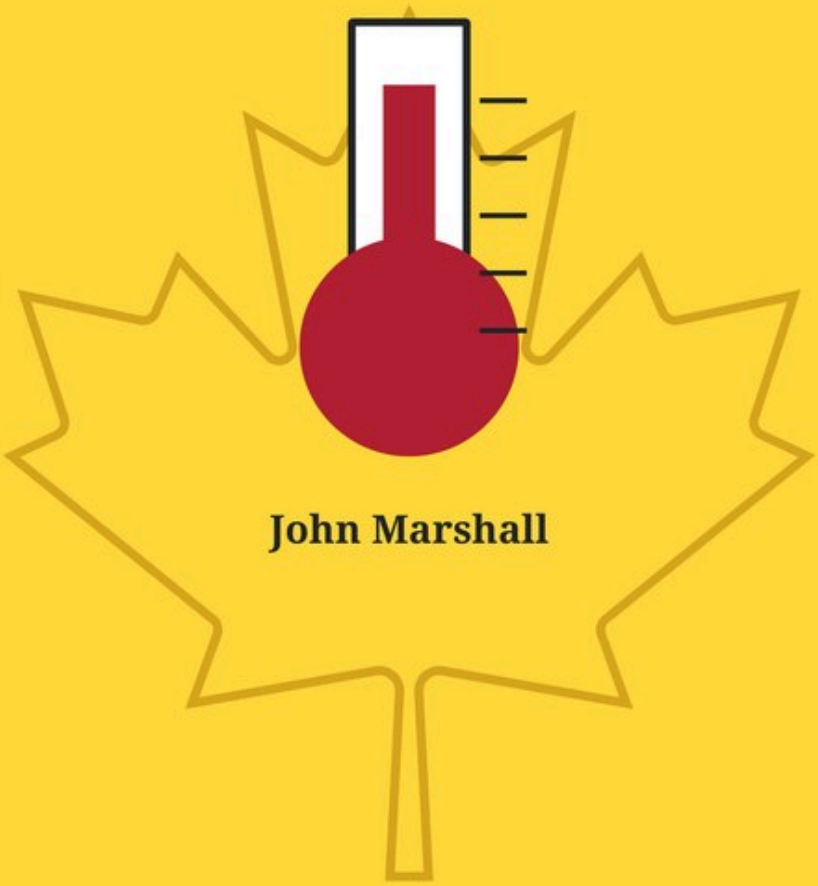
THE PROOF SERIES

A PLAYFUL GUIDE TO HEATING AND COOLING

HVAC Proof

Furnaces, air conditioners, and thermostats, from filters to tune-ups — in plain language, with big type and a few laughs.



John Marshall

PROUDLY CANADIAN



PROUDLY CANADIAN

FREE SAMPLE CHAPTER

By John Marshall

www.buyproof.ca



START HERE

Your Home Has a Heart and Lungs

Every home heating and cooling system does two simple jobs: move heat around and move air around. Once you see that, the furnace, the ducts, and the thermostat all start to make sense.

Make the heat › Push the air › Deliver it › Repeat the loop

1. Picture a loop — Warm or cool air leaves your furnace or air conditioner, travels through ducts, and comes out of vents in each room. Then it returns through bigger return vents to be conditioned again. It is one big circle.

2. Heat is made, cold is moved — A furnace creates heat by burning fuel or using electricity. An air conditioner does not create cold; it carries heat out of your house and dumps it outside. A heat pump does both jobs in one machine.

3. The thermostat is the boss — The little box on your wall tells the system what to do. Set 21 degrees, and it calls for heat until the room reaches 21, then calls a halt. Every cycle you hear is the thermostat giving orders.

4. You are the owner, not the mechanic — You do not need to fix anything inside the machines. Your real job is simpler: keep filters clean, vents open, and know when a strange sound or smell means it is time to call a professional.

TALE

E STORY

Ruth, 76, told her neighbour her furnace had “given up” — until he pointed at the thermostat, which her cat had nudged down to 12 degrees.
She now keeps a little note beside it: “Check me first.”

!

Most comfort problems are airflow problems, not equipment problems. A clean filter and open vents solve a surprising number of mysteries.

Take care: Never open a furnace cabinet or remove panels while it is running. The high-voltage parts inside are not a do-it-yourself project.

START HERE

Meet the Furnace: The Friendly Giant

Your furnace is the biggest, quietest appliance in your home. It waits in the basement or a closet all summer, then wakes up each autumn to keep you warm.

Call for heat › Fire up › Warm the air › Blow it out

1. Burn fuel, carefully — Most Canadian furnaces burn natural gas or oil in a sealed chamber. Electric furnaces use big heating elements instead. Either way, the fire or element never touches your household air.

2. Borrow the heat — Room air passes over a metal box called the heat exchanger, which is hot from the burner. The air picks up the heat while the exhaust gases go safely up the chimney or vent pipe.

3. Push it through the house — A blower fan — basically a big, quiet fan — pushes the warmed air through ducts and out of the vents. You hear it hum for a few minutes, then silence.

4. Shut down in order — When the thermostat is satisfied, the burner stops first, then the blower runs a little longer to push out the last of the warm air. That after-run is normal and good.

TALE

E STORY

George, 81, was convinced his new furnace was broken because it kept running after the vents went quiet.

His technician laughed kindly and said, "That is the furnace finishing its chores — like a dishwasher draining after the cycle."

!

Modern furnaces are 90 percent efficient or better, meaning almost all the fuel becomes heat. An old furnace may have been 60 percent — the rest went up the chimney.

Take care: Keep the area around the furnace clear. Boxes, paint cans, and laundry piled against it are a fire hazard and block the air it needs.

START HERE

Meet the Air Conditioner: The Heat Mover

An air conditioner never makes cold air out of nothing. It is a heat-moving machine, and understanding that one idea makes everything about cooling click.

Grab indoor heat › Carry it outside › Dump it outdoors › Send cool air back

1. Soak up heat indoors — A cold coil sits above your furnace. Warm room air blows across it, and a special fluid called refrigerant soaks up the heat like a sponge — and wrings out moisture too.

2. Pump it outside — The refrigerant, now full of your home's heat, travels through copper lines to the big box outside. A compressor squeezes it, which makes it even hotter — strange but true.

3. Let the heat escape — A fan blows outdoor air across the hot coil, and your home's heat drifts away into the yard. That is why the outdoor unit blows warm air on a hot day.

4. Repeat all summer — The cooled refrigerant flows back inside, expands, gets cold again, and the loop repeats. Round and round, all summer long, with no fuel burned.

TALE

E STORY

Diane, 73, touched the air blowing out of her outdoor unit on a July afternoon and yelped, "It's hot!" Her son grinned: "That is your living room's heat, leaving the building.
The machine is doing its job."

!

Air conditioners also dehumidify. That sticky feeling leaving the house on a humid August day is the AC pulling litres of water out of your air.

Take care: Keep at least 60 centimetres of clear space around the outdoor unit. Bushes and fences crowding it make the whole system work harder and die younger.

START HERE

Meet the Heat Pump: Two Jobs, One Machine

A heat pump looks like an air conditioner, and in summer it acts like one. In winter it runs the movie backwards, pulling warmth from the chilly outdoor air.

Summer: cool inside › Winter: warm inside › Defrost itself › Ask for backup

1. Reversible by design — A heat pump is an air conditioner with a reversing valve. Flip the direction, and instead of dumping heat outside, it gathers heat from outside and brings it in.

2. Cold air still holds heat — Even at minus 15, outdoor air contains heat energy. The pump squeezes it out and concentrates it. It sounds like magic, but it is the same physics as your refrigerator — in reverse.

3. It takes breaks to defrost — In damp cold weather, frost builds on the outdoor coil. The pump pauses heating for a few minutes to melt it off. You may see steam rise — that is normal, not a fire.

4. Backup heat kicks in — On the coldest days, most Canadian heat pumps get help from electric backup heat or a gas furnace. The system switches over by itself; you do not have to do a thing.

TALE

E STORY

Harold, 79, watched steam pour off his heat pump on a January morning and called the fire department.

The dispatcher, after one question, said gently, “Sir, that is your heat pump defrosting. It does that. You are safe — and warm.”

!

Cold-climate heat pumps made for Canada keep working down to minus 25 or lower. If you are shopping, look for that rating on the label.

Take care: Do not chip ice off a heat pump with a shovel or axe. You can puncture the refrigerant lines. Pour warm (not boiling) water, or call a technician.



START HERE

Follow the Air: The Great Duct Loop

Ducts are the hidden hallways of your home's comfort. Conditioned air travels out through supply ducts and comes back through return ducts, in one endless loop.

Out through supplies › Into the rooms › Back through returns › Conditioned again

1. Supplies blow out — Supply vents — the smaller grilles on walls, floors, or ceilings — deliver warm or cool air to each room. Put your hand near one: you should feel a steady, gentle flow.

2. Returns pull back — Return vents are the bigger grilles, often in hallways. They draw room air back toward the furnace. They are the other half of the loop, and just as important.

3. One loop, always moving — When the system runs, air is constantly circling: out the supplies, across the room, in the returns, through the filter, past the heat source or cooling coil, and out again.

4. Closed doors break the loop — Shutting a bedroom door with no return vent inside starves the loop. Leave interior doors ajar when you can, or talk to a technician about adding a return.

TALE

E STORY

Margaret, 78, closed every vent in the spare rooms "to save money" and wondered why the living room felt stuffy.

Her technician opened them all and said, "Your furnace needs to breathe in as much as it breathes out."

! A typical home's air passes through the filter and furnace several times an hour while the system runs. That is why a dirty filter affects the whole house so fast.

Take care: Never block a return vent with furniture or rugs. A starved system strains the blower, freezes cooling coils, and can crack a furnace heat exchanger.

START HERE

What Comfort Really Is (It's Not Just Temperature)

Two homes can both read 21 degrees, yet one feels cosy and the other feels clammy. Comfort is a recipe with three ingredients, and temperature is only one.

Right temperature › Right humidity › Gentle airflow › Even everywhere

1. Temperature sets the baseline — Most adults feel comfortable between 20 and 22 degrees in winter. But if the air is bone dry or the room is drafty, the number on the wall will lie to you.

2. Humidity is the secret — Winter air in Canada can drop below 20 percent humidity indoors, which makes 21 feel like 18. Adding moisture — a humidifier, or even a pot of water simmering — makes the same temperature feel warmer.

3. Airflow should be invisible — You should barely notice moving air. Hot spots, cold spots, and rooms that never quite match are usually airflow problems: blocked vents, closed doors, or leaky ducts.

4. Your body votes last — If you are always cold while others are fine, check drafts at windows and doors before blaming the furnace. A five-dollar draft stopper has ended many thermostat wars.

TALE

E STORY

Bill, 82, kept turning the thermostat up to 25 and still felt chilly.

His daughter found the culprit: a drafty old window behind his armchair. A roll of weatherstripping later, 21 felt like a sauna.

! Aim for 30 to 50 percent indoor humidity in winter. Below 30 feels cold and crackles with static; above 50 fogs windows and feeds mould.

Take care: A cheap indoor thermometer-hygrometer (about fifteen dollars) tells you the truth about your rooms. Trust it more than your memory of what "21 used to feel like."

START HERE

How Your System Knows What to Do

Your furnace and air conditioner have no brains. The thermostat is the brain, the messenger, and the foreman — and it is simpler than it looks.

Sense the room › Compare to setting › Call for help › Call it off

1. It only knows one thing — A thermostat measures the air temperature right where it sits on the wall. That is all. It has no idea the bedroom is freezing or the kitchen is roasting.

2. Compare and call — If the room is colder than your setting, the thermostat sends a low-voltage signal: “heat, please.” The furnace obeys, runs, and shuts off when the thermostat says “enough.”

3. It cycles on purpose — Heating and cooling happen in cycles — on for a while, off for a while. Three to six cycles an hour is normal. Constant on-off every two minutes is not, and has a name: short cycling.

4. Give it time to think — After you change the setting, wait at least 15 minutes before deciding nothing happened. Big temperature changes take time, especially on very cold or hot days.

TALE

E STORY

Edith, 75, cranked her thermostat to 30 “to heat the house faster,” then called her son in a panic at the tropical result.

He explained: “Thermostats are not gas pedals, Mum. They are just on-off switches with a dream.”

! Setting the thermostat higher does not heat your home faster — the furnace runs at one speed. It only makes it overshoot and waste fuel.

Take care: If the thermostat screen is blank, check its batteries before calling anyone. A two-dollar battery swap has saved many an unnecessary service call.

START HERE

Your Home Comfort Map

This book follows the air through your home, chapter by chapter. Here is the route we will take together — read straight through, or jump to the job you need today.

Learn the machines › Master the controls › Spot trouble early › Save money

1. Chapters two and three: the machines — Furnaces, air conditioners, and heat pumps — what each one does, how it starts up, and the simple checks that keep them happy.

2. Chapters four and five: air and control — Filters, vents, and ducts carry comfort to every room. The thermostat directs it all. These two chapters hold the highest-value habits in the book.

3. Chapter six: detective work — Bangs, smells, puddles, and short cycling — what your system is trying to tell you, and which messages mean “call someone today.”

4. Chapters seven and eight: money and seasons — Lower the bills without lowering comfort, then walk through the fall and spring checklists that prevent most breakdowns.

TALE

E STORY

At a seniors’ centre talk, a man asked the speaker which chapter mattered most.

“The filter one,” she said without hesitating. “Change the filter and you have already beaten half the problems in this book.”

! Keep a pencil handy while you read. Circling the one task you will do this week turns a book into a warmer, cheaper home.

Take care: This book teaches habits and simple checks, not repairs. Anything involving gas, refrigerant, or wiring belongs to a licensed technician — always.

YOUR FURNACE

How a Furnace Fires Up, Step by Step

A furnace start-up is a careful little ceremony with safety checks at every step. Here is what happens in the minute after your thermostat calls for heat.

Call arrives › Safety checks › Ignition › Blower starts

1. The call comes in — Your thermostat closes a small electrical circuit — the "call for heat." The furnace's control board wakes up and runs a safety checklist before anything burns.

2. Clear the chimney first — A small draft fan runs for about 30 seconds, pushing any leftover gases out the vent. Only when sensors confirm clear airflow does the gas valve open.

3. Light it safely — Most modern furnaces use a hot-surface igniter — a ceramic part that glows orange-hot and lights the gas. Older ones have a standing pilot flame. Either way, a flame sensor confirms the fire caught.

4. Warm up, then blow — The burner heats the heat exchanger for a minute or two before the big blower starts. That delay is deliberate: it keeps the furnace from blowing cold air on you.

TALE

E STORY

Norman, 77, timed his furnace with a stopwatch and complained it was "too slow." The technician showed him the safety sequence and said, "Those 90 seconds of patience are what keep your house from filling with gas. Worth the wait."

!

You will hear clicks, a whoosh, then the blower hum. Learning your furnace's normal sounds means you will notice abnormal ones much sooner.

Take care: If you ever smell gas near the furnace, do not flip switches or light anything. Leave the house and call your gas utility's emergency line from outside.

YOUR FURNACE

Gas, Oil, Electric, or Wood?

Canadian homes heat with four main fuels, and each has its personality. Knowing which one you have changes what you maintain and what you watch for.

Find your fuel › Know its habits › Feed it properly › Respect its risks

1. Natural gas: the common one — Piped in from the street in most towns and cities. Clean-burning, and the furnace needs little from you beyond filter changes and yearly service. A gas meter outside tells the tale.

2. Oil: the rural workhorse — Common where gas lines do not reach. Oil is stored in a basement or outdoor tank that a truck refills. Watch the gauge, schedule fills before deep winter, and service the burner yearly.

3. Electric: simple and silent — Baseboards or an electric furnace — no flame, no chimney, almost no maintenance. But electricity costs more per unit of heat, so good insulation matters even more.

4. Wood: the hands-on choice — Wood stoves and pellet stoves warm beautifully but demand the most from you: dry wood, regular ash removal, and a chimney swept every year by a certified sweep.

TALE

E STORY

A couple who moved from Toronto to a farmhouse outside Peterborough discovered their first winter ran on oil, not gas.

"We learned to read a tank gauge," the husband said, "and to never, ever let it hit empty in February."

! Your fuel type is usually printed on a label inside the furnace door or on your energy bills. When in doubt, ask your utility — they love this question.

Take care: Each fuel has its own detector: carbon monoxide alarms for anything that burns, and a working smoke alarm regardless. Test both monthly.

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