design needs to be revamped if the industry is to deliver buildings that can be called sustainable. The balancing calculation is just one way of drawing attention to this matter. 



Robert Bean is a Registered Engineering Technologist in building construction (ASET) and a Professional Licensee (Engineering) in HVAC (APEGA). He is president of Indoor Climate Consultants Inc. and director of [www.healthyheating.com](http://www.healthyheating.com); a past ASHRAE Distinguished Lecturer; recipient of ASHRAE's Lou Flagg Award and ASHRAE Distinguished Service Award; and a member of ASHRAE technical committees 2.1 (Physiology & Human Environment) 6.1 (hydronics), 6.5 (radiant), 7.04 (eXergy) and SSPC 55 (thermal comfort). Bean is also the author of numerous industry courses and seminars covering the building sciences, indoor environmental quality, energy, and radiant-based HVAC systems.

# LESSONS LEARNED

When to use a three-pipe buffer tank configuration. **BY JOHN SIEGENTHALER**

**W**hen it comes to thermal storage tanks, there are many shapes, sizes and pressure ratings available, ranging from tanks that resemble (or are) domestic water heaters to larger ASME-certified pressure vessels.

In most hydronic thermal storage applications, it is desirable to maintain temperature stratification within the tank—that is hottest water at the top, coolest water at the bottom. Good stratification improves the “quality” of thermal energy available from the tank, relative to that available from a full mixed tank.

A thermal storage tank, left undisturbed, will naturally stratify. The temperature range from top to bottom will depend on several factors, including:

1. The height to diameter ratio of the tank
2. The thermal conductivity of the tank walls
3. The insulation used on the tank
4. Conductive/convective heat loss through piping connected to the tank

Thermal stratification should be maintained within the tank while heat is being added from the heat source(s), as well as when heat is being extracted by the load(s). The degree to which this happens depends upon the temperature rise across the heat source, and the temperature drop across the load circuits.

Ideally, the water returning from the load to the thermal storage tank should enter the tank at a “strata” that’s at the same temperature as the returning water. This minimizes buoyancy induced mixing within the tank. Flow should also enter the tank horizontally and gently, again to minimize mixing within the tank.

The latter can be accomplished by keeping the flow velocity entering the tank no higher than two feet per second, and connecting the piping to the side of the tank rather than the top or bottom.

What’s difficult is attempting to maintain a match between the temperature of water returning from the load, and the water temperature within the tank at the connection point. The temperature returning from the distribution system is going to change from when the load starts operating to when warm water makes its way through the load and start flowing back to the tank. The return temperature is also going to change as the supply water temperature changes.

## EURO-DETAILING

Outside of North America, some European designers have attempted to create “smart” return systems using multiple return valves as shown in *Figure 1*. These designers tend to also sell motorized valves.

A controller measures the return water temperature and the temperature stratification within the tank. As the returning water temperature varies, the controller opens one valve to allow water back into the tank where the internal temperature—either measured or inferred—is closest to the returning water temperature.

While this might be a control engineer’s delight in terms of hardware and algorithms, it adds expense and complication.

Another approach is to use a “stratification lance” within the tank. Water returning from the load enters an isolated chamber at the bottom of the storage tank and slowly rises through a polymer tube with lots of holes along its height and up the centreline of the tank.

In theory, the water rises due to buoyancy until it matches the temperature of the water in the tank. It then flows out of the central tube and into the tank with minimal disturbance of stratification. The holes are covered by small plastic flaps, which are designed to close to prevent circulation between the water in the central tube and water in the tank when the tank is at rest. As a result, there are no inflows or outflows.

While I am confident this approach has validity, I am not as confident in a more than 20 year life expectancy for the polymer tube, or the plastic flaps covering the holes on this lance, especially if that tank is exposed to water temperatures approaching 200F.

## A SIMPLER APPROACH

My proposition to the challenge of maintaining reasonable stratification within the tank is three-fold:

1. The hydronic industry needs thermal storage tanks with at least one generously sized mid-height connection point, as shown in *Figure 2*. This would be in addition to connections on the upper and lower sidewalls. A mid-height connection point offers the designer options as to where the return piping from a load can be connected to the tank.

If the mid-height connections are not needed for piping, they can be used for temperature sensors, thermometers or other instrumentation. These connections can also be plugged if they are not needed.

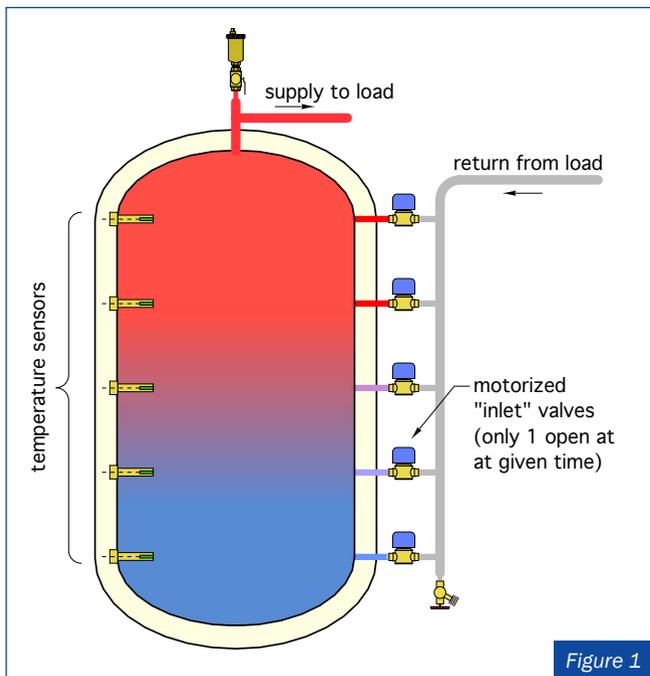


Figure 1

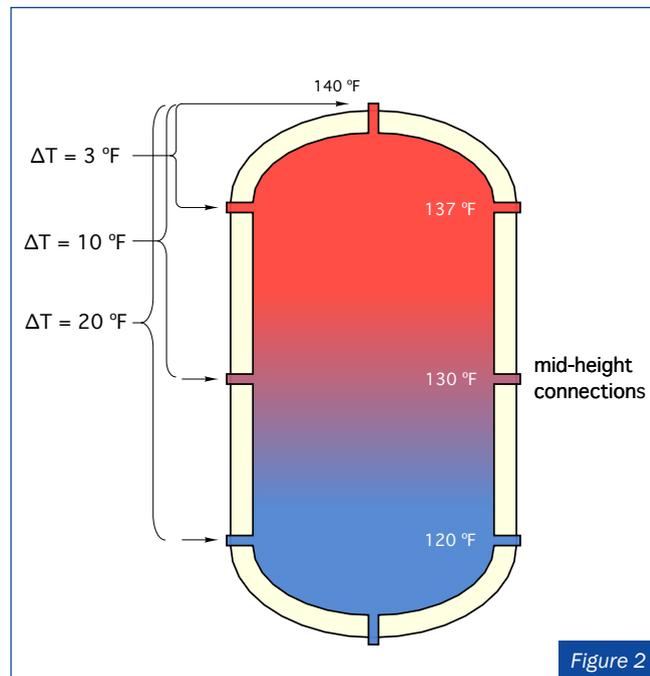


Figure 2

I would rather specify a tank with extra connections than try to “shoehorn” the design around a tank with not enough connections, or with connections in the wrong location on the tank.

**2.** All connections other than those specifically intended for an air vent or drain valve should have generously-sized connections. This allows use of larger pipe sizes near the tank to reduce inlet flow velocity and help maintain temperature stratification. I suggest a minimum of two-inch FPT treaded connections on tanks intended for residential and light commercial applications. Tanks for commercial applications should have a three-inch pipe, minimum, on all in-flow and out-flow connections. Large connections can always be reduced to fit smaller piping using relatively inexpensive bushings.

**3.** Designers need to assess the likely temperature drop of load circuits, then lay out piping that returns water from those loads into the tank at a level where the temperature in the tank is about the same as the incoming water.

If the load is likely to produce a “wide” temperature drop it can be returned to the lower sidewall connection. If the load will have a small temperature drop, it could be returned to the mid-height connection. If the load is small with a low Btu/hr heat transfer and operates with a minimal temperature drop, it could even be returned to the upper sidewall connection of the tank. These options are illustrated in *Figure 2*.

This concept is easy to understand, but not as easy to execute. The complication is that the return water temperature from any given load will vary as that load starts and operates. The temperature profile within the tank is also going to vary as heat is removed and when heat is added from one or more heat sources.

In practical terms, it is likely the load with the deepest con-

sistent temperature drop will tend to set up a corresponding temperature profile within the tank. It makes sense to connect that load over the full height of the tank. A load with perhaps half that temperature drop, but the same supply temperature requirement, could then be piped over the upper half of the tank, assuming there’s a connection port at that location.

### WATCH OUT FOR THIS ONE

An example of where returning water from the load to higher connections on the tank makes sense is when a typical indirect water heater is supplied from the system’s thermal storage tank.

The internal coils in many North American indirect water heaters are, in my opinion, too small for efficient heat transfer at coil inlet temperatures below 180F. While it is possible that some thermal storage tanks can reach these high temperatures, it is usually the exception, especially with heat sources such as solar thermal collectors. Still, there is energy available for domestic water heating when thermal storage temperatures are as low as 125F, assuming domestic hot water delivery temperatures of 115 to 120F.

Heat can be transferred from thermal storage to the indirect tank as shown in *Figure 3*.

A differential temperature controller monitors the difference between the temperature in the upper portion of the thermal storage tank and the water temperature in the lower portion of the indirect tank. When the temperature of the “source” sensor in the thermal storage tank is at least 15F or more above the temperature of the sensor in the lower portion of the indirect tank, a circulator turns on to move heat

Continued on p82

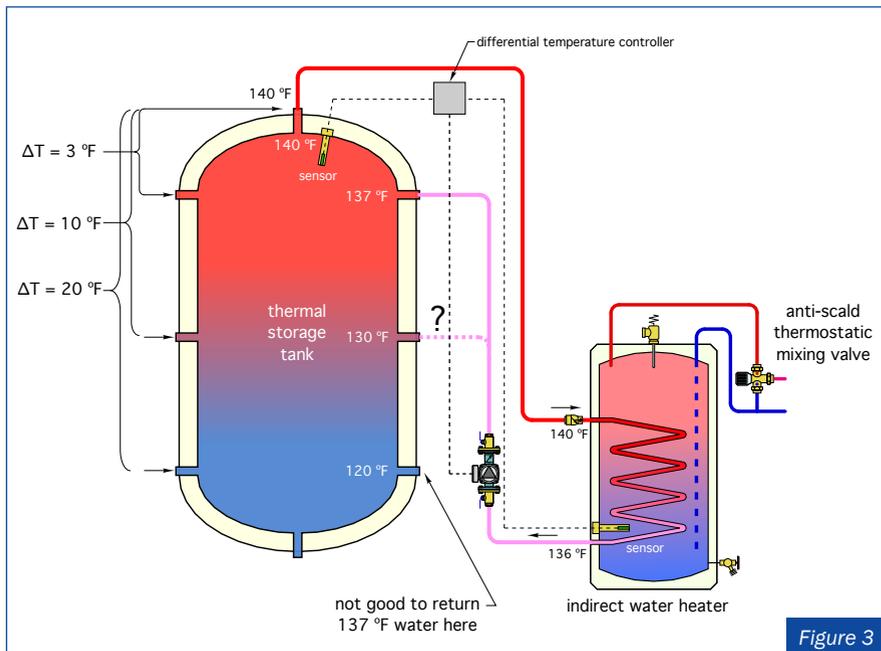


Figure 3

from the former to the latter. When the thermal storage temperature is 10F or less above the indirect tank temperature, the circulator turns off. The “on” and “off” differentials can be adjusted based on the heat transfer performance of the coil heat exchanger and the position of the sensor in the indirect tank (e.g., lower placement of the sensor may allow for slightly lower “off” differential).

The issue I have experienced with this setup is that the rate of heat transfer from the coil heat exchanger in the indirect water heater drops off consid-

erably as the thermal storage tank temperature decreases. This results in minimal temperature drop across the coil. If the water leaving the coil is then returned to the lower connection on the thermal storage tank, it is likely to be significantly warmer than the water in the tank at this location. This induces buoyancy differences, which tend to break up tank stratification.

One way to reduce this effect is by bringing water back into the upper portion of the tank—no lower than the mid-height connection and possibly even to the upper sidewall connection. The lat-

ter is the better choice if the DHW load is small and the thermal storage tank can adequately supply space heating at lower water temperatures.

Although this is still not an ideal solution, it is an improvement over returning the water to the lower connection on the thermal storage tank.

**SMARTER TANKS**

In the future we may see improved methods for returning water from heating loads to thermal storage with minimal disruption of stratification—perhaps an intelligent device that can “unload” return water over the full height of the tank, so that it flows into a “strata” at the same temperature. The device will have to be robust to survive the environment within the tank for many years. Put your thinking hats on for this one.<>



*John Siegenthaler, P.E., is a mechanical engineering graduate of Rensselaer Polytechnic Institute and a licensed professional engineer. He has over 34 years experience in designing modern hydronic heating systems. Siegenthaler's latest book is Heating with Renewable Energy (see www.hydronicpros.com for more information).*

COMING... SEPTEMBER 19, 2019

**MODERN HYDRONICS SUMMIT 2019**

North America's **LARGEST (and growing!)** hydronic – only event.

Presented by **HPAC** HEATING PLUMBING AIR CONDITIONING



Check [modernhydronicssummit.com](http://modernhydronicssummit.com) for updates

# Replacing Your Water Heater Every Few Years is Not Our Business Plan



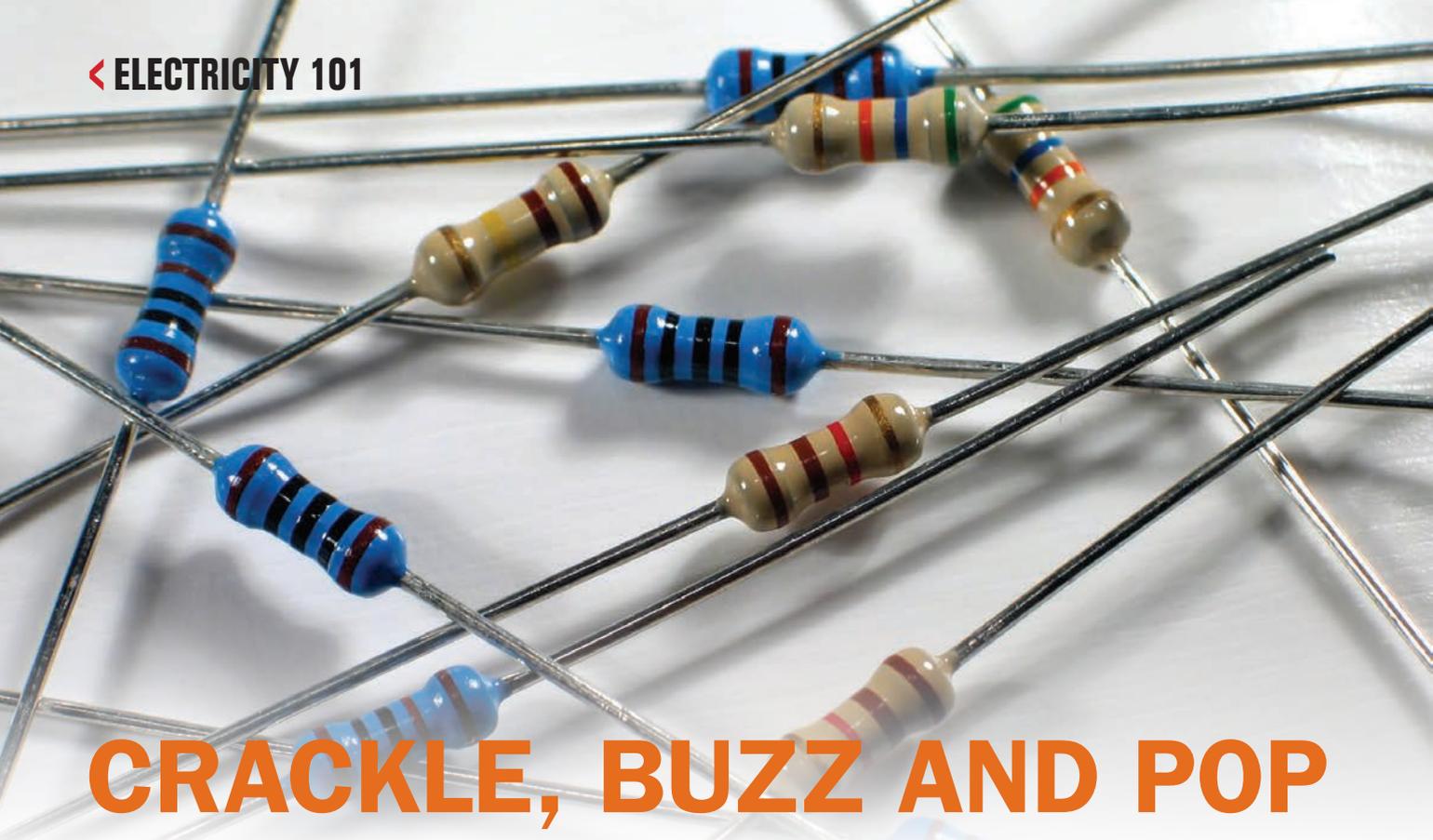
Conquest<sup>®</sup> condensing, gas-fired water heaters are constructed from AquaPLEX<sup>®</sup> duplex stainless steel so they're corrosion-resistant in potable water at any temperature. Available in 199-1000 MBH, Conquest provides even more BTUs in small spaces and fits through a standard 36-inch doorway. With a thermal efficiency of up to 96%, long product life and a 15-year tank and heat exchanger warranty, you can't afford not to have one.



800.784.8326 | [pvi.com](http://pvi.com)

**AquaPLEX<sup>®</sup>**  
Engineered Duplex Alloy

*Engineered Water Heating Solutions<sup>®</sup>*



# CRACKLE, BUZZ AND POP

What you need to know about resistance. BY CURTIS BENNETT

There are some facts about thermistors and resistance that cause confusion. Luckily that lines up with our topics on electricity. How you wonder? Once again it is all physics.  $V = I R$ , where the R is resistance. A story will help to illustrate the topic.

I always knew what I wanted to be when I was finished school. I was ridiculously interested in electronics from a young age. After finishing high school I attended the Southern Alberta Institute of Technology (SAIT). After my first year there I figured I was a computer scientist. We had been taught a ridiculous amount of information and I thought at that point I knew everything. It turned out that even the basics can be forgotten very easily.

My family ended up gathering at my grandparents that summer. We were going to be sitting out on the patio and my

grandma asked me if I could hook up all the speakers they had outside to the new stereo they had purchased. Speakers in the front and speakers in the back all needed to come to one stereo.

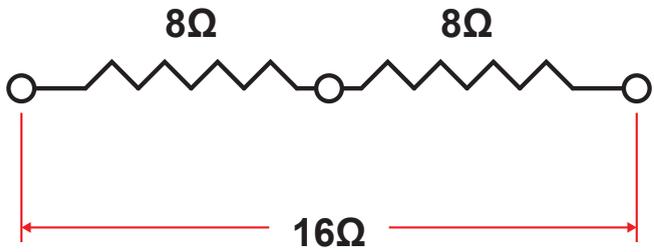
This sounded easy. I started to hook everything up all the while throwing the very basics about resistance right out the window. I took one wire from here, one wire from there, tied them all in and turned on the stereo to test. They all were working and sounding good for about 30 seconds before there was some crackling, then buzzing, then pop and then nothing. The first chance I had to show my family I was this awesome electronics guy went straight down the tubes.

I rushed inside to see what was going on. At first I thought the wires had come out of the terminal blocks because I had so many in there, only to have that very distinctive smoke smell lingering in the air and no power on the stereo. I had burned out the new stereo.

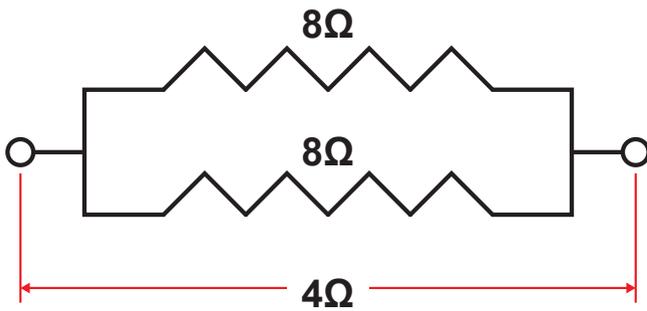
What went wrong? Let me articulate how I hooked up all the wires. There were only two speaker terminals on the back but I had eight speakers to hook up. So what did I do? I took four speakers and twisted all the wires together and put them on one side and then did the same on the second side. Easy right? Easy, yes, right, no! This takes us to our first lesson: resistance and parallel and series circuits.

What do speakers have to do with resistance? Speakers are rated in impedance and without getting into a whole bunch of physics equations, it is resistance at a certain frequency. For

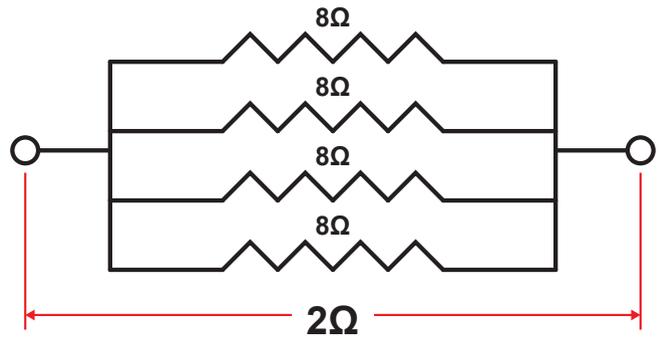
## Series



## Parallel



## Parallel



our purposes we will just say that speakers have a resistance. The symbol for resistance is the omega or the  $\Omega$ . In the case of these speakers, which were home speakers, the resistance is usually  $8\Omega$  while car speakers usually use  $4\Omega$ .

Each time you connect resistors in parallel, if they are the same resistance you essentially half the total resistance. If we had two  $8\Omega$  speakers and put them in parallel we would end up with  $4\Omega$ . If you connect resistors in series you add the resistance together. So if we had two  $8\Omega$  speakers and put them in series we would have  $16\Omega$ .

These are vastly different numbers. In my case I put four speakers in parallel. That put the total resistance down to  $2\Omega$ . When the resistance values are the same the math is simple but here is the actual formula for parallel resistance:

$$1/(1/r) + (1/r) + (1/r) + (1/r).$$

If we put the  $8\Omega$  speakers in there we can see how we came out to two ohms.  $1$  divided by  $8\Omega = 0.125\Omega$  so we put this in our formula and we get  $1/(0.125 + 0.125 + 0.125 + 0.125) = 1/0.5$ , which equals  $2\Omega$ . The problem with putting  $2\Omega$  into the stereo is the components that drive the speakers are rated for a certain driving power and when you lower the resistance too much things heat up and factory smoke comes out.

Was there a way that I could have done this properly? Yes there was by using a parallel series circuit. Sorry, more math coming. To connect the wires correctly I would have needed to put two sets of the speakers in series. What that would do is add the resistance together:  $8\Omega + 8\Omega = 16\Omega$ . That does not look right either but stay with me here. Then we take the other set that we put in series and we put that in parallel with the first and voila!  $1/(\frac{1}{16}) + (\frac{1}{16}) = 8\Omega$ . Math wins again.

What does resistance have to do with mechanical contracting and plumbing? Lots. To start with you have all heard the term thermistor. We use them all over the place. A thermistor is a resistance device where the resistance changes based on temperature. It is a handy device and used in about 100 per cent of boiler rooms. Every time you hook up a "sensor" to the boiler, or put a "sensor" in a DHW tank you are hooking up thermistors.

What did you learn here? Have you ever needed to take an

average reading of temperatures on a room, or had more than one tank you needed to average out the temperatures in. Do not kid yourself—it happens all the time.

To take an average you need to use four thermistors. Take two sets and put them in series and then take those two set in series and put those in parallel with each other. Then you can put those four thermistors wherever you want and they will give you the average of those four thermistors.

Resistance also crops up in continuity tests, more commonly known as the "beep test." The wording bugs me but I understand why people call it that. This test is used all the time while installing and/or troubleshooting a system. What it is essentially doing is checking for a short or an open circuit.

A short in electrical terms is a direct connection between two points and open is when the two points do not have any electrical connection. What the beep test tells us is that the two points you are testing are connected and have a very low resistance, usually below  $100\Omega$ . Most meters have this handy little test that, in a lot of cases, will be one of the first things you are asked about by someone in tech support. After the test you do have to power it up properly.

If wires can have a resistance then when we hook the wire up to the thermistors we are adding resistance to that thermistor. Does this affect the reading? It does affect the reading of that thermistor but not as badly as you might think. Yes wire has a resistance but it is a clearly defined number. Meaning that wire gauge determines the resistance per foot you need to add in.

Let's do a little experiment. Most manufacturers that use thermistors say do not use more than 1000 feet of wire to connect the thermistor to the control. One thousand feet of 18-2 sensor wire has about  $6.5\Omega$  of resistance on it going one way. We actually need to double it because we are adding the wire in series to both sides of the thermistor as we are going out to the thermistor then back to the control. Thermistors have a rating on them,  $10k\Omega$ ,  $5k\Omega$ ,  $2k\Omega$  or otherwise—what that means is the curve is specified so at  $25C$  the resistance equals that amount. So a  $10k\Omega$  thermistor is

Continued on p86

10,000Ω at 25C.

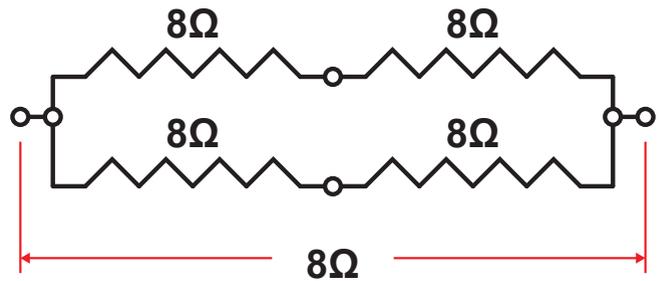
Using the term 10k thermistors loosely can sometimes get you into trouble as there are multiple curves when it comes to thermistors but for this purpose we will generalize. So, if we had a temperature on that thermistor of -5F (-20C) the resistance of the thermistor would be around 100,000Ω and if we added our (6.5Ω X 2) from our wire you can see that the wire resistance really will have no effect on the temperature reading at -5F. It goes from 100,000Ω to 100,012Ω.

If we go in the other direction and put the thermistor in 190F (88C) then the thermistor will make 1000Ω of resistance, and if we add on the wire resistance the total is 1012Ω you will see it does have more effect but still not much. At that point it will not even throw the reading out by one degree.

When measuring resistance on your handy dandy meter one major thing to remember is there can be no power on the line or the reading will not work. You cannot measure resistance with power on the line. That does not mean AC power necessarily. This can be any voltage, even the control putting DC voltage on that part. Word to the wise: power down before reading resistance.

It is also good practice to disconnect the wires from the con-

## Parallel Series



trols or whatever device they are attached to because there could be other resistors in parallel or series on the circuit board in the device, which will vastly skew your results. <->



*Curtis Bennett C.E.T is product development manager with HBX Control Systems Inc. in Calgary, AB. He formed HBX Control Systems with Tom Hermann in 2002. Its control systems are designed, engineered and manufactured in Canada to accommodate a range of hydronic heating and cooling needs commonly found in residential, commercial and industrial design applications.*



# Get Ready for the Heating Season with UEI's Combustion Analyzer Countdown

## C85: EOS Long Life Combustion Analyzer



WWW.UEITEST.COM  
Copyright © 2018 KANE USA. All Rights Reserved.



# 3

**Trusted Combustion Analyzers**  
For residential or commercial applications, proven solutions to match your job.

# 2

**-Day Turnaround on Annual Service**  
Up-front pricing means no surprises. For a standard, paid-for service received Monday we'll ship it no later than Wednesday.

# 1

**Company Offering Award-Winning Technology**  
HVAC professionals have benefitted from UEI's EOS technology for over 10 years.

# 0

**Oxygen Sensors to Replace**  
**NO** Oxygen sensor. This lowers cost-of-ownership with one less sensor to maintain. Over the lifespan of an analyzer this saves hundreds of dollars.

# One App to Rule Them All.



**ThermoLinX**<sup>TM</sup>  
Hydronic Network



## So Smart, It's Simple

With the HBX ThermoLinX App, you can configure and monitor any HBX 0550 series controller from your smartphone or tablet device. The App gives you access to all system information and the ability to receive alarm notifications at any time.



**Radiant Floor & Forced Air Heating & Cooling**



**Geothermal Heat Pump Control with Backup**



**Snow Melt Control**



**Boiler Staging & Mixing Control**



**Booth 532!**



Control Systems Inc.

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



# RULES CHANGE FOR TAXATION OF INVESTMENT INCOME

BY HANK BULMASH

**Y**ou may recall last summer's furor when the Minister of Finance announced changes to the tax regime of Canadian Controlled Private Corporations (CCPCs). In addition to increasing taxes on private companies, those changes would have imposed a costly compliance burden on taxpayers. The government seemed genuinely taken aback when it ran into nearly universal opposition.

Business groups were unanimous in their antagonism—as were professional organizations, doctors, dentists, architects, engineers, the Law Society and CPA Canada. Even Liberal MPs eventually joined the chorus for amending the government's position.

The government's response was announced in its March 2018 budget. It addressed the Finance Department's major concern that companies eligible for the small business tax rate were supposedly using the existing rules to obtain tax benefits on investment income. While the new rules contained in the budget are less draconian than the original plan, they still increase the tax burden on investment income earned by CCPCs. However, along with the bitter medicine on investment income, the government also produced some sugar to help the amended legislation go down.

A CCPC is a private corporation which is controlled by Canadian residents. A corporation will not qualify as a CCPC if it is controlled directly or indirectly by a public corporation or non-residents, or a combination of the two.

As of January 1, 2018, small business corporations have their tax rate reduced to 10 per cent federal tax rate on the first \$500,000 of qualifying active business income. The rate will be further reduced to nine per cent as of 2019. Those numbers are just the federal tax. The provinces tax small business income as well. For example, Ontario's small business rate is 3.5 per cent for 2018 for a quite low composite 2018 tax rate of 13.5 per cent.

Along with the rate reductions, the government has sharpened the focus of the low tax rate towards helping only small businesses. Access to the small business rate is reduced once a business (or an associated group of companies) has \$10 million of taxable capital employed in Canada. The small business rate is eliminated altogether once a company or associated group has \$15 million of taxable capital.

In addition, once a company accumulates a sizable investment portfolio, its opportunity to use the low tax rate will be phased out. For every dollar of investment income a company earns in excess of \$50,000, its small business limit of \$500,000 will be reduced by \$5. That means if a company earns \$80,000 of investment income, its business limit will be reduced for the \$30,000 of excess investment income. The reduction will be \$150,000 ( $\$30,000 \times 5 = \$150,000$ ) to \$350,000. That means, when investment income equals \$150,000, the \$500,000 small business limit will be reduced to zero.

## **RDTOH AND TAX INTEGRATION**

The 2018 budget brought in a major change to how investment income

earned in a corporation is taxed. When governments originally introduced the low small business rate for corporations, they wanted to ensure that the low rate was applied only to active business income—not investments. The goal was to encourage the growth of Canadian small business with a tax preference. However, no government wanted to extend that tax preference to investment income.

To that end, investment income earned in corporations is taxed at the maximum personal rate. For example, the combined federal-provincial rate in Ontario is just over 50 per cent. When your company earns \$10,000 in investment income, the tax on that income is about 50 per cent. If your personal tax rate is, say 40 per cent, you will end up paying a penalty of 10 per cent by earning investment income in the corporation.

That penalty is very punitive. In fact, it is more punitive than the government intends. The mechanism for avoiding a significant tax penalty is embodied in a tax principle called tax integration. The idea behind integration is that a taxpayer should be indifferent between earning investment income in a company or personally meaning the tax should be the same whether you earn investment income personally or in a corporation.

The mechanism the Tax Act employs to attain integration is the dividend gross up and refundable tax system. The acronym for refundable tax is RDTOH (Refundable Dividend Tax On Hand).

When a company pays tax on investment income, a portion of that tax goes into the RDTOH account. When dividends are paid out, the company gets a



“Now the Department of Finance has decided it is being cheated by an element of the very system it created.”



tax credit based on the amount on the RDTOH account. For example, let's say your company earns \$100 in investment income. The tax on that would be about \$50. At the same time about \$31 goes into the RDTOH account. A year later, you decide to pay a dividend of \$81 to the shareholders. Why \$81? Because the company has an after tax amount from its investment income of \$50 plus it will get a dividend refund equal to 38 per cent of any dividend paid. Paying an \$81 dividend will generate a dividend refund of \$31. The \$31 dividend refund will reduce the RDTOH account to zero. After paying personal tax on the dividend of \$81, the after tax amount retained by the taxpayer will be roughly (although a little less) than what he would have retained if he had made his investment personally.

That is how the system worked for a long time. Now the Department of Finance has decided it is being cheated by an element of the very system it created.

The payee must classify dividends paid to the taxpayer as eligible dividends or non-eligible dividends. The tax is lower on an eligible dividend. Most dividends paid by public companies are eligible and

have about a 39 per cent maximum tax rate. Non-eligible dividends are subject to a maximum tax of about 47 per cent. The idea is there should be a lower personal tax on dividends coming from business income on which full tax has been paid. So if you receive a dividend from the Royal Bank—the dividend will be eligible. RBC does not qualify for the small business rate. It is too big.

Private companies that earn more than \$500,000 per year in active business income pay tax at two rates. On the first \$500,000 of active business income, they pay tax at the low rate. But for active business income in excess of the \$500,000 limit, they pay tax at the full business rate, which is about 25 per cent instead of about 15 per cent. Dividends from that income pool are eligible and taxed at the low rate.

If you get a dividend from your family company, JonesFamilyCo, and your company paid tax at the low business rate the dividend will be non-eligible. And your personal tax will be higher. What about investment income earned by JonesFamilyCo? Tax on that was paid at the highest rate. No win there.

Dividends paid from small company investment income are also non-eligible.

But what if JFC pays an eligible dividend from its fully-taxed active business income. In that case the dividend would be eligible. Not only would the dividend be eligible (and taxed at the low rate) but it would generate an RDTOH refund in the company. So the company could get a refund of the high tax paid on investment income while it paid a dividend from its high-tax, active business income pool.

The Finance Department has decided it does not like that. And so the 2018 budget has brought in changes. From the beginning of tax years starting in 2019, a company will no longer be permitted an RDTOH refund on eligible dividends. That means when a shareholder receives a dividend paid from a company's investment income, in order for the company to receive a refund from the RDTOH account, the dividend paid must be a high-tax, non-eligible dividend. This rule will not apply to dividends paid by a CCPC funded by eligible dividend income it has received. Those dividends will generate an RDTOH through an amendment to the RDTOH system.

There are transitional proposals to set up this new RDTOH system. RDTOH will be split into two accounts, eligible and non-eligible RDTOH. Eligible RDTOH will track just refundable tax paid on eligible dividends received.

These new rules come into effect in 2019. You can still obtain a deferral in 2018 if your corporation has both a general rate income pool (GRIP) account and a balance in its RDTOH account. To see if that makes sense for you, you should discuss the issue with a professional advisor. <>



*Hank Bulmash, CPA, CA, MBA, TEP, is CEO of Bulmash Accounting Professional Corporation in Toronto, ON. He can be reached at [hank@bulmash.ca](mailto:hank@bulmash.ca).*

# WHAT TO DO ABOUT THAT PESKY R-22 CHILLER - PART I

The crucial pieces of information you need to determine the best choice for R-22 replacement.

BY DAVE DEMMA

While there have not been any widespread shortages of R-22 to date, the price has certainly been reflective of a reduced supply. With a complete ban on new R-22 (either imported or manufactured) beginning January 2020, the supply will continue to reduce. That likely means continued increases in price.

So, what are the options for those R-22 chillers still in use? Certainly, replacing an older R-22 chiller with a new, more efficient chiller is always desirable but it is not always practical in a budgetary sense.

Let's review the procedure for undertaking a refrigerant conversion for R-22 chillers starting with the refrigerant selection. Part II in HPAC December 2018 will address the conversion procedure.

## CHOOSING THE R-22 REPLACEMENT

Table 1 is a list of the available R-22 replacements. There are essentially four main building blocks for all of these refrigerants; R-32, R-125, R-134A and R-143A.

There are many R-22 replacement choices available and each has its plusses and minuses. Just as there were no perfect replacements for R-12 or R-502, there is no perfect replacement for R-22. And while the term drop-in seems to be

freely used in reference to R-22 replacements, there are no replacements that you can simply drop-in in place of R-22 and walk away without any further concern.

The fact is there is no single R-22 replacement that has properties identical to R-22. Since each refrigerant has its own particular set of thermodynamic properties, it stands to reason that each refrigerant will have its own specific capacity compared to R-22, mass flow rate compared to R-22 and efficiency compared to R-22.

The following are three of the crucial pieces of information in determining the best choice as a replacement for R-22.

**1) System capacity with new refrigerant (compared to R-22):** This is pretty self-explanatory. If you have a 75-ton chiller and the particular application requires all of that 75 tons to maintain the design temperature, then a reduction in capacity would not be acceptable. Typically, the capacity for the R-22 replacement should have a capacity that is fairly close to the original system capacity with R-22.

**2) Refrigerant mass flow rate with new refrigerant (compared to R-22):** This might not be quite so self-explanatory, but still important in terms of complexity and expense of the conversion. The thermodynamic properties will determine what the refrigerant mass flow rate will be in a given ap-

		Refrigerant (ASHRAE Number & GWP)																	HFO-HFC Blend Options						
		Refrigerant	R-32	R-404A	R-407A	R-407C	R-407F	R-410A	R-417A	R-421A	R-422A	R-422B	R-422D	R-424A	R-427A	R-428A	R-434A	R-438A	R-507	R-448A	R-449A	R-452B	R-454B	R-513A	
		GWP	677	3943	1923	1624	1674	1924	2346	2600	3143	2525	2729	2440	2138	3607	3245	2265	3985	1273	1282	676	467	573	
Components	R-32 (677)	100.0%		20.0%	23.0%	30.0%	50.0%							15.0%				8.5%		26.0%	24.0%	67.0%	68.9%		
	R-125 (3170)		44.0%	40.0%	25.0%	30.0%	50.0%	46.6%	58.0%	85.1%	55.0%	65.1%	50.5%	25.0%	77.5%	63.2%	45.0%	50.0%		26.0%	25.0%	7.0%		44.0%	
	R-134A (1300)		4.0%	40.0%	52.0%	40.0%		50.0%	42.0%	11.5%	52.0%	31.5%	47.0%	50.0%		18.0%	44.2%			21.0%	26.0%				
	R-143A (4800)		52.0%												10.0%	20.0%	16.0%		50.0%						
	R-1234YF (HFO) (4)																				20.0%	25.0%	26.0%	31.1%	56.0%
	R-1234ZE (HFO) (6)																				7.0%				
Hydrocarbon Component	R-290 Propane															0.6%									
	R-601 NButane												1.0%					1.7%							
	R-600A IsoButane							3.4%		3.4%	3.0%	3.4%	0.9%		1.9%	2.8%									
	R-601A IsoPentane												0.6%					0.6%							

Table 1 Chemical Composition of R-22 replacements

Thermostatic Expansion Valve Selection									
120,000 Btu Evaporator 45F SST / 105 SCT 100F Liquid Temp	R-22	R-407A	R-407C	R-417A	R-421A	R-422B	R-424A	R-434A	R-438A
TEV Selection (Using R-22 Dist/Nozzle)	OVE-10								
Thermostatic Element Replacement Required?	---	No	No	No	---	No	---	Yes	No
New Element (if required)	---	---	---	---	---	---	---	SCP100	---
Nominal TEV Capacity after Element Replacement	---	---	---	---	---	---	---	6 Ton	---
% Rated Capacity at 105F Condensing	99%	99%	92%	150%	151%	155%	151%	188%	123%
Valve Replacement Required?	---	No	No	OVE-15	OVE-15	OVE-15	OVE-15	OSE-12	OVE-15

Table 2 TEV capacity with R-22 replacements

plication. TEV capacity is based on physical dimensions of the valve pin and port, system conditions and thermodynamic properties of the refrigerant.

If the mass flow requirement of the replacement refrigerant is significantly greater than the mass flow requirement for R-22, than the existing R-22 TEV would have insufficient capacity for the replacement refrigerant.

Table 2 shows a Thermostatic Expansion Valve (TEV) selection for a 10-ton AC application with R-22. An OVE-10 was selected, and it is operating at 99 per cent of its rated capacity at the design condition.

The table shows eight R-22 replacements, and how the R-22 TEV selection fares with each of the new refrigerant possibilities.

With R-407A and R-407C having similar mass flow rates to R-22, the original R-22 TEV selection is very suitable for application with both refrigerants. The others on the chart do not fare so well. Each has a greater mass flow requirement than R-22, resulting in the original R-22 TEV being undersized for each. The most notable capacity deficiency is with R-434A. In addition, the manufacturer of R-434A states that their refrigerant requires a TEV element that is compatible with R-502 (R-404A).

Certainly, there is no problem using any of these refrigerants as a replacement for R-22. But the TEV replacement adds cost and complexity to the conversion.

A note regarding chillers with electronic expansion valves (EEVs): while there is no compatibility issue regarding the use of the R-22 EEV with any of these R-22 replacements, it is important to investigate whether the EEV controller was programmed with the ability to operate with the refrigerant you're planning on using. This might be the determining factor in which refrigerant is chosen. Worst case scenario is that the controller was only programmed to be used with R-22. This would then require replacing or upgrading the controller, or forgoing the conversion.

**3) System efficiency with the new refrigerant (compared to R-22):** This is often overlooked. However, a refrigerant that has a reduced efficiency compared to R-22 will result

in increased electrical consumption. This should also be a consideration, as operating expenses accrue every month.

In addition to the factors listed above, the following might be secondary factors, which would be considered:

- Pressure-Temperature relationship of the conversion refrigerant
- Has compressor manufacturer evaluated compressor performance and wear with conversion refrigerant
- Oil requirements of the conversion refrigerant
- Environmental concerns (GWP of the conversion refrigerant)
- Price and availability of the conversion refrigerant

Table 3 shows the more common R-22 replacements, showing capacity relative to R-22, mass flow relative to R22, and efficiency relative to R-22 when applied in a comfort cooling application.

Looking over this list of replacements, with the parameters listed, it becomes easier to make an educated choice. For example:

- R-404A shows to have good capacity compared to R-22. However, with a 42 per cent greater mass flow requirement, a TEV replacement will be required. In addition, it has a nine per cent reduction in efficiency.
- R-417A shows to have a good mass flow requirement compared to R-22, meaning that a TEV replacement will not be required. But a 14 per cent capacity loss would likely not be the best choice.
- R-407C show a slight increase in capacity compared to R-22, very close mass flow requirement compared to R-22, and a minor three per cent drop-in efficiency. In addition, R-407C has been out of patent for several years. It is widely distributed and reasonably priced. As such, the industry has seen R-407C as the more common replacement for R-22 in comfort cooling applications.

## READING THE FINE PRINT

There is a considerable amount of misinformation regarding the pros and cons of various R-22 replacements. It is best to

Continued on p92

read the fine print to have the necessary information to make the best choice for a replacement.

For instance, in referring to *Table 1* (Chemical composition of R-22 replacements), these replacements can be categorized in many ways, one important distinction is those refrigerants that have a hydrocarbon component (which allows the refrigerant to be used with mineral oil), and those that do not have a hydrocarbon component (which requires the use of POE).

One refrigerant manufacturer states this in its Conversion Guidelines: *A lubricant change may not be required, but POE is always recommended for optimal performance. Confirming oil quality is important. Check the oil for moisture, acidity, and metal shavings or sediments. If the oil does not meet the desired specification, a complete oil change using POE is recommended. Systems with complex piping schemes or receivers could impede proper oil return so adding or changing over to POE is recommended. And oil change to POE is also recommended for systems designed to lubricate compressor bearings by pulling oil from the bottom of the oil sump, such as with Danfoss SM scroll and Trane 3-D compressors.*

The fact is the refrigerant in question does not have a hydrocarbon component in its chemical composition. While there “might” be some systems with short and simple piping runs (package AC units) where one could get away with using mineral oil, this practice is not recommended by compressor manufacturers.

Another refrigerant manufacturer states: *Because R-\*\*\* is a close match for R22 with similar cooling capacity, energy efficiency, pressures & low glide, it is suited for use in new equipment by Original Equipment Manufactures where it has significant advantages over R-\*\*\*. Owing to the fact that R-\*\*\* is compatible with*

Refrigerant	Trade Name	Capacity Relative to R-22	Mass Flow Relative to R-22	Efficiency (COP) Relative to R-22	Recommended Lubricant Type
R-404A	HP62, FX-70	103%	142%	91%	POE
R-407A	Klea 60	106%	114%	96%	POE
R-407C	Suva 9000	102%	101%	97%	POE
R-407F	Performax LT	112%	109%	96%	POE
R-417A	MO59, NU22	86%	107%	96%	MO, AB, POE
R-421A	Choice	88%	120%	95%	MO, AB, POE
R-422A	MO79, OneShot	102%	164%	90%	MO, AB, POE
R-422B	NU22B	89%	118%	95%	MO, AB, POE
R-422C	One Shot B	100%	158%	91%	MO, AB, POE
R-422D	MO79	93%	131%	93%	MO, AB, POE
R-424A	RS-44	86%	130%	96%	MO, AB, POE
R-427A	FX-100	98%	103%	97%	POE
R-428A	RS-52	107%	170%	89%	MO, AB, POE
R-434A	RS-45	99%	144%	93%	MO, AB, POE
R-438A	MO99	94%	111%	96%	MO, AB, POE
R-507A	AZ-50	104%	148%	90%	POE

Table 3 Comparative Performance of R-22 Replacements in AC applications

mineral & alkylbenzene lubricants, it is suitable for use as a *Drop-in replacement for R22 in systems which contain an expansion device.*

From this marketing blurb, one would think they had stumbled upon the Holy Grail of R-22 replacements but for the fine print: *For the same duty R-\*\*\* has a higher volume flow rate than R22 which may require OEMs to increase appropriately the sizes of liquid lines to optimize performance, notably the following:*

**(1) Capillary tube:** *the length may need to be decreased, the diameter increased or a combination of both.*

**(2) Expansion valve:** *recommendation is to that the TX valve is sized to accommodate a mass flow 40% greater than R22. The bulb in a TXV typically used in a R502 system should be used.*

**(3) Liquid line:** *the diameter may need to be increased. On large systems with remote air-cooled condensers the liquid return line from the outlet of the condenser to the inlet of the receiver may also need to be modified.*

However, OEMs should also note that the liquid viscosity of R-\*\*\* is significantly lower than that of R22 (see physical properties table) so that only modest changes to the liquid lines and expansion devices may be required.

To optimize system performance with R-\*\*\*, *evaporator and/or condenser capacities may need to be altered in some cases.* The addition of a liquid/suction heat exchanger may also improve overall performance.

In systems where oil return could be an area of potential concern, e.g. containing a liquid receiver, flooded evaporators or long & complex pipelines, *the replacement of up to 25% of the oil charge with a POE is recommended starting with an initial 10% followed by increments of 5% until the oil level stabilizes & returns to normal.*

No additional commentary besides the red highlights is required, only to point out that with all of the “which may require” warnings, this particular refrigerant is anything other than a drop-in replacement for R-22.

Do your own research and read the fine print.<>



Dave Demma holds a degree in refrigeration engineering and worked as a journeyman refrigeration technician before moving into the manufacturing sector where he regularly trains contractor and engineering groups. He can be reached at [demma@uri.com](mailto:demma@uri.com).

# DON'T GET CAUGHT IN THE WEED(S): CANNABIS AND THE WORKPLACE

Cannabis legalization presents challenges new and old for employers, but leveraging legal tools can make for a smooth transition. **BY DIANE LARANJA**

**E**ffective October 17, 2018, recreational cannabis became legal in Canada. It is not surprising many employers fear the cognitive and psychomotor effects its use will present in the workplace.

Cannabis is a generally impairing substance. Its effects can include diminished cognitive functions, such as memory loss, confusion and loss of concentration, as well as diminished psychomotor abilities, such as delayed reactions or response time. These effects can significantly impact an individual's ability to work safely and effectively.

## EMPLOYER OBLIGATIONS

The effects of cannabis use are problematic given an employer is obligated to take every precaution reasonable in the circumstances to protect the health and safety of a worker. Occupational health and safety legislation in British Columbia explicitly requires a worker to not be impaired at work, and Yukon statutorily requires an employer to not allow workers to be in the workplace while impaired.

Although there are no statutory provisions in the other provinces and territories' occupational health and safety legislation that specifically address substance use in the workplace, it is arguably incumbent on an employer to implement an appropriate policy to deal with cannabis (and other substance use) as part of its due diligence requirements. In all jurisdictions, an employer should therefore take every reasonable precaution to minimize the risks caused by workers who are impaired or potentially impaired at work by cannabis.

Workers should also be adequately informed, instructed, and supervised on this policy.

## HUMAN RIGHTS PROTECTIONS

An addiction to or medical authorization to use cannabis is protected by applicable human rights legislation. Because of an employer's occupational health and safety obligations, many are inclined to enforce a "zero-tolerance" policy for cannabis use. It should be noted, however, that an employee's reported use of cannabis may trigger an employer's duty to accommodate pursuant to applicable human rights legislation.

Medicinal use of cannabis has been authorized since as early as 2001. Since this time, physicians have been permit-

ted to authorize patients to use cannabis for a variety of therapeutic or medicinal purposes. Further, an addiction to cannabis is recognized as a protected disability under human rights legislation. These human rights protections must be considered alongside an employer's health and safety obligations.

Accommodating an employee's cannabis use presents a wide range of considerations and concerns. However, accommodation is not a limitless exercise. An employer is not obligated to incur undue hardship in order to accommodate an employee's disability, which includes undue health and safety risks. Instead of an illusory concern, an employer must be prepared to establish that there are demonstrable health and safety concerns resulting from the specific employee's cannabis use that constitute undue hardship. So in order to assess the potential health and safety risks that cannabis use may present, an employer is entitled to know (and should know) the limitations that the employee's disability or authorized cannabis use may have on his or her ability to work safely and effectively. This includes information regarding the dosage, tetrahydrocannabinol (THC) concentration level, timing and method of consumption in order to determine the potential impairing effects.

## TESTING FOR CANNABIS

Employers increasingly view drug testing as an effective tool to detect and combat problematic cannabis use by employees. In some cases, drug testing can certainly serve this important objective.

Across Canada, however, testing for cannabis raises difficult privacy and human rights issues that ought to be considered. Drug testing remains only justified in safety-sensitive workplaces and only in certain circumstances.

An employer may demand a drug test if: (a) the employer has reason to believe that an employee is impaired at work, (b) the employee was involved in an accident or "near-miss," and the employer's preliminary investigation does not identify an obvious reason for the incident (such as a mechanical failure), or (c) the employer and employee develop an appropriate return-to-work protocol after the employee's rehabilitative efforts.

Random drug and alcohol testing is the most controversial form of testing. In order to justify random drug testing, the

*Continued on p94*

employer must first demonstrate that there is a general substance use problem in the workplace and that the random drug testing will adequately address this workplace issue.

An employer should ensure that the method of testing properly detects impairment or likely impairment. If an employer is unable to establish that an employee is actually impaired while at work with the testing method that it implemented, then an adjudicator may not find that the test was justifiable or that the employee committed any wrongdoing.

Although it remains limited, the science and capability in detecting impairment when it comes to cannabis use continues to improve. Employers should work with the appropriate providers to ensure they are using the proper and updated forms of testing.

### RESTRICTED USE

With its legalization, an employer can—and is expected to—limit or restrict the use of cannabis in the workplace. For example, the Ontario Smoke-Free Ontario Act, 2017, which is currently paused for further review, would prohibit individuals from smoking or holding lighted medical cannabis in a number of places, including in an “enclosed workplace” or “enclosed public place.” It would also require an employer to:

- ensure compliance with the restrictions on smoking or holding lighted medical cannabis in enclosed spaces;
- provide notice to employees of the restrictions;
- post signs throughout the workplace;
- ensure that there are no ashtrays or similar equipment in the enclosed workplace or area (other than a vehicle in which the manufacturer has installed the ashtray); and
- ensure that employees or persons who do not comply with these requirements are removed from the space

Corporations who fail to abide by these obligations may be fined up to \$100,000 for a first offence, and up to \$300,000 for subsequent offences. Individuals may also be fined up to \$1,000 for the first offence, and up to \$5,000 for subsequent offences.

The Ontario Cannabis Act, 2017, which is also paused for further review, would prohibit individuals from consuming recreational cannabis in a workplace within the meaning of the Occupational Health and Safety Act (OHS) (as well as other specified locations, such as a public place). The OHS’s definition of a “workplace” includes “any land, premises, location, or thing at, upon, in or near which a worker works.”

Another example is found in Alberta, where its Bill 26: An Act to Control and Regulate Cannabis, which will soon be brought into force, will prohibit smoking cannabis in any location where smoking tobacco is also prohibited. This would include workplaces.

There is also British Columbia’s Cannabis Control and

Licensing Act, which is currently in its third reading, and will prohibit smoking and vaping cannabis in a “fully or substantially enclosed” workplace. Nova Scotia and New Brunswick have each enacted their own Cannabis Control Act. Both state that smoking cannabis is prohibited in a place that is set out and defined in the respective province’s Smoke-free Places Act for tobacco.

It can be seen and expected that after recreational cannabis is legalized, an individual cannot consume recreational cannabis in the workplace. It should be noted for the reasons above, however, that if an employee requires medical cannabis, the employer should consider their obligation to accommodate a disability under the applicable human rights legislation.

### DRUG (AND ALCOHOL) POLICY

There can be no doubt that the legalization of cannabis will bring about a slew of challenges for employers.

In order to prepare for these challenges, employers should consider creating or appropriately revising written drug use policies. The objective of a drug (and alcohol) policy should be to educate workers, including supervisors and managers, and to clearly outline how the use of cannabis will be addressed.

A drug (and alcohol) policy should:

- Identify the objective of the policy and acknowledge your and an employee’s obligations under the applicable human rights legislation.
- Outline clear expectations regarding fitness for duty, workplace use, possession, and sale of impairing substances. This includes what a worker is expected to do and what a worker is prohibited from doing.
- Inform employees of any investigations or justifiable drug testing that may occur and in what circumstances.
- Provide information on support resources, such as access to an employee assistance program, and accommodations that are available to employees with a disability. This should include the contact information of a designated representative who will handle requests or needs for accommodation.
- Advise employees of the disciplinary consequences for violating the drug (and alcohol) policy and workplace rules regarding substance use in the workplace.

Developing appropriate workplace drug use policies, and the legal tools available to employers will help to maintain safe workplaces moving forward. <>

---

*Diane Laranja is a lawyer with Fillion Wakely Thorup Angeletti LLP, which is a management-side employment and labour law firm in Toronto, Ontario. Laranja can be contacted for more information or assistance at 416.408.5565 or [dlaranja@fillion.on.ca](mailto:dlaranja@fillion.on.ca).*

home reno  
rebate



Your customers will get up to \$5,000 and you'll get the thanks



Your customers get up to

**\$5,000**  
back

Your customers will thank you for letting them know about rebates for energy saving upgrades that will save them up to 20 per cent a year in utility costs. The Home Reno Rebate. We write the cheque. You get the credit. Visit [uniongas.com/homerencontractor](https://uniongas.com/homerencontractor) to find out more.

Limited time offer. Program enrollment and rebate payment subject to availability of funds. Some conditions apply. Please go to [uniongas.com/homerencontractor](https://uniongas.com/homerencontractor) for complete terms and conditions.

This program is delivered by Union Gas in partnership with the Government of Ontario.



**uniongas**  
An Enbridge Company



**Ontario**

# TRAINING

EDUCATIONAL OPPORTUNITIES ACROSS CANADA

## HRAI Training

The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) offers a variety of residential and commercial courses. The Small Commercial Heat Loss & Heat Gain Calculations course is developed for HVAC technicians and designers. This three-day course instructs participants in proper calculation of small commercial heat gains and heat losses, and applies to buildings of up to three storeys and 600 sq. metres per storey. For scheduling opportunities, tel. 800.267.2231 ext. 237, or e-mail amantei@hrai.ca. [www.hrai.ca](http://www.hrai.ca)

## Construction Education Council

CEC's National Seminar Program offers over 160 seminars. Areas of interest run from supervisory training, estimation, project management, commissioning, safety, leadership and communication, productivity, business management, and service, to name a few. Where applicable the courses have been Gold Seal Accredited. The majority of listed programs are ½ day to two days in duration. To determine if a seminar has been scheduled in your area, tel. 613.232.5169. [www.constructioneducation.ca](http://www.constructioneducation.ca)

## Hydronics Training

The Canadian Hydronics Council (CHC) has partnered with NAIT and British Columbia Institute of Technology to provide course blocks toward CHC certification for hydronic system designers and installers. At NAIT students can register for online or paper-based learning and have nine months to complete each block. [www.ciph.com](http://www.ciph.com)

## TECA Quality First Training

TECA's Quality First training programs are developed by the industry, for the industry, setting minimum standards for the residential and light

commercial heating, ventilating and cooling trade in BC. Courses provide contractors with the information they need to install equipment that operates safely and comfortably at rated efficiencies. [www.teca.ca](http://www.teca.ca)

## Dollars to \$ense Energy Management Workshops

Since 1997, over 30,000 representatives of industrial, commercial and institutional (ICI) organizations have enrolled in the Dollars to \$ense energy management workshops. In 2016, the material was completely remodeled and updated; it is now presented in 30 modules, which can easily be used as building blocks for organizations that have limited resources or that wish to focus on specific topics. [www.cietcanada.com](http://www.cietcanada.com)

## International Ground Source Heat Pump Association (IGSHPA)

Under agreement with AGSHP, HRAI will be providing IGSHPA training courses for geothermal heat pump system designers and installers in Ontario. The courses are in support of the recently established GreenON Low Carbon Technologies Incentive Program requirements, using IGSHPA certified trainers. The IGSHPA Accredited Geothermal Installer course covers ground-source heat pumps systems, while IGSHPA Certified Residential Geothermal Designer course will train attendees on how to properly design a residential geothermal heat pump. For details contact Angie Mantei at 800.267.2231, ext. 237 or e-mail amantei@hrai.ca. [www.hrai.ca](http://www.hrai.ca)

## GPRO Fundamentals of Building Green

Canada Green Building Council is offering this four-hour course as part of its Green Professional Skills Training (GPRO) program. It teaches the basics of sustainability and provides an overview of the essential strategies and work practices that make buildings more efficient. [www.cagbc.org](http://www.cagbc.org)

# THE SOURCE

ADVERTISERS IN THIS ISSUE

Adrian Steel.....	<a href="http://AdrianSteel.com">AdrianSteel.com</a> .....	68
AERCO.....	<a href="http://aerco.com">aerco.com</a> .....	7
AHR Expo.....	<a href="http://ahrexpo.com">ahrexpo.com</a> .....	67
Amvic Building System.....	<a href="http://amvicsystem.com">amvicsystem.com</a> .....	69
Bosch.....	<a href="http://BoschHeatingAndCooling.com">BoschHeatingAndCooling.com</a> .....	36
Bibby Ste-Croix.....	<a href="http://Bibby-Ste-Croix.com">Bibby-Ste-Croix.com</a> .....	41
Boshart Industries.....	<a href="http://boshart.com">boshart.com</a> .....	46
Brant Radiant Heaters.....	<a href="http://brantradiant.com">brantradiant.com</a> .....	14
Canada Controls.....	<a href="http://canadacontrols.com">canadacontrols.com</a> .....	16
Canarm.....	<a href="http://canarm.com">canarm.com</a> .....	17
CIPHEX West.....	<a href="http://ciphexwest.ca/register">ciphexwest.ca/register</a> .....	72
Delta.....	<a href="http://deltacommercialfaucets.ca">deltacommercialfaucets.ca</a> .....	19
Electric Eel.....	<a href="http://electriceel.com">electriceel.com</a> .....	24
Franklin Electric.....	<a href="http://littlegiant.com">littlegiant.com</a> .....	25, 64
Fujitsu.....	<a href="http://fujitsu-general.com">fujitsu-general.com</a> .....	13
General Pipe Cleaners.....	<a href="http://drainbrain.com/geneye">drainbrain.com/geneye</a> .....	53
Gerber.....	<a href="http://gerberonline.ca">gerberonline.ca</a> .....	57
Giant.....	<a href="http://giantinc.com">giantinc.com</a> .....	22
GM.....	<a href="http://gmfleet.ca">gmfleet.ca</a> .....	103
Gree.....	<a href="http://gree.ca">gree.ca</a> .....	31
Hardcast.....	<a href="http://hardcast.com">hardcast.com</a> .....	35
HBX.....	<a href="http://hbxcontrols.com">hbxcontrols.com</a> .....	87
IBC.....	<a href="http://ibcboiler.com">ibcboiler.com</a> .....	47

ICP.....	<a href="http://GoKeepRite.com">GoKeepRite.com</a> .....	29
IPEX.....	<a href="http://Scorewithsystem636.com">Scorewithsystem636.com</a> .....	71
Liberty Pumps.....	<a href="http://libertypumps.com/stormcell">libertypumps.com/stormcell</a> .....	51
Lochinvar.....	<a href="http://Lochinvar.com">Lochinvar.com</a> .....	39
Master Group.....	<a href="http://master.ca">master.ca</a> .....	55
Napoleon.....	<a href="http://napoleonheatingandcooling.com">napoleonheatingandcooling.com</a> .....	9
Navien.....	<a href="http://NavienInc.com">NavienInc.com</a> .....	11
Noble.....	<a href="http://noble.ca">noble.ca</a> .....	61
PVI.....	<a href="http://pvi.com">pvi.com</a> .....	83
Reed.....	<a href="http://reedmfgco.com">reedmfgco.com</a> .....	42
Saniflo.....	<a href="http://saniflo.ca">saniflo.ca</a> .....	45
Taco.....	<a href="http://tacocomfortsolutions.com">tacocomfortsolutions.com</a> .....	4
Tamas Hydronic.....	<a href="http://TamasHydronic.com">TamasHydronic.com</a> .....	44
Testo.....	<a href="http://testo.com/promo">testo.com/promo</a> .....	15
The Whalen Company.....	<a href="http://whalencompany.com">whalencompany.com</a> .....	18
TRP.....	<a href="http://hrai.ca/trp">hrai.ca/trp</a> .....	14
UEI Test Instruments.....	<a href="http://ueitest.com">ueitest.com</a> .....	86
Union Gas.....	<a href="http://uniongas.com/homerencontractor">uniongas.com/homerencontractor</a> .....	95
Viessmann.....	<a href="http://viessmann.ca">viessmann.ca</a> .....	2
Viewpoint.....	<a href="http://VIEWPOINT.com/ViewpointOne">VIEWPOINT.com/ViewpointOne</a> .....	65
Watts.....	<a href="http://Watts/Deadlevel.com">Watts/Deadlevel.com</a> .....	104
Zurn.....	<a href="http://zurn.ca">zurn.ca</a> .....	23

# THE CASE FOR RAINWATER HARVESTING

Is this age old practice an area of potential growth for contractors? **BY ROBERT WATERS**

**C**anada is a country with vast fresh water resources. In most areas of Canada you are never far from a lake, river or underground aquifer. The Great Lakes alone are the largest system of fresh surface water on the earth, holding roughly 18 per cent of the world's supply.

With all of this fresh water close at hand why would anyone in Canada need to collect rainwater? It turns out there are many compelling reasons to install a rainwater harvesting system that have to do with both environmental protection and smart economics. The market for rainwater harvesting systems in Canada is growing steadily, especially in certain regions across the country that now experience water scarcity on a seasonal or ongoing basis.

Not all areas of the world are as blessed with water as Canada, and the rainwater harvesting industry is very well established in other parts of the world. The purpose of a rainwater harvesting system is to collect rain and store it for later use and it is an ancient practice that goes back thousands of years.

Australia, Germany, Japan and the southern USA are just a few examples of areas with very strong rainwater harvesting markets, utilizing new modern methods and materials. In Queensland, Australia, rainwater harvesting is mandated for all new homes, and the State of Texas now requires installations for large government buildings.

## THE BENEFITS

Local harvesting of rainwater has several environmental benefits. It is less

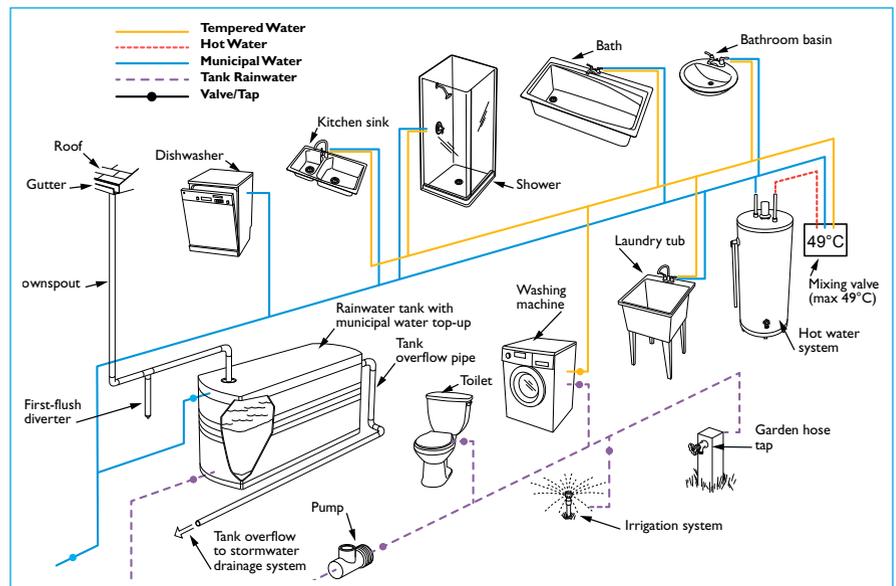


Figure 1 Integration of a rainwater harvesting system into a household plumbing system

energy intensive than desalination and water recycling, and reduces the energy consumption and GHG emissions linked with treating and pumping water from a municipal water plant. Rainwater is a renewable and sustainable water source that is almost pH neutral, chlorine free, naturally soft with no minerals, and is often cleaner than groundwater.

In some older urban areas the collection of rainwater can help to reduce the potential for basement flooding by decreasing the amount of rainwater leaving the property and entering storm sewers.

There are also big economic benefits to installing a rainwater harvesting system. By collecting and using water on site, there can be substantial reductions in municipal water and sewage charges. In some cases using rainwater can allow building owners to avoid watering bans in times of drought.

## COMMON USES

Rainwater is most commonly used for non-potable applications. Indoors this will be for toilet and urinal flushing and laundry, while outdoors it will be used for irrigation and gardening. Rainwater can also be used as potable drinking water, but this use will depend on whether it is permitted by local plumbing codes. Additional water treatment equipment, such as fine particle filters and UV sterilizers, will need to be added to ensure water is safe to drink, and that it does not smell or have a bad taste.

According to Environment Canada, "Less than three per cent of municipally-treated water is actually used for drinking. The rest goes down the drain, down the toilet, or on our gardens." This shows there is a huge potential for non-potable rainwater applications.

The rainwater harvesting industry in

Continued on p98

FIGURES 1.2 FROM COLLECTING AND USING RAINWATER AT HOME, A GUIDE FOR HOMEOWNERS, CANADA MORTGAGE AND HOUSING CORPORATION (CMHC)

Canada consists of two primary market segments: residential systems and commercial industrial systems. A system can be as simple as a rainbarrel placed below a downspout, up to large-scale systems with massive underground storage tanks, distribution systems and water treatment systems.

## MARKET GROWTH

In Canada there is a rainwater industry association called the Canadian Association for Rainwater Management (CANARM). CANARM is made up of over 200 individuals, including manufacturers, installers, designers and regulators.

Benjamin Morrison works for Cleanflo Water Technologies and he is the current president of CANARM. According to Morrison, the commercial/industrial market in Canada is growing rapidly. Commercial systems are now becoming very economically attractive. This has a lot to do with changing regulations regarding water, sewage and storm water management being introduced in many dense urban areas.

“Municipalities used to bury the cost of water in the tax base, but this is no longer the case in most areas,” says Morrison. “Almost all urban water supplies in Canada are now metered, which has led to water and sewage costs going up significantly.”

In some areas storm water must be managed on-site, which also adds costs. Other factors driving growth in rainwater systems include urban sprawl in many areas, which is leaving many municipalities scrambling to supply adequate amounts of potable water while dealing with an aging infrastructure that cannot keep up with demand.

According to Morrison, all of these factors have led to commercial systems being in “the sweet spot” for rainwater harvesting systems. “Large commercial systems provide the biggest return on investment as they typically have large roof areas combined with large non-po-

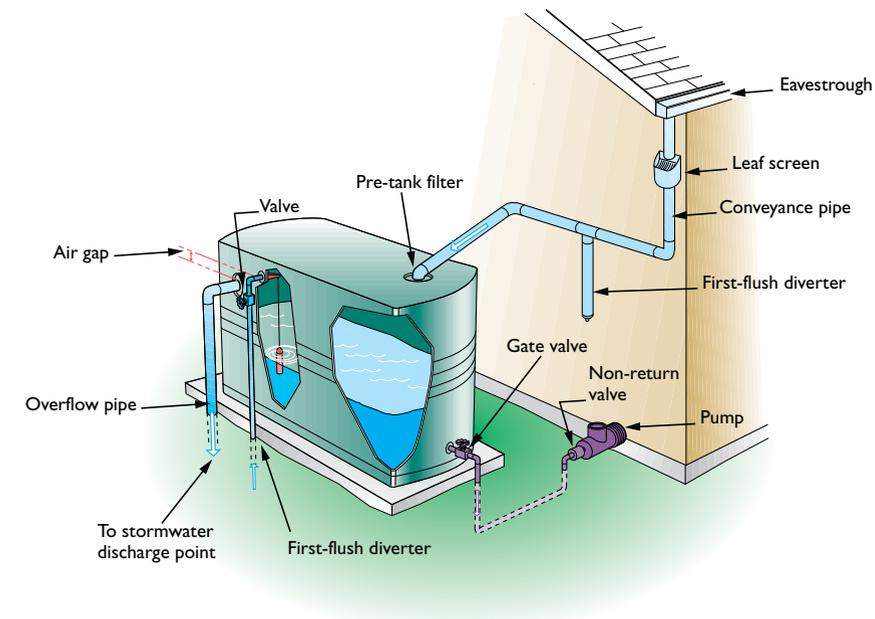


Figure 2 A rainwater harvesting system with top-up supply and an overflow pipe that discharges surplus rainwater to an appropriate location

table water demands,” notes Morrison.

Many systems are being installed to service primarily non-potable toilet flushing loads and the savings can be very significant. There can be thousands of dollars of savings on a company’s water and sewer bill if all of the water normally used for toilet flushing is provided by a rainwater harvesting system. This leads to systems that have very attractive paybacks.

## HOW IT WORKS

A rainwater harvesting system consists of the following basic components: a collection surface, distribution piping, pre-filters, a storage tank and a distribution system. Almost any type of roofing material can be used to collect the rain, however some types of roof material cannot be utilized if the water is to be used for potable use. Metal roofing is a good choice due to its reduced water-loss potential and longevity.

The rainwater will be collected by the eavestrough and downspouts and delivered by a properly-sized piping network to the storage tank. The pipe must be a UV-resistant material and must be sloped properly. Due to the po-

tential for contaminants such as leaves, twigs, dust, and pollen getting into the rainwater, pre-filtration prior to storing the water is essential. Depending on the project, the pre-filtration system could consist of gutter guards, downspout filters, first flush devices and pre-tank filters.

Rainwater storage tanks can be located above or below ground. Common tank materials include: polyethylene or polypropylene, concrete, fibreglass, or galvanized metal with a liner. The tank size can range from hundreds of litres to tens of thousands of litres. The size will depend on many factors which include: the size of the roof area, the local annual rainfall, the size of the water load, the tank’s location, and whether the system is seasonal or year round.

Plastic tanks are most common for residential above ground installations for seasonal applications. Above ground tanks are popular when the water will be used for irrigation systems that will be emptied for the winter, or systems that will be installed entirely indoors. Concrete tanks are typical for below-ground systems and are commonly used for year round systems and



Rainwater storage tank sizes can range from hundreds of litres to tens of thousands of litres and may be above ground or in ground as shown here.

larger commercial systems.

Tanks should always have an allowance for overflow during times of heavy rain or low water usage. In some cases the tank may also be equipped with an automatic municipal water feed to top-up the tank during times of low rainfall or overconsumption.

## DISTRIBUTION

To distribute the collected rainwater, a pump, and sometimes a pressure tank, is required to pressurize the water up to normal household pressure, and move the rainwater to where it is needed. If the water is going to be used for potable use, then additional water treatment equipment would also be required.

The 2010 National Plumbing Code of Canada permits the use of rainwater for toilet flushing as well as irrigation. There are some jurisdictions, such as Guelph, ON and Nanaimo, BC that are actively promoting rainwater harvesting, and both of these cities have developed best practices guidebooks. Guelph is one of the only jurisdictions that currently has an incentive program for rainwater harvesting systems. The incentive provides

\$0.50 per litre of tank storage up to a maximum of \$2000.

## COMPREHENSIVE STANDARD

Many jurisdictions have been slow to embrace rainwater systems due to the lack of a comprehensive rainwater standard. Code officials responsible for inspecting these systems have cited a need for more detailed design parameters to ensure systems are designed and installed in a way that protects the health and safety of users.

These concerns may not be the case much longer as a new comprehensive standard, CSA B805-18/ICC 805-2018 Rainwater harvesting systems was released in 2017. This standard applies to the design, materials, installation and operation of rainwater harvesting systems for potable and non-potable applications. CSA B805 will make it easier for jurisdictions to confidently accept and approve rainwater systems on a much wider scale.

Morrison is excited about the standard, as he feels it will help tremendously in increasing the awareness and confidence in rainwater systems. He feels there is a good chance that CSA B805 will be adopted in the 2020 National Plumbing Code of Canada.

Like most new industries the rainwater industry is also challenged with a poor public awareness about the benefits, a lack of product knowledge about what equipment is available and problems with getting systems designed and installed properly. From my perspective, this seems very similar to the challenges faced by the radiant floor heating business in the late 1980s, and the current problems facing the solar thermal industry.

## KNOWLEDGE AND TRAINING

Morrison feels CANARM can help to overcome these challenges. "CANARM wants to pick up the gap in rainwater system training, and provide designers and in-

stallers the knowledge that they need to be successful," says Morrison. He feels that the rainwater harvesting business requires a multi-disciplinary skill set.

"Proper design and installation requires knowledge of hydrology, mechanical and structural engineering, plumbing and electrical, instrumentation and controls skills and water treatment knowledge," notes Morrison. With this array of knowledge requirements, he is seeing some specialist companies in the U.S. and Canada tackling this market by providing a sole source design/build rainwater system.

You just have to read the news lately to see that water issues are a growing concern in many areas of Canada. Droughts, forest fires and ground water protection have been dominating the news headlines and will continue to be pressing regional issues.

## INDUSTRY DRIVERS

Southern Ontario, which is highly dependent on groundwater supplies, has seen an expanding population put increased pressure on this resource. This region has also seen large increases in water and sewer charges, and added storm water regulations in recent years. These factors are driving interest in rainwater harvesting systems in this area, and bode well for the future of this industry.

Will it be long before we see rainwater harvesting systems become mandatory in some areas? Only time and the changing climate hold the answer to that question. <=>



*Robert Waters is president of Solar Water Services Inc., which provides training, education and support services to the hydronic industry. He has over 30 years experience in hydronic and solar water heating. He can be reached at [solwatservices@gmail.com](mailto:solwatservices@gmail.com).*

# BEYOND THE BASICS

What are the keys to optimal radiant system performance? **BY MIKE MILLER**

**C**ontrols play an integral role in ensuring today's hydronic radiant systems operate as energy efficiently as possible while still providing ultimate comfort to the consumer. Every system should, at the very least, be employed using outdoor weather compensating controllers or even better yet, controllers that will also be able to increase efficiency and comfort by adding indoor temperature feedback into the control system's algorithm. This technology has been around for over two decades. If you want a refresher on this topic, check out an article I wrote in *HPAC* January/February 2012 (see [www.hpacmag.com/digital-archives](http://www.hpacmag.com/digital-archives)).

In addition to the basics, there are other things to consider to ensure optimal radiant system performance. First and foremost, of course, would be a proper heat load analysis of the building and zones within. All radiant manufacturers have software available so you can do the analysis yourself, have it provided by a distributor, or most

manufacturers offer heat load analysis as a paid service.

The heat load analysis will also provide you with a suggested number of loops required per zone, the individual estimated loop lengths and the desired flow through each of those loops. An example of flow requirements in a very small residential structure can be seen in *Figure 1*.

Balancing the loops for flow based on loop lengths is a very important practice to eliminate warm and cold spots on the floor surface. Perhaps you have seen radiant installations where warm and cold spots were a reported issue? If the tubing was installed with even spacing throughout, more often than not, the major contributor for this complaint is the lack of balanced flow through the loops.

Best practice would suggest that each loop is balanced automatically if all loop lengths are kept the same. While this may be doable on paper, in practice, it is unlikely to be attainable unless it is a large, square or rectangular commercial structure.



*Figure 2* (top) Engineered polymer manifold with balancing valves with flow indicators as part of the manifold. (bottom) Single loop balancing valve with flow indicator.

## Applications with single manifold for zoning using loop actuators

In order for the loops to be balanced in a non-perfect (on paper) system or field installation where a single manifold is used for zoning using loop actuators, there are two control options:

### 1. Use manufacturer recommended balancing valves

Most radiant manifold manufacturers provide a means of loop balancing right at the manifold and for each loop connected. The means of balancing can be right inside of the manifold itself, either found on the supply header with an adjustable stem adjusted by means of an allen key, or through added balancing valves that often come with a flow indicator as seen in *Figure 2*.

Another option is to add an external balancing valve that is typically installed on the supply header of the manifold on each loop. Manifold loop actuators are then added to the return connections for each loop to allow for the loops to be split into different zones.

Manifolds									
Name	Manifold Type		#Circuits	Tubing Size	Supply Temp (°F)	Total Flow (USGPM)	Head Loss (ft water)	Total Load (Btu/hr)	#Actuators
Manifold 1	Stainless-steel, 1" with flow meter, B&I, ball valve		4	1/2"	99	3.43	19.9	13,986	4

Circuit Information											
Number	Length (ft)	Tube Size	Spacing (in)	Manifold	Rooms	Zone	Actuator	Coil	Coil-Length (ft)	Head Loss (ft water)	Flow (USGPM)
M1.1	252	1/2"	6-12	Manifold 1	Bathroom, Kitchen/Dining/Living	Zone 102	Yes	Coil 1	Coil 1 - 1,000ft	18.8	1.21
M1.2	260	1/2"	6-12	Manifold 1	Kitchen/Dining/Living	Zone 102	Yes	Coil 1	Coil 1 - 1,000ft	16.8	1.11
M1.3	168	1/2"	6-12	Manifold 1	Bedroom	Zone 101	Yes	Coil 1	Coil 1 - 1,000ft	3.3	0.55
M1.4	161	1/2"	6-12	Manifold 1	Office	Zone 102	Yes	Coil 1	Coil 1 - 1,000ft	3.4	0.57

Zones					
Name	Area (ft²)	#Circuits	Total Load (Btu/hr)	Room	Manifold
Zone 101	137	1	2,638	Bedroom	Manifold 1
Zone 102	568	3	22,539	Mech, Bathroom, Office, Kitchen/Dining/Living	Manifold 1

Rooms					
Name	Area (ft²)	Zone	Total Load (Btu/hr)	RH Unit Load (Btu/hr-ft²)	Supplemental
Bathroom	39	Zone 102	871	14	331
Bedroom	137	Zone 101	2,638	19.3	0
Kitchen/Dining/Living	383	Zone 102	16,634	19.9	9,013
Mech	58	Zone 102	1,830	24.2	425
Office	89	Zone 102	3,204	22.6	1,205

*Figure 1* Radiant loop summary

FIGURE 1. COURTESY UPONOR



Figure 3 Manifold loop actuator with supply and return sensors for deltaT control

## 2. Self balancing loop actuator

There is a manifold loop actuator available now with a set of supply and return sensors that can be strapped to the supply and return tubing for each loop. See *Figure 3* for an example. The loop actuator comes pre-programmed with a 7C differential that will allow the loop to be modulated to maintain that deltaT. Just like any other actuator, a thermostat calls it into operation when the zone is calling, but rather than to just go fully open or fully closed, upon a call for heat, this actuator will modulate to maintain the deltaT, thus automatically balancing each loop to the right amount of flow needed. This kind of technology pretty much eliminates all of the guesswork whereas in option 1, the flow rate is an 'estimate' based on the calculated 'estimated' loop lengths. Granted, being close to the estimate will suffice most of the time.

### Applications with single zone manifolds

Both of these options above work well with manifolds used for zoning of multiple rooms connected to the same mani-



Figure 4 Pump with control logic

fold. But what if a complete manifold is used to supply heat to a single zone? Option 1 will still be required and desired, unless all loop lengths are equal or pretty close to that. It is still an option to increase efficiency of the radiant system by controlling the deltaT across the manifold itself. This can be done by zoning with pumps that have a supply and return sensor and will modulate to maintain a desired deltaT across the manifold, as shown in *Figure 4*. The mechanical for that pump is shown in *Figure 5*. You could have multiple manifolds in a system—this setup would be duplicated for each.

If a pump does not have the control logic and capability within, an external deltaT controller can be added that will control the speed of the pump either through a modulating signal of 0-10Vdc, or, by changing the frequency and voltage provided to it, using a triac.

### Commercial applications using larger manifolds

In larger commercial applications where multiple manifolds are used for the

same zone and where the flow rate required is greater than what can be achieved with a pump with the modulating logic built in as in the last example, modulating for each manifold can be achieved by installing larger two-way modulating valves on the supply to each of the manifolds. Each would have its own deltaT Controller with supply and return sensors. Then a larger system pump could be used that modulates based on Pressure Differential (deltaP). Some light commercial pumps have this technology already built in and in many cases come with ECM motor technology.

Larger commercial pumps utilize drives that come with external pressure differential sensors, or more modern pumps nowadays operate with a technology where deltaP operation is achieved without the use of external deltaP sensors (see *HPAC* February 2015 for more details on this technology).

Aside from the wired technology discussed here, wireless has been around for some time and major advances have been realized. It is expected to replace wired radiant slab controls in the not too distant future. Keep an eye out for an article focusing on wireless technology available for radiant systems. <>



Mike Miller is director of sales, commercial building services, Canada with Taco Inc. and a past chair of the Canadian Hydronics Council (CHC). He can be reached at [hydronicismike@tacocomfort.com](mailto:hydronicismike@tacocomfort.com).

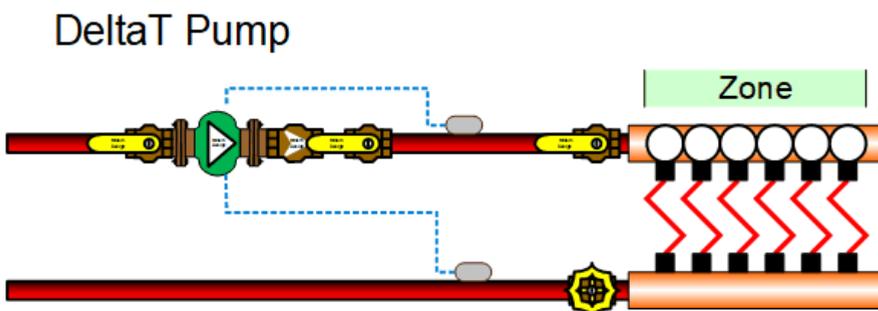


Figure 5 Single zone Manifold with deltaT Pump

# CALENDAR

FOR THE LATEST EVENT NEWS, SEE HPAC'S NEWSLETTER @ [HPACMAG.COM](mailto:HPACMAG.COM)

2018	<p><b>CIPHEX West</b> <b>November 7-8</b></p> <p>The Calgary tradeshow will feature a full conference program and product showcase. It will be co-located with BUILDEX Calgary and the Canadian Hydronics Conference. <a href="http://www.ciphexwest.ca">www.ciphexwest.ca</a></p>	<p><b>Passive House Canada Conference</b> <b>November 7-8</b></p> <p>With a focus on Partnering for Innovation, the 2018 conference will be held at the Vancouver Convention Centre in Vancouver, BC. <a href="http://www.passivehousecanada.com">www.passivehousecanada.com</a></p>	<p><b>Supporting Women in Trades Conference</b> <b>November 7-8</b></p> <p>The Canadian Apprenticeship Forum inaugural Supporting Women in Trades Conference will be held at the Halifax Marriott Harbourfront in Halifax, NS. <a href="http://www.caf-fca.org">www.caf-fca.org</a></p>
	<p><b>Solar Ontario</b> <b>November 14</b></p> <p>To be held at the Hilton Mississauga in Mississauga, ON, the conference is intended for the solar energy industry <a href="http://www.solarontarioconference.ca">www.solarontarioconference.ca</a></p>	<p><b>AHRI Annual Meeting</b> <b>November 11-13</b></p> <p>AHRI will hold its annual meeting at the JW Marriott Tuscon Starr Pass Resort and Spa in Tuscon, AZ. <a href="http://www.ahrinet.org">www.ahrinet.org</a></p>	<p><b>Greenbuild Conference and Expo</b> <b>November 14-16</b></p> <p>The green building event will take place at McCormick Place in Chicago, IL. <a href="http://www.greenbuild.usgbc.org">www.greenbuild.usgbc.org</a></p>
	<p><b>The Buildings Show</b> <b>November 28-30</b></p> <p>The 30th anniversary of the Buildings Show will be held at the Metro Toronto Convention Centre in Toronto, ON. <a href="http://www.thebuildingsshow.com">www.thebuildingsshow.com</a></p>	<p><b>HARDI Annual Conference</b> <b>December 1-4</b></p> <p>The HVAC/R conference will be held at the JW Marriott Austin in Austin, TX. <a href="http://www.hardinet.org">www.hardinet.org</a></p>	<p><b>ACEEE Conference on Health, Environment and Energy</b> <b>December 3-5</b></p> <p>To be held at the Hyatt Centric French Quarter in New Orleans, LA, the event will showcase new ACEEE research. <a href="http://www.aceee.org/conferences/2018/chee">www.aceee.org/conferences/2018/chee</a></p>
2019	<p><b>ASHRAE Winter Conference</b> <b>January 12-16</b></p> <p>The 2019 ASHRAE Winter Conference will be held in conjunction with the AHR Expo at the Georgia World Congress Center in Atlanta, GA. <a href="http://www.ashrae.org">www.ashrae.org</a></p>	<p><b>AHR Expo</b> <b>January 14-16</b></p> <p>AHR Expo returns to the Georgia World Congress Center in Atlanta, GA for its 2019 show. <a href="http://www.ahrexpo.com">www.ahrexpo.com</a></p>	<p><b>National HVAC/R Educators and Trainers Conference</b> <b>March 3-5</b></p> <p>The conference for HVAC/R instructors will take place at the South Point Hotel in Las Vegas, NV. <a href="http://www.escogroup.com">www.escogroup.com</a></p>
	<p><b>CCOHS Forum: The Changing World of Work</b> <b>March 5-6</b></p> <p>This national event will be held in Winnipeg, MB at Delta Hotels by Marriott. <a href="http://www.ccohs.ca">www.ccohs.ca</a></p>	<p><b>ISH</b> <b>March 11-15</b></p> <p>The ISH trade fair will be held at the Messe Frankfurt in Frankfurt, Germany. <a href="http://www.ish.messefrankfurt.com">www.ish.messefrankfurt.com</a></p>	<p><b>SMACNA Annual Convention</b> <b>October 20-23</b></p> <p>The convention will be held at the JW Marriott Austin in Austin, TX. <a href="http://www.smacna.org">www.smacna.org</a></p>

## MODERN HYDRONICS SUMMIT 2019

### MODERN HYDRONICS SUMMIT

This highly successful trade show and conference will take place on September 19, 2019 at the International Centre in Mississauga, ON. Stay tuned for more details. Check [modernhydronicssummit.com](http://modernhydronicssummit.com) for updates.

# We're in the vans built for your business business.



U.S. models shown

2018 GMC  
Savana 4500 Cutaway<sup>1</sup>

2018 Chevrolet  
Express 2500 Passenger Van

2018 Chevrolet  
Express 2500 Cargo Van

2018

## BUSINESS-FOCUSED VEHICLES

Whether you're moving people, product or anything in between, GM Fleet's versatile lineup of customizable vans are the work-ready solution for your hardworking business.

With Bluetooth® wireless technology<sup>2</sup> and steel body-on-frame construction, we've got the perfect van for whatever job's at hand.

 **5 YR/160k<sup>3</sup>**

2018 Powertrain Component  
Warranty Coverage



**Available**  
**2.8L TURBO DIESEL**

This Duramax® engine also comes with  
an 8-speed transmission for fuel efficiency



**TECH**

Available built-in 4G LTE  
Wi-Fi® hotspot<sup>5</sup> (data plan  
required), Bluetooth<sup>2</sup>  
and rear view camera<sup>4</sup>

[gmfleet.ca](http://gmfleet.ca)

GENERAL MOTORS FLEET



<sup>1</sup>Professionally-installed aftermarket accessories and alterations shown. Installations or alterations to the original equipment vehicle (or chassis) as manufactured and assembled by General Motors are not covered by this warranty. The body company, assembler, or equipment installer, is solely responsible for warranties on the body or equipment and any alterations to any of the parts, components, systems, or assemblies installed by GM. Examples include, but are not limited to, special body installation or conversion (such as recreational vehicles), the installation of any non-GM part, cutting, welding or the disconnecting of original equipment vehicle or chassis parts and components, extension of the wheelbase, suspension and driveline modifications and axle additions. General Motors is not responsible for the safety or quality of design features, materials, or workmanship of any alterations by such suppliers. <sup>2</sup> Services and connectivity vary by model, conditions as well as geographical and technical restrictions. Requires active OnStar service and data plan. Data plans provided by AT&T or its local service provider. Not compatible with all devices. Go to [www.gmtotalconnect.ca](http://www.gmtotalconnect.ca) to find out which phones are compatible with the vehicle. Bluetooth is a registered trademark of Bluetooth SIG, Inc. <sup>3</sup> Whichever comes first. Coverage begins on the date the vehicle is delivered and ends at the expiration of the applicable coverage period. Your vehicle's Warranty Booklet contains conditions, limitations, restrictions and exclusions and coverage periods pertaining to the warranties and the Owner's Manual contains important information which may impact you maintaining your warranties. See your Warranty Booklet and Owner's Manual for details. <sup>4</sup> Read the vehicle's owner's manual for more important feature limitations and information. <sup>5</sup> Visit [onstar.ca](http://onstar.ca) for vehicle availability, coverage maps, details and system limitations. Services and connectivity vary by model and conditions as well as geographical and technical restrictions. 4G LTE service available in select markets. Requires active connected vehicle services and a data plan to access the vehicle's built-in Wi-Fi hotspot. Accessory Power must be active to use the Wi-Fi hotspot. Data plans provided by AT&T or its local service provider. Credit card is required for purchase.



# Straight to the Point!

## Save Cost and Install Time

**The unique pre-sloped design of the Dead Level® trench drain ensures consistently straight runs and makes installation quick and easy.**

- Standard 4' and 1' sections eliminate nearly all field cutting
- Frame locks ensure a straight run, every time
- The unique design transfers the load to the concrete, maintaining drain integrity during the concrete pour
- The drain's construction cover protects against the impact of people, concrete, hoses, and finishing equipment

**WATTS®**

For more  
information go to  
[Watts/Deadlevel.com](http://Watts/Deadlevel.com)

**TRY IT. There's Nothing Like it.**