Volume 27 - Issue 8

BOA
Building Operators Association of Canada

Official Publication of the Building Operators Association (Calgary)

April 2021

What's Inside?

Front cover photo: Devon Mackay

Important Phone Numbers

Emergency	911
Alberta Boiler Association	403 291 7070
Alberta Labour (Emergency)	403 297 2222
Buried Utility Locations	1 800 242 3447
City Of Calgary (All Departments)	311
Dangerous Goods Incidents	1 800 272 9600
Environmental Emergency	1 800 222 6514
Poison Centre	403 670 1414
Weather Information (24hr)	403 299 7878

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President's Message

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I hope this message finds you and yours well and in good health

The executive volunteers have been working hard over the last year during this trying time to accommodate the education of the Building Operators and do it in a way that keeps us all safe. We Have been active in getting guest speakers that are willing to do webinars that they haven't done before because they believe it is important too.
There have been great talks and unique topics that have been delivered to you. We have as well recorded them and placed them on our website to be viewed at your leisure. I want to say thanks to Mark Arton who has been instrumental in acquiring interesting speakers and then hosting the meetings too. Carrissa Spreager in providing the ZOOM invitations to the membership to link them to the meetings. Monika Bhandari for putting the magazine out with the links to the meeting and the BIO out for the readers to preview and connect. The next speakers will be interesting to managers at all levels. Enmax will speak on how it is preparing the local distribution grid for the future, as well as catastrophic events such as the power outages which recently occurred in southern US.

The Building Operators Association has been working with the Alberta Chief Power Engineers Conference Committee (ACPECC) The committee has a mandate in that they put on an annual conference focusing on safety for the Chief Power Engineers that manage not only plants but to include facilities as well. Because of the pandemic they had to cancel the 2020 conference but are looking to put on a virtual one this fall. There will be guest speakers and will include ABSA as keynote speakers. We will keep our membership abreast of the status of the Seminars and the guest speakers. The topics will range from some in depth system safety systems and protocols to management topics as pertains to Chief Engineers.

We continue to move forward to establishing competencies for Building Operators. It is becoming a big task but lessened with the right people behind it. We are always looking for volunteers to the association. Elections for the executive are coming soon. We are so looking forward to Building Operators to help out. We will post the positions to the association in the next magazine. I hope you would consider a position, we need you and your ideas.

So, take care of yourself and please be kind to one another.

With kind regards,

JOIN US!

FOR OUR VIRTUAL BOA MONTHLY MEETING ON TUESDAY APRIL 13, 2021 AT 5PM

zoom

TEST YOUR OPERATOR IQ!

Are you equally adept at troubleshooting problems in the boardroom and the boiler room? As the resident facility guru, there's a lot riding on whether or not you know the difference between sounds control and a sound investment.

Try our monthly Operator IQ challenge...answers on page 15

1. The most common system installed in most residences where the furnace is located in the basement and provides conditioned air via ducts to each room is called a:

a. forced air system
b. single zone, constant air volume system
c. low velocity terminal reheat system
d. multi-zone system
e. unit ventilator

2. The unitary air conditioning system which uses a direct expansion refrigeration system to provide cooling and dehumidification in a local area without ductwork is called a:

a. unit ventilator
b. rooftop unit
c. window air conditioner
d. high velocity terminal reheat system
e. multi-zone system

3. To offset the heat gain through the building's exterior shell from solar radiation, the atmosphere surrounding the building, and from internal sources of heat, then one of the following is required:

a. a humidifier
b. a heat source
c. ventilation
d. a cooling source
e. a dehumidifier

4. The four properties of an interior environment that most affect thermal comfort are:

a. air temperature, dew point, relative humidity, solar radiation
b. air temperature, relative humidity, metabolism, clothing
c. air temperature, relative humidity, air speed, mean radiant temperature (MRT)
d. surface temperature, surface texture, air temperature, air cleanliness

5. Preferred conditions for thermal comfort are usually presented in the form of a comfort "zone":

a. because there is no single ideal comfort point for any group of people
b. as a means of including a safety factor to ensure good health
c. because no one in comfort research really knows what they are doing
d. so that designers can do whatever they want, while convincing clients they know what they are doing

HOW RETROFIT SUBMETERS SAVE LANDLORDS MONEY

BY ALBERTO QUIROZ

Older multi-family properties with single main master utilities meter have no way to directly charge for energy used to their tenants. When tenants are not billed for their actual energy usage, they develop a careless mindset of wasting energy. The negative effect of this attitude results in undue and extremely high utility costs to property management companies.

Property owners and managers of master-metered apartment buildings are therefore turning to retrofit their properties with sub-meters.

Sub-meters are devices that can track each apartment's utility consumption, allowing landlords to accurately bill their tenants for their precise share of the bill. Sub-meters are very effective at driving energy conservation, but they also save landlords money by reducing costs.

5 WAYS RETROFIT SUB-METERS SAVE COSTS:

1. COLLECTING METER READINGS

Labor and time involved in collecting information is the first hard cost. It can add up to several thousand dollars per year just to have someone read the meters directly and record the readings in a list. With sub-meters (digital and cloud-connected devices), these expenses can be eliminated entirely.

2. ADJUSTMENTS

With old master meters landlords are not able to provide a bill to the tenant if there is a mid-month move-in or move-out. They either have to absorb the costs or collect payments from tenants that have moved out with additional costs. There is also no way to split the bill based on the day of the move-out, so landlords can only make estimates, which open up to disputes or not collecting the full cost. Sub-meters can provide five or 15 minute interval readings, hourly time of use reports and coincidental demand for individual apartments which allows landlords to split up the costs among the tenants more accurately.

3. INTEREST AND CASH RESERVES

The whole process of reading meters, collecting and transcribing data, allocating costs, sending invoices, and collecting payments can take up to 30-45 days from the end of the billing cycle. Landlords typically pay the utility company first and then wait to get reimbursed from residents. This process alone forces landlords to forego interest every year to front their tenant's utility bills, which could add up to thousands every year. A submetering system with a software platform can provide real-time readings that can be used instantly, generating reports within minutes. By reducing the time-frame of the whole process with a submetering system, the stockpile of money and the interest could be put towards other productive investments, such as renovations, capital expenditures, and more.

4. TENANT DISPUTES

Modern sub-metering technology can help landlords avoid incorrect and over-billing tenant disputes altogether because readings are continuously recorded and uploaded to the cloud, which al-

Continued on page 8...

Continued from page 7

lows for any dispute to be resolved quickly.

5. ACCOUNTING COSTS

Whether sub-metering is done through a third-party vendor or in-house using analog or outdated digital meters, having an employee do the work-related to tenant billing can take up about 10% of their total time. On the other hand, by installing a submetering system that integrates all the utilities with a software platform that produces reports to an accounting software; Allows landlords to have an automated billing system that will eliminate the cost of employee time and accelerate cash recovery.

Upgrading a sub-metering infrastructure is definitely worth the investment. The initial upfront investment to retrofit may seem high, the payback period can be quite short. Along with the right balance of long-term savings and incentives, retrofit sub-meters can save money for landlords, as well as help protect the environment.

Article reprinted with permission

KenKen Puzzle

How to solve the Kenken puzzle:

(Answers on page 17)

- Fill in the numbers from 1 –6
- Do not repeat the number in any row or column
- The numbers in each heavily outlined set of squares, called cages, must combine (in any order) to produce the target number in the top corner using the mathematical operation indicated
- Cages with just one square should be filled in with the target number in the top corner
- A number can be repeated within a cage as long as it in the same or column

10×		3−		20+	
9+		6×	2−		
3÷				1−	
	16+		2÷		6+
1−				40×	
3÷		1−			

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Effective Maintenance of Filtration Systems

by

C.H. Gordon

SCOPE OF THE ARTICLE

The filter is the first line of defence in protecting heat transfer and building surfaces. This article describes the types of air filters commonly encountered in heating, ventilating, and air conditioning systems; how they are classified; what the purpose is intended to be; the limitations of each; and reasons for selection of each type. Instructions are provided for servicing each type of filter. How to maximize economy and utility in filter systems is discussed in detail for each element of cost, with common sense rules for maximizing overall system life and economy in filtration systems. Case histories are presented for upgrading filter systems to show the economics of using modern technology. Finally, this article will explain what to do when filtration has not been maintained effectively, including remedial cleaning of hot deck and cold deck coils, plenum chambers, duct work, and diffusers.

COMMON FILTER TYPES

Filters in common use may be classified in several ways: by efficiency, by method, by use, or by construction. Here are the various classifications commonly found:

1. EFFICIENCY

a. Low = 20 percent of less dust spot efficiency (The ASHRAE standard 52-76)

b. Medium = More than 20 percent, less than 90 percent dust spot efficiency.

c. High = More than 90 percent dust spot efficiency, or more than or equal to 95 percent DOP test (0.3 micron Smoke).

2. METHOD

a. Inertial Impingement: Particles are trapped on media fibers by being impinged by the force created by their weight and high velocity. An adhesive coating holds the accumulated dust in place.

b. Interception: Particles too small and too light in weight to be impinged are removed most economically by interception, which occurs when their path is altered by air molecules after their velocity is slowed by passing through media. Filter media used in interception is pleated and usually of finer fiber than inertial impingement media.

c. Electronic Agglomeration or Electrostatic Precipitation: This filter works by electronically charging dust particles so that they will collect on oppositely charged plates. When sufficient small particles bind together or agglomerate, they break away from the plates and are collected downstream, usually on inertial impingement or impingement-interception type media. Older designs require washing in place of collector cells to remove dust and oiling of plates for reconditioning.

3. USAGE

a. Prefilters: Protect both coils and final filtration systems by removing larger dust particles and contaminants upstream, usually right near outside air dampers. Prefilters are usually a panel-type using inertial impingement method.

b. General Ventilation and Air Conditioning: Includes low, medium, and high efficiency ranges, dry, viscous-treated, washable, and disposable media types, in a variety of frames, construction, and arrangements. Economy in first cost and life cycle is the usual criterion for selection.

c. Downstream High Efficiency Particulate Air Filter Beds: Designed to meet requirements of Department of Health, Education, and Welfare Resources Publication No. 76-4000 for Hospital and Medical Facilities. Efficiency of 90 percent minimum is required for installations, to protect the environment of patient care, treatment, diagnostic and related areas, and sensitive areas such as operating rooms, delivery rooms, recovery rooms, and intensive care units.

d. Industrial (non-atmospheric dust): Includes special media and filter arrangements to remove lint, press ink mist, and non-atmospheric contaminants.

CLASSIFICATION OF FILTERS BY CONSTRUCTION

PANEL MEDIA WITH COARSE FIBRES:

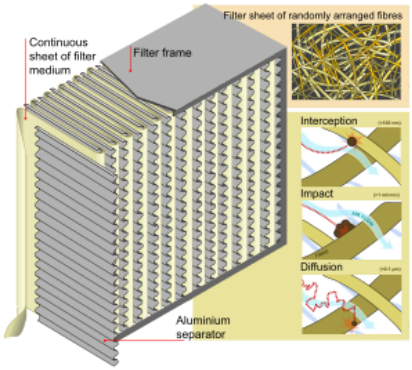
Usually called throwaway filters. This construction is the common type found in prefilters. The medium most common in disposable panel filters is glass fiber, although polyester fiber is also used. The fiber is treated with an oil or adhesive spray to create a viscous impingement medium. This is usually found in an efficiency range of 20 percent or less (ASHRAE average with atmospheric dust).

A variation of this type of construction is the renewable pad of glass fiber in a permanent metal and wire frame. When the pad collects its full dust load, it is discarded and replaced with another inexpensive pad.

PLEATED MEDIA WITH LESS COARSE FIBER, FEW PLEATS:

There are typically two distinct layers of media material having different fiber sizes and packing densities. The less dense, coarse fibered upstream layer removes large, heavy particles,

while the finer fibered, more dense down stream may also be treated with a special adhesive on the air-leaving side to prevent blow-off of collected dust. The pleats are generally supported and held in place by wire retainers or welded-wire fabric. Efficiency will range from 25 to 40 percent, according to various manufacturers.



PLEATED MEDIA WITH FINE FIBERS AND PRECISELY SHAPED PLEATS:

Efficiencies from 50 to 95 percent are available in this type of construction, depending upon the media fiber size, thickness, and dispersion. Capacities for operation in cfm vary with filter media area (net effective) provided. Although generally found in supported media construction, there are non supported pleated media filters in this range of efficiencies. Non-supported media should never be used in variable volume air systems nor in areas of critical care where media blowout could cause contamination.

HEPA-TYPE FINELY FIBRED MEDIA:

High Efficiency particulate air filters were developed originally for clean rooms and gauge and metrology labs used in miliraty and aerospace hardware production, which explains why the military standard testing procedure (M16-STD-282) is used for this type of filter. HEPA filters are now used in pharmaceutical manufacturing, food and beverage processing, surgical and other hospital applications, electronics and aerospace assembly, photosensitive film production, nuclear uses, and many other areas. The distinguishing construction features are high ratio of filter area to face area, and fine fibers with tightly controlled spacing, closely pleated. Performance characteristics typically include an efficiency of 99.97 percent on 0.3 micron size particles at an initial resistance of 1.0" / w.g. and final resistance of 2.0" to 3.0", depending upon construction.

ROLL MEDIA:

Although typically furnished as a prefilter or upstream filter for a higher efficiency filter system, the roll media filter may be used where 25 percent average efficiency will be suffice. The usual roll media installation is an automatically advanced roll of adhesive-coated glass fiber filter media that is fed into the air stream and rerolled after it has collected its dust load. The roll may advanced by a signal from a timer (at a predetermined rate), or better by an inclined draft gauge to advance the roll only when the design final pressure drop is reached. Manual crank models are also available.

ACTIVATED CARBON MEDIA:

Activated carbon will absorb up to 50 percent of its weight with odors and retain them in the network of tiny pores within the body of the carbon. One pound of activated carbon (approximately 50 cubic inches) contains an estimated six million square feet of surface area. Activated carbon filtration use is limited to odor control in air conditioning systems, although its widest usage is in the chemical processing industry where activated carbon is used to purify gases, to separate gases, to recovery solvents, and to carry catalysts. Activated carbon filters in environmental control systems are usually constructed of trays or panels of activated carbon and placed in the final filtration air stream in a housing designed either for front or side access to the trays or panels.

SIDE ACCESS HOUSING:

Packaged, side access housings are available for combinations of almost all types of prefilters and final filter construction. The advantages include ease of access for servicing, installation where limited headroom is a factor, and ability to service from outside the duct, usually from either side.

ELECTRONIC FILTERS:

Two types are generally found in HVAC systems: (1) the agglomerator-type with disposable collection media, or (2) the precipitator/collector-type, which requires washing and renewal of collector plates, automatically or manually. The principle of electrostatic precipitation is the same - dust and smoke particles are given positive or negative static charges by the electrostatic field set up by the charged ionizing wires and the grounded struts. Charged particles then enter the collecting section, which is made up of alternately positive charged and grounded plates. The charged particles are attracted to and held by the oppositely charged plates. In the agglomerator-type with disposable collection media, particles build up on the plates until they break off in larger chunks called agglomerates and flow downstream to be captured by the final collecting (disposable) filter. In the precipitator/collector-type, which requires washing and renewal, an automatic or manual wash cycle is required to remove the collected particles to prevent their unloading and passing downstream.

AUTOMATIC VACUUM RENEWABLE:

This system is not designed for ordinary HVAC installations but for specific industrial situations, primarily laundries and textile mills, where a stable interior environment is essential and large quantities of conditioned air must be re-circulated. The system consists of a lint filter that traps airborne particles. An automatic vacuum or pneumatic sweep removes the particles through a manifold to a secondary collection point for recovery or disposal.

UNDERSTANDING EFFICIENCY TERMINOLOGY:

Three performance test procedures for general HVAC air cleaning devices are in current use:

- Atmosphere Dust Spot Efficiency
- Synthetic Dust Weight Arrestance
- DOP Smoke Penetration Method

The first two procedures are covered by ASHRAE standard 52 -76 (which supersedes 52-68). The third is prescribed by a U.S. Government standard, MIL-STD-282. Much past confusion has been eliminated by standardizing terminology. In the ASHRAE standard, the efficiency now applies only to

tests made by the dust spot procedure on atmospheric air and its contaminants. Results of tests measuring weight of an injected synthetic dust removed by the air cleaning device are now reported as arrestance. The DOP Smoke Penetration Method, which reports results in count percent, is designed to distinguish between filters whose air cleaning efficiency exceeds 98 percent.

Of primary importance in building maintenance is the ability to reduce staining by trapping small particles found in atmospheric dust and contaminants. This is the performance measure meant by efficiency in the dust spot procedure and is the rating commonly spoken of in classifying filters. High Efficiency Particulate Air Filters (HEPA) are found in industrial "clean rooms". operating theaters, and other areas of hospitals, as final filter beds to meet critical requirements.

SERVICE PROCEDURES FOR AIR FILTRATION SYSTEMS

The general rule for servicing environmental air filters among too many maintenance people has been:

- Look at it occasionally
- If it looks too dirty, clean it or change it.

Unfortunately, this approach ignores all principles of engineering economy. Let's look first at some guidelines for maintenance that apply to all filter systems, then to specific procedures for each type.

Filtration system economy is based on trade-offs among three major cost components: filter media, labor, and energy. It is easy to see that filter media cost would be minimized by using the cheapest media for the longest possible time. The labor cost component, however, has three elements: labor to service filters; labor to clean coils, ductwork, and registers in the distribution system and labor to clean building ceilings, wall surfaces, and furnishings. While the strategy that minimizes filter media cost will also minimize service labor cost, the likely effect will be to increase the cost of labor to clean air distribution system internals and building surfaces. Many filters have a tendency to unload excess contaminants once their capacity has been reached. They discharge downstream, fouling heat exchange surfaces, coating the inside of distribution ducts, and spilling into conditioned spaces, showing up as sooty soil on ceilings, diffusers, drapes, and wall surfaces.

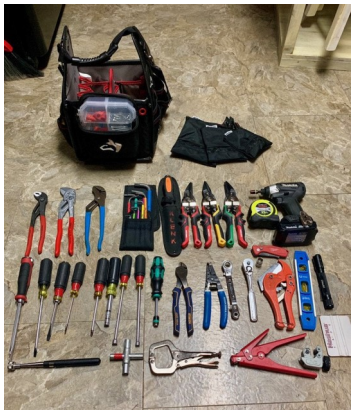
Energy cost is affected by two elements related to filtration maintenance - heat exchange at coil surfaces and static pressure on the fan caused by resistance to the air stream. Optimum energy costs demand the best possible heat transfer between the coils and the airstream. The work required of the fan is minimized when the least resistance to the airstream presented. Since the filter's resistance to air flow increases as it does its work of removing contaminants, allowing the filter to "load up" to its design capacity may create extra energy cost in excess of the cost of additional service labor and filter media. A good case can be made for changing filters at approximately 80 percent of design final resistance, since the energy cost rises sharply with resistance and the 80 percent of resistance (and filter life) takes a much longer time period than would be proportional to resistance.

In order to optimize total system economy, the engineer would need to evaluate the fan characteristics (volume, static pressure, velocity pressure, and horsepower required) and the filter characteristics in order to determine design, initial and final resistances, efficiency, and downstream requirements.

HOW TO INSPECT FILTER INSTALLATION:

There are four important items in any filter installation to check:

- Support of the filter frames. If the bank filter frames is not rigid and well supported, it can collapse as the filters load up.
- Leaks around frames. If light is showing anywhere between filter frames and/or between the frames and duct walls, caulk these cracks to prevent unfiltered air from leaking by.
- Fit of filters in frames. Incorrectly installed will also allow air to bypass. Set them in plumb and square.
- Condition of the media. Extended surface (bag) filters should be fully open and extended, not pinched shut. If you see any tears, rips, or holes in any media, replace the filter at once.



TOOLS REQUIRED

Any HVAC mechanic servicing filtration systems needs, at least a minimum, these tools:

- A good flashlight, preferably with magnetic handle
- Screwdrivers and nut drivers
- Locking pliers
- A good quality manometer (portable)
- Caulking gun
- Duct tape

HOW TO CHANGE FILTERS (GENERAL)

The following steps should be followed in changing filters in most environmental air filter systems:

- Remove the old filters and set them to one side in the dust or filter housing.
- Vacuum-clean or brush the holding frames to remove settled dust.
- Inspect the holding frame gaskets, and replace any that are damaged.
- Remove the new filters from their cartons and install according to manufacturer's instructions. It pays to read instructions.
- Check the filter to make sure the media is not caught or damaged. If a filter was damaged during shipment, contact the delivering carrier and file your claim for loss. If you are using bag filters, check to make sure the pleats are free to open fully.
- Check all fasteners to make sure they are holding filters in place securely.
- Remove the dirty filters in the cartons that held the new ones. Vacuum the duct floor, close the duct door, and zero the manometer.

USE OF THE MANOMETER

A simple inclined gauge device is inexpensive and easy to use. Manometers may be portable or installed permanently at major filter bank locations. In either case, the purpose is the same - to remove guesswork from servicing filters. All filters have design specifications giving both initial and recommended final resistance to air flow. These specifications are usually stated in inches of water. The manometer is installed to measure pressure drop across the filters in inches of water.

Since oil can evaporate from the gauge, every three months or so the manometer should be zeroed. This requires the system to be off if the manometer is permanently installed, or at least the tubing disconnected, taking care not to lose oil from the gauge.

When pressure drop reaches the predetermined point, filters should be changed. Since panel-type prefilters have a relatively short life, measure their pressure drop weekly to prevent having them start to "unload" contaminants. For other types of filters, monthly readings should be adequate to tell the rate at which they are loading. Remember, the last 20 percent of resistance comes more quickly.

SPECIFIC INSTRUCTION FOR SERVICING:
PANEL FILTERS

There are four main types of panel filters: permanent metal. permanent foam, disposable, and replaceable media. The general service procedure apply for each with the following modification:

- Permanent Metal Panel Filters: Unit filter cells of this type use an impingement fluid that may or may not be coated on the cell at the factory, but must be applied to "charge" the filter before it is placed in operation. The cleaning cycle will depend upon the amount of dust in the air, fan characteristics, and the number of hours in operation. Cells are usually cleaned when the resistance reaches 0.25" to 0.50" w.g., but can be operated at 0.75" pressure drop or higher, depending upon the capacity of the fan. By cleaning one-sixth to one-fourth of the cells during each cleaning period, a constant operating resistance can be more nearly maintained, which will give a more uniform air distribution for the system. Remove the dirty cells and replace immediately with clean sprayed cells. Clean the cell by washing with a water spray, soaking in a detergent solution, or immersing in a steam-heated cleaning tank. Water temperature is not critical, but a heated detergent solution only should be used in the solution. Do not use caustic (high pH) solutions for cleaning filter cells. After draining off dirty water, the cells should be recharged, It is not necessary for cells to be completely dry prior to recharging. Never try to clean filters by brushing off the dirt. This mats the dirt over the front of the cell, making it harder to wash. For recharging, a pump-up pressure spray (such as the Hudson sprayer) is ideal. Alternate methods are aerosol spray, or shaking and draining dry. The impingement fluid VIA Viscosine or equal) must coat both faces, penetrating into the depth of the cell. For a 20' x 20' size filter, approximately one ounce fluid per half-inch thickness of filter is required.
- Permanent Foam Panel Filters: Open-cell foam or synthetic material (polyurethane or polystyrene) is used for impingement-type media in residential and small commercial equipment. This material generally will not have the capacity of permanent metal and will require more frequent cleaning. The foam is cleaned by washing with a hose or tap water. Impingement fluid is not generally used.
- Disposable Panel Filters: Fiberglass or polyester fiber woven media are used in paperboard frames to conduct a variety of types and thicknesses of panel filters. Typically the media are coated with an impingement adhesive similar to permanent metal, although with a different viscosity than that used with metal. Servicing is simple - follow the general rules for exchanging clean for dirty filters, and discard the dirty filter units.
  Replaceable Media: Permanent frames with disposable pads of filter media are popular replacements for disposable panel filters. The media are treated with the same impingement adhesive as the disposable filters. The procedure for servicing is the same as other panel filters except that the frames snap open for exchanging clean pads in place of dirty pads.

EXTENDED SURFACE FILTERS

These filters will operate until they are completely plugged without unloading. Actually, their filtration efficiency increases as more and more dust is collected. However, their resistance also increases, eventually reducing air flow. This makes monitoring of the pressure drop across the filter bank most critical. Also, the consequences of a torn or ruptured bag, releasing contaminants downstream, make it imperative to examine carefully the pleats to assure free opening to full extent of the surface. Supported pleat design filters may be treated essentially as disposable panel filters except for the capacity and pressure drop.

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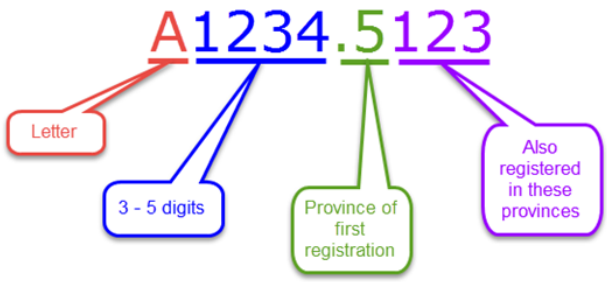
Canadian Registration Number (CRN)

A Canadian Registration Number (CRN) for a boiler or pressure vessel is defined by CSA B51 Clause 4.3 as:

- consisting of a letter, four digits, and a decimal point followed by up to ten digits and three letters
- the first letter and four digits are part of a sequential numbering system used by the issuing province or territory
- the first digit or letter to the right of the decimal point indicates the province that issued the particular number



The following identifications are used in accordance with the code:

1 – British Columbia	7 – New Brunswick
2 – Alberta	8 – Nova Scotia
3 – Saskatchewan	9 – Prince Edward Island
4 – Manitoba	0 (zero) – Newfoundland
5 – Ontario	T – Northwest Territories
6 – Quebec	Y – Yukon Territory
	N – Nunavut

- The letter C may follow the designation of first registration if a design is registered in all jurisdictions. No jurisdiction issues the letter C; it is a convenience for stamping once the manufacturer has received all the registrations.
- The letters CL may follow the designation of first registration if a design is registered in all jurisdictions that require registration and is not registered in the jurisdictions that do not require registration. No jurisdiction issues the letter CL; it is a convenience for stamping once the manufacturer has received registrations for all jurisdictions that require registration. (The "L" means limited.)
- To be eligible for use in Alberta, the CRN must have the digit 2, or the letter C, somewhere after the decimal point.

A Canadian Registration Number or Pressure Piping number is issued if the design is satisfactory.

For example, the following could be valid CRNs: **B1079.23, M2138.5C** and **V1234.5CL**.

When's the best time to use a trampoline?

Springtime!

Kenken Puzzle Answer

10× 5	2	3− 1	4	20+ 6	3
9+ 4	5	6× 2	2− 3	1	6
3÷ 6	1	3	5	1− 2	4
2	16+ 6	4	2÷ 1	3	6+ 5
1− 3	4	6	2	40× 5	1
3÷ 1	3	1− 5	6	4	2

TEST YOUR OPERATOR IQ ANSWERS

Answers: 1) a 2) c 3) d 4) c 5) a

March Meeting Minutes

Chaired by:	Minutes by:	Call to order:	Webinar: March 9, 2021
Mark Arton	Monika Bhandari	5:01pm	

- **Introduction from Mark Arton**

Guest Speaker:
Kyle D'Agostino of Heartland Exchanger

Topic: **When and How to Maintain Gasketed Plate Heat Exchangers**

New Business:

- BOA Tradeshow postponed until May 2022
- More webinars to be presented possibly a few a month—share your ideas with BOA Executive
- Mike Gerald moving to another province—we are thankful to Mike for all his support over the years to BOA and wish him the best! Samson Isowade, from BGE, will be taking over Mike's role—Welcome Sammy!
- Visit the website for YouTube videos of last meetings
- Next virtual (zoom) meeting on April 13, 2021, 5PM
- Current balance is $4082.74

JOIN US: TUESDAY APRIL 13, 2021 AT 5PM FOR OUR VIRTUAL MONTHLY MEETING

Webinar Presentation Topic: **ENMAX Power – Preparing the Grid for the Future**

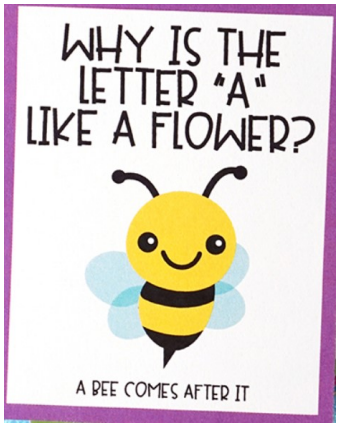
ENMAX Power is the regulated electrical utility that owns, operates and maintains the transmission and distribution system in and around Calgary. As new technologies are advanced, such as electric vehicles and distributed energy resources like solar generation, ENMAX Power is taking proactive steps to understand the grid of the future. Join us to learn more about the trends we are seeing and what we are doing to be prepared

John Nowostawski **is the Manager of Grid Innovation and brings people together to tackle the electrical industry's problems and develop opportunities. He received his electrical engineering degree from the University of Manitoba and has worked in oil and gas, electric utility, and manufacturing industry segments across Canada and the US.**

Juval Bothe **is a Senior Engineer on the Grid Innovation team. Among other things, Juval has a wealth of knowledge about Distributed Energy Resources and the influence they will have on the future operations of the grid. He received his Electrical Engineering degree from the University of Alberta and throughout his career has worked in various Distribution Engineering and Planning roles.**

Nicole Morter **is a Senior Engineer on the Grid Innovation team. Her expertise includes a deep understanding of electric vehicle adoption and the subsequent charging infrastructure that will change how our grid operates. She received her electrical engineering degree from the University of Alberta and has worked in the utility sector her whole career.**

Click on the link to register for the BOA Monthly Meeting



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