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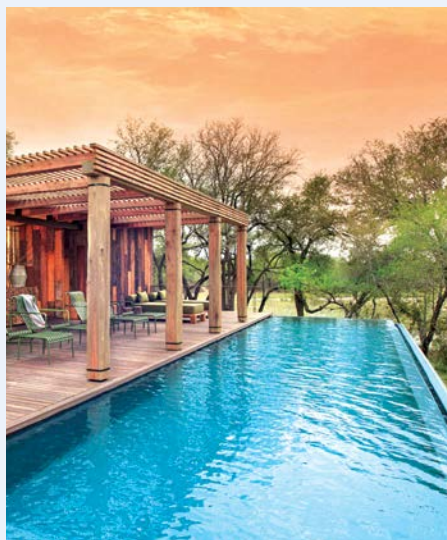
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on the cover



Clean lines, calm water, and a seamless connection to the landscape define this contemporary luxury pool. Set beside a timber pavilion, the pool's reflective surface extends the outdoor living area and showcases minimalist design. A reinforced PVC membrane finish can provide the durable, consistent surface quality needed to support sharp corners, a uniform waterline, and long-term performance in high-end pool projects.

PHOTO COURTESY RENOLIT

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www.poolspamarketing.com

EDITORIAL

Jason Cramp | Executive Editor
jcramp@kenilworth.com

Dave Flaherty | Editor
dflaherty@kenilworth.com

Amrit BLS | Online Editor
amrit@kenilworth.com

SALES

Linda Dalke | Publisher
ldalke@kenilworth.com

Heidi AlBarbary | Account Manager
halbarbary@kenilworth.com

Tim Broderick | Sales Operations Manager

DESIGN

Lisa Greco | Graphic Designer

PRODUCTION

Melissa Vukicevic | Senior Production Co-ordinator

CIRCULATION

Mei Hong | Circulation Manager



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Matthew Buckstein | DIRECTOR OF DIGITAL OPERATIONS

Founding Publisher Richard Hubbard

HOW TO REACH US

30 Leek Crescent, Suite 201, Richmond Hill, ON, L4B 4N4; 905-771-7333

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Designing What's Next

October is a month of transition. Across Canada, the shift from peak-season operations to closing preparations creates space to reflect on the decisions that will shape the next cycle—how pools are designed, protected, and how they serve the people who use them.

That conversation begins with our cover story, “Luxury Through Simplicity: The Rise of Clean-line Pool Design” (page 8), by Matthew Sands. In an increasingly value-conscious market, luxury is defined less by sheer scale than by purposeful, long-lasting outdoor environments. Homeowners are seeking compact pools, integrated spas, cold plunges, and spaces that support recreation, recovery, and connection, while also asking more questions about maintenance, energy use, and durability. Reinforced PVC membrane is part of this evolving design conversation, offering a clean, adaptable finish that supports both the visual simplicity and the practical performance these projects demand. As David Hobaica observes, “Maximizing the whole yard becomes the priority.” The pool is no longer a stand-alone feature; it is part of a carefully planned outdoor experience.

That heightened attention to design must be matched by early, practical collaboration. “Covering a Work of Art” (page 16) follows a West Vancouver project in which an architecturally ambitious pool required two automatic covers and an exceptional level of problem-solving. Allan Horwood puts the lesson plainly: “The earlier the cover installer joins the conversation, the more options everyone has—the architect, the builder, and especially the homeowner.” As high-end projects incorporate more complex forms, concealed systems, and smart-home expectations, coordination among designers, builders, and specialty trades becomes essential to delivering both performance and polish.

Behind every refined pool, of course, is a water-management strategy that must perform under changing conditions. “Structure Before Sanitation” (page 38) reframes familiar chemistry conversations by placing sanitizer within a broader operating hierarchy. Author John Bereza writes, “Pool water chemistry is not a linear checklist but an interconnected system where every adjustment has secondary consequences.” With the last pool closings now complete across much of Canada, Bereza’s framework is a timely reminder that spring water quality is largely determined well before the cover comes off.

The issue also extends beyond residential backyards to a central question for public aquatic spaces: who can participate? “Access for All” (page 32) argues that accessibility should be seen as an ongoing commitment rather than a one-time compliance exercise. As the article notes, “When you design a park around being able to accommodate and support every guest where everyone feels welcome, then everyone can benefit.” For facilities facing evolving community expectations, phased improvements and more inclusive planning can make access a meaningful part of the guest experience.

October asks the industry to look at the whole picture: beautiful design, reliable systems, sound fundamentals, and spaces that welcome more people. As construction costs and lot sizes reshape the market, the work done now lays the strongest foundation for next season. 

Jason Cramp
EXECUTIVE EDITOR

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Luxury Through Simplicity

By Matthew Sands
PHOTO COURTESY RENOLIT

The Rise of Clean-line Pool Design

In luxury pool design today, simplicity has become a defining element of sophistication. While ornate finishes and elaborate shapes once dominated high-end backyards, many architects and builders are now embracing a different philosophy: pools emphasizing geometry, calm surfaces, and architectural integration.

This shift reflects broader trends in contemporary design. Across architecture, interior design, and

landscape planning, luxury is increasingly expressed through restraint rather than excess. In pool design, that means straight lines, carefully proportioned spaces, and materials chosen not only for appearance but also for performance.

Several design trends have contributed to the rise of minimalist pool design.

Contemporary architecture increasingly favours clean geometry, large expanses of glass, and seamless



On this spread:

Left: The reinforced PVC membrane interior supports the clean geometry and calm water plane central to the pool's minimalist design.

Top right: A reinforced PVC membrane finish provides the consistent surface quality needed to define sharp corners and a uniform waterline.

Bottom right: The reinforced PVC membrane interior complements the pool's geometric form and its co-ordinated relationship with the surrounding outdoor setting.

indoor-outdoor living. At the same time, landscape designers are embracing simplified material palettes, structured outdoor spaces, and resort-inspired environments. Together, these trends have shifted pools from decorative backyard features to architectural elements that complement the home's overall design.

Pools as architectural elements

Rather than positioning a pool as a separate landscape element, architects are aligning water features

directly with the home's geometry—mirroring rooflines, terraces, and outdoor living spaces.

Reinforced PVC membranes are being developed for high-end architectural projects, emphasizing textures and premium colours designed to elevate pool projects. Examples include minimalist retreats, grey stone finishes for minimalist design environments, and natural textures that support contemporary architectural settings. A good example would be a rectangular residential pool with a stone-inspired reinforced membrane, aligned with the



This compact pool combines a reinforced PVC membrane interior with seating, landscaping, umbrellas, and a fire feature to make the full yard functional.

surrounding decking and landscape materials. Therefore, the pool reads as part of the architecture rather than a separate decorative element.

This approach often results in pools defined by clean, geometric forms. Sharp corners, consistent waterlines, and minimalist detailing allow the water to function as a reflective plane that complements surrounding materials such as stone, concrete, and glass.

Minimalist designs leave little room to hide imperfections. Small variations in wall alignment, corner geometry, or waterline elevation become much more noticeable in clean-line pools. Achieving this level of precision requires careful co-ordination between the structure, interior finish, and surrounding hardscape materials.

In this context, visual calm becomes a design goal. The pool is meant to enhance the architecture rather than compete with it.

Designers say this approach creates a sense of balance between the built environment and the landscape, particularly in properties where outdoor living spaces have become as important as interior rooms.

Pools are often integrated with outdoor kitchens, dining areas, lounges, fire features, spas, and wellness spaces through co-ordinated materials, elevations, and sightlines. The goal is to create a seamless transition between recreation, relaxation, and entertainment areas, allowing the entire outdoor space to function as a cohesive extension of the home.

The rise of the compact luxury pool

Another trend shaping modern pool design is the growing popularity of smaller, architecturally focused pools. In urban environments and in homes where outdoor space must be carefully planned, plunge pools are increasingly seen as a refined alternative to large traditional swimming pools.

While exact unit data for residential plunge pools is limited, multiple market signals point to rising demand. David Hobaica, co-founder of Plunge Pool Concepts, describes plunge pools as “one of the fastest-growing trends in outdoor living,” driven by smaller footprints, lower maintenance, wellness benefits, faster installation, and sustainability. Broader market research also identifies wellness and health trends as drivers for plunge and vitality pools.^{1,2} Rather than simply replacing traditional pools, compact pools are creating a distinct category focused on wellness, design efficiency, and lower ownership demands. Plunge pools also allow homeowners to integrate water features into smaller yards, terraces, or outdoor living spaces while still achieving a high-end esthetic.

Founded by second-generation pool builders David and Robert Hobaica of Easton Pool & Spa, Plunge Pool Concepts builds on decades of experience in traditional concrete-pool construction, adapting that expertise to a format that aligns with modern lifestyles.

Several factors are driving demand for smaller pools. Homeowners are increasingly prioritizing wellness, relaxation, and outdoor living while seeking lower maintenance and operating costs. At the same time, smaller lot sizes and rising construction costs have made compact, multifunctional pool designs more attractive.

A recent project Plunge Pool Concepts worked on saw a 2.7-m x 6.4-m (9-ft x 21-ft) plunge pool integrated into a manicured backyard with natural stone decking, seating, umbrellas, landscaping, and a fire pit. The key point is that the pool delivers a luxury outdoor experience without requiring a large footprint. The design demonstrates how compact geometry, premium materials, and surrounding amenities can make a constrained site fully functional.

This shift is also changing how designers approach outdoor environments. "Maximizing the whole yard becomes the priority," says David Hobaica. "Designers are no longer focused on just the pool, but on how the pool fits into the patio and overall lifestyle."

Designers often maximize outdoor space by combining the plunge pool with other amenities such as

lounges, outdoor kitchens, fire features, and wellness areas. Compact pool footprints, integrated seating, and efficient layouts help create multiple functional spaces while maintaining an open, uncluttered feel.

Precision design meets modern materials

Clean-line pools demand materials capable of delivering precise geometry and consistent surfaces. Traditional pool finishes can sometimes limit design possibilities when tight corners, integrated benches, or minimalist detailing are required.

Designers most commonly encounter these limitations in modern geometric pools, integrated benches, tanning ledges, and other architectural features, where sharp corners, complex detailing, and a uniform appearance are critical to the overall design.

Modern interior systems are increasingly helping designers achieve these architectural goals while supporting a more integrated design approach. As David Hobaica notes, "When the interior finish is executed thoughtfully, the pool no longer feels like an add-on—it becomes a seamless extension of the home's architecture."

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The lighter reinforced PVC membrane finish creates a bright water colour while complementing the pool's straight lines and contemporary architecture.

Designers are increasingly specifying large-format porcelain pavers, architectural concrete, natural stone, frameless glass, and concealed drainage systems to create clean, uninterrupted lines. These materials complement minimalist pool designs by emphasizing simplicity, consistency, and strong architectural integration.

For example, some pools incorporate reinforced PVC membranes as an interior finish.

"The durability and luxury of reinforced PVC made it the right choice for our product," explains David Hobaica. "In frost-belt climates, the material performs exceptionally well and isn't affected by freeze-thaw cycles."

Freeze-thaw performance is important in colder climates because repeated freezing and thawing can cause cracking, delamination, and surface deterioration in some traditional cementitious finishes. Reinforced PVC membranes remain flexible and waterproof, allowing them to accommodate temperature-related movement without the same risk of damage. This helps maintain both appearance and watertightness over time.

"I had read several articles about reinforced PVC being used in commercial pools and learned that it had been used successfully in Europe for many years," explains Robert Hobaica. "So, when the opportunity came to explore it for our plunge pool product, we wanted to see if it could deliver the performance and look we were aiming for."

To test the material, he first installed it in his own backyard pool.

The evaluation confirmed that reinforced PVC membranes provided the durability, appearance, and freeze-thaw performance they were looking for. The team also found that the material delivered a consistent finish quality and offered more flexibility during construction.

Durability meets design

Beyond esthetics, durability is becoming an increasingly important consideration in luxury pool construction. High-end clients expect pools to perform reliably for many years with minimal maintenance interruptions.

Compared to five or 10 years ago, homeowners are placing greater emphasis on long-term performance, maintenance requirements, and lifecycle costs. Clients increasingly ask about stain resistance, colour retention, watertightness, freeze-thaw durability, and how often a finish may require repair or replacement. They want materials that not only look good on day one but continue to perform for decades.

That performance often surprises homeowners. "Many assume it's just another liner," says David Hobaica, "but once they see and feel the material, they're impressed by how substantial and durable it is."

Robert Hobaica says one experience with his personal pool installation demonstrated the resilience of the reinforced PVC system.

"After the pool's interior was completed, I left the pool empty for almost five months while I worked on a full

backyard renovation,” he recalls. “The pool interior was exposed to rocks, dirt, sun, and debris the entire time, but the material was completely unaffected.”

Reinforced PVC membranes have a long track record in Europe, where they have been used in swimming pools for more than 40 years. In real-world applications, these systems have commonly demonstrated service lives exceeding 20 to 30 years when properly maintained. Long-term lifecycle simulations and stress testing also support their ability to perform over extended periods. This is especially relevant for high-end clients focused on lifecycle cost, watertightness, reduced maintenance, and avoiding premature renovation.

This level of durability, combined with predictable installation timelines and resistance to weather delays, has made the system particularly attractive.

“It eliminates some of the scheduling challenges that come with traditional finishes,” says David Hobaica. “It can also handle freeze-thaw conditions and doesn’t require water to remain in the pool during construction phases.”

Compared to traditional plaster or aggregate finishes, reinforced PVC membranes can significantly simplify scheduling. A typical 6.1 m x 12.2 m (20 ft x 40 ft) pool can often be completed in two to three days and can be filled immediately upon completion, since no curing period is required. Traditional finishes typically involve multiple application stages, curing times, and greater sensitivity to weather conditions, making project timelines less predictable.

Esthetic versatility

While durability and reliability are essential, appearance remains central to luxury pool design.

Modern reinforced PVC membranes now offer a wide range of textures, colours, and patterns, allowing architects and builders to co-ordinate pool interiors with surrounding materials.

For minimalist pool designs, neutral and natural-inspired finishes remain the most popular. Light and medium greys, concrete-inspired textures, soft stone patterns, and subtle earth tones are frequently specified because they complement contemporary architecture without drawing attention away from the overall design. Homeowners

and designers are increasingly choosing finishes that enhance the colour of the water while creating a clean, timeless esthetic.

This flexibility is particularly important in minimalist pool designs, where the simplicity of the surrounding architecture heightens the visual impact of the water surface.

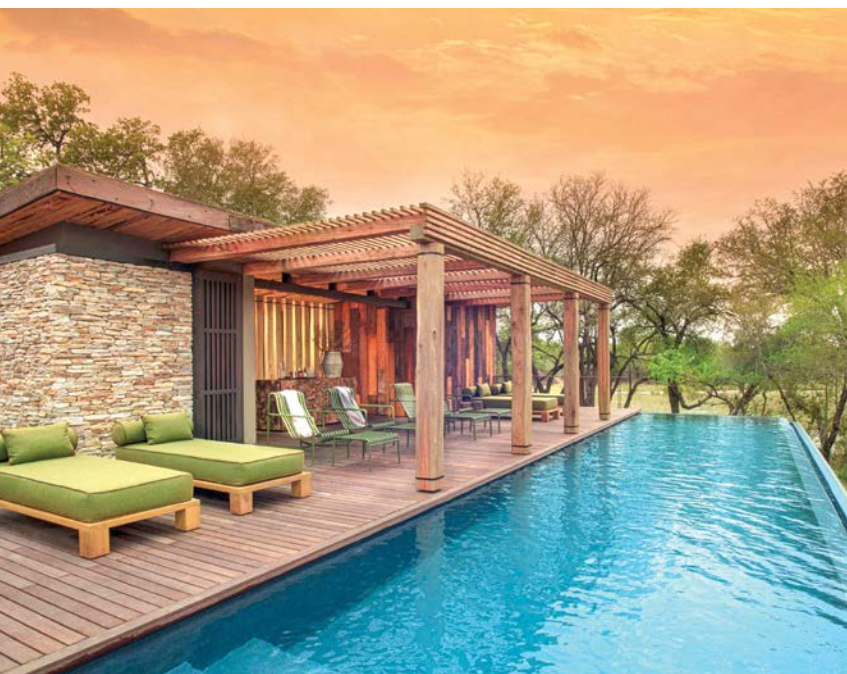
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The pool and adjacent lounge area illustrate how co-ordinated materials and amenities can create a cohesive outdoor living space.

Rather than relying on decorative tile or intricate mosaics, many designers now use subtle interior finishes that enhance the water's natural colour and create a cohesive visual connection with the surrounding landscape.

Interior finish selection has a significant impact on both water colour and the overall character of a pool. Lighter finishes tend to create brighter blue and turquoise tones in water, while darker greys and slate-inspired finishes produce deeper blue hues and more reflective, mirror-like surfaces. Stone and concrete-inspired finishes often create a natural, contemporary appearance that complements modern architecture, whereas brighter finishes can evoke a more tropical or resort-style esthetic.

A new standard for outdoor living

Wellness-focused features are transforming pools from recreational amenities into year-round lifestyle and recovery spaces, as homeowners are incorporating cold plunges, hydrotherapy zones, integrated spas, and saunas to support relaxation, fitness, and overall well-being. This trend is also driving demand for smaller, multifunctional pools that can serve multiple purposes while fitting seamlessly into a broader outdoor living environment.

Compact plunge pools, minimalist geometry, and performance-driven materials contribute to a design philosophy that prioritizes both beauty and practicality.

For builders, the appeal of this approach is clear. "These pools are easier to maintain, heat, and clean,

while still offering luxury add-ons like built-in spas and architectural finishes," says David Hobaica. "Plunge pools are quickly becoming a category of their own. As outdoor spaces become more important and lot sizes continue to shrink, homeowners aren't just adding a pool—they're investing in a full backyard where the pool is only one part of the experience."

Over the next five to 10 years, luxury pool design will likely be shaped by wellness, sustainability, and the continued integration into outdoor living environments. Homeowners are increasingly seeking multifunctional spaces that combine recreation, relaxation, fitness, and recovery. At the same time, demand for compact, highly efficient pool designs is expected to grow as lot sizes decrease and construction costs rise. Materials that offer long-term durability, water conservation benefits, design flexibility, and low maintenance—such as reinforced PVC membranes—will also continue to gain traction as homeowners place greater emphasis on lifecycle value rather than just initial appearance.

In many ways, the movement toward clean-line pool design reflects a broader evolution in luxury living. The most refined environments are no longer defined by size or complexity but by thoughtful design, material performance, and the ability to create calm, elegant spaces where architecture and water work together seamlessly. 🌊

Notes

¹ Grand View Research, "Cold Plunge Tub Market Size & Trends, 2026–2033," grandviewresearch.com/industry-analysis/cold-plunge-tub-market-report.

² Global Wellness Institute, "2024 Hydrothermal Initiative Trends," April 30, 2024, globalwellnessinstitute.org/global-wellness-institute-blog/2024/04/30/2024-hydrothermal-initiative-trends/.



Matthew Sands is a sales engineer with RENOLIT and has more than 20 years of specialized experience in construction renovation, product installation, and project engineering. He supports architects, installers, and distributors across North America with technical expertise, field training, and system design guidance. Additionally, he trains international customers through RENOLIT's Global Training Academies worldwide. He can be reached at matthew.sands@renolit.com.



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Covering a Work of Art

Two Auto Covers for One Architect-designed Pool

By Mike Shadoan

PHOTOS COURTESY
POOL PATROL

When an architect designs the pool, and nobody consults the cover installer, a “simple” automatic cover job becomes a puzzle involving two covers, three men, and four times as many hours to resolve. Here is how one B.C. installer solved it.

High in West Vancouver’s British Properties, where hillside homes command sweeping views of Burrard Inlet, sits a residence that turns the usual pool playbook on its head. The pool does not face the view, nor does it face south. In fact, much of it is not even outside.

Designed by the home’s architect rather than a pool professional, the sculpted pool begins inside the house. A glass wall separates the interior living space from the water, and swimmers enter down a

set of steps from inside the home, gliding beneath the structure and out into the north-facing backyard. Overhead, a deck spans a portion of the pool, pierced by a large triangular skylight that bathes the water below in daylight. Turquoise and green mosaic tile lines the pool and its integrated spa, while a separate water feature runs along the pool’s exterior, filling the space with the sound of falling water.

Even the pool’s unusual orientation appears deliberate. Where most designers would chase the southern exposure—and the spectacular view—the architect turned the pool north into a shaded corner of the yard, wrapped by the house itself, creating an intensely private, indoor-outdoor swimming experience. It is, by any measure, a stunning piece of



architecture. It is also one of the most demanding automatic cover installations imaginable.

"The home and the landscaping are stunning and unique, but when we were called in to put an automatic cover on the pool, we realized this was not going to be an easy task," says Allan Horwood, owner of Pool Patrol, which has offices in Vancouver and Kelowna, B.C. "What we often find on these projects is that the pool takes shape on the architect's drawing board, and the pool builder and cover installer come into the picture later. You end up with a pool that's a piece of art—and our job becomes adding something practical like an automatic cover without compromising that artistry, because high-end pool owners are exactly the customers who want that kind of automation."

It is a familiar irony in the luxury segment: the design decisions that make these pools remarkable

are made long before anyone considers how a cover will travel across the water, where its housing will be hidden, or how its track will be mounted.

By the time Horwood was brought in by the pool builder, the pool was already finished; the builder's role had been to execute the architect's vision faithfully. That left Horwood's crew to engineer a covering solution for a pool that had never been drawn with one in mind. It is a pool with an unconventional footprint tucked tightly into a corner of the yard, minimal deck space around the perimeter, an intricate cantilevered coping detail, and a width of 6.7 m (22 ft), beyond the 6.1 m (20 ft) span most automatic cover systems are engineered for.

Two covers or no cover

The first realization came quickly: no single automatic cover could do the job. The pool's shape, the overhead deck structure, and the indoor entry point made a conventional one-cover layout impossible.

"We quickly realized that the only way to cover this pool completely was to do so with two automatic covers that come together in the middle," Horwood says.

The main cover would span the pool's primary section—a 6.7-m x 7.6-m (22-ft x 25-ft) expanse—while a second, smaller cover, roughly 1.8 m x 3.7 m (6 ft x 12 ft), would handle the indoor and outdoor stair entry. Splitting the pool between two independent systems solved the geometry problem.

Rather than being designed by a pool professional, this home's pool was conceived by the project's architect.



When closed, the two covers create one clean plane across the water, delivering the unobtrusive practicality the project required.

Still, it doubled nearly everything else: two motors, two tracks, two housings, two sets of controls, and a seam in the middle of the pool where the two covers would have to meet cleanly, function reliably, and look like they belonged together.

In Horwood's experience, the two-cover configuration itself is a reliable signal of what kind of project it is.

"Anytime you're doing a two-cover job, it's generally going to be a high-end job," he says. "And on high-end projects, there's a whole design team making decisions. The challenges those choices create for the pool builder and the cover installer aren't always visible from the drawing board—and that's where we come in."

Engineering beneath a cantilevered coping

Of all the design details, the coping demanded the most ingenuity. The limestone coping projects farther into the pool—and hangs lower—than a conventional profile, creating a deep cantilevered overhang: a crisp shadow-line detail that photographs beautifully and complicates everything an automatic cover needs to do. The cover track had to be tucked completely out of sight beneath

that overhang, in a space never dimensioned to receive it.

"It was a real challenge to install the cover because of that coping," Horwood says. "Automatic covers run on hardware in a track mounted to the pool, so we had to make some complex adjustments to the tracking mechanisms to avoid any rubbing of the ropes and the cover fabric. That rubbing isn't cosmetic—it can compromise both the safety and the mechanical function of the cover."

Any installer who has fought a non-conforming coping knows the stakes: rope wear means premature failure, fabric abrasion means warranty calls, and a cover that binds undermines the very safety function the client paid for.

Horwood's first instinct was to propose modifying the coping profile to simplify the installation. But the cantilevered detail was integral to the architect's design—one of the signatures that gives the pool its sculptural quality—so the team committed to engineering around it instead.

"We had to provide a modified cover glider arm and reduce the length of the leading edge, which then led to a slight modification of the fabric itself due to the looped leading edge," says Horwood.

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Adjusting for an unusual cover size

At 6.7 m (22 ft), the pool's main section exceeds the width most cover systems are built for, and that created a structural problem at the leading edge. "Anything over 6.1 m (20 ft), your normal leading-edge bar—the front bar that carries the vinyl across the pool—starts to sag," Horwood explains. The fix itself was straightforward: a heavy-duty, oversized leading-edge bar on the main cover, a standard upgrade for wide pools.

But this pool was not standard, and the upgrade created a knock-on problem. Because the two covers would meet nose-to-nose in the middle of the pool, a mismatch would be glaring: a beefy bar on one cover butting up against a slim standard bar on the other, in the most visible spot on the water. Horwood caught the problem before the smaller cover went into production.

"I said, wait a minute—we need to order the smaller cover to jive with the bigger cover," he recalls.

The small cover got the same oversized leading-edge bar, purely for esthetics, so the two covers would read as one continuous system when closed.

"They meet in the middle, and they don't look different. But of course, by putting the bigger bar on the little cover, we now had a bigger bar to hide and get out of the way at the entry steps. On this job, it

was one thing after another—you solve this, and suddenly you've got to solve that," Horwood explains.

Even the way the covers stop took engineering thought. There is no shared mechanical stop between the two systems; instead, the installation relies on the pool's own geometry. The main cover halts when its leading edge reaches the overhanging coping, which runs along roughly 5.5 m (18 ft) of the meeting line. The small cover, in turn, stops when it meets the main cover. The two simply butt together with no gasket and no interlock, which meant the travel of each system had to be dialed in precisely so that neither cover stopped short and opened a gap over the water.

The far wall added one more wrinkle. Each cover's track terminates in a rope pulley—a small roller the drive rope wraps around—and on this pool, two of those pulleys meet head-to-head on the same long wall. "There were real considerations in making sure one cover didn't stop short of the other," Horwood says. "A lot of thought went into making the mechanisms work and look good."

A cover housing you can walk on

Placement of the cover housings brought its own complications. The main cover's roll-up mechanism was concealed at the far end of the pool, supported by custom brackets, with the lid material fabricated to match the surrounding limestone deck.



However, the small cover had nowhere to go except directly beside the first entry step—the very spot where the homeowners walk into their pool from inside the house. To reach the water, they would have to step directly over the cover housing.

“Generally, you don’t put a cover roller mechanism at the end of the pool where people access the water—it gets complicated,” Horwood says. “But there was nowhere else to put it. So we had to create a plan where they could actually walk on the housing to get to that first step.”

The solution was a custom load-bearing lid over the housing, engineered to serve as a step, with the cover’s leading edge set back far enough that bathers would never step on the front bar itself. What reads to the homeowner as a simple threshold into the water is, beneath the surface, a structural lid concealing a complete roll-up mechanism.

“We used a series of pool cover-compatible support brackets that are rated for 136 kg (300 lb) each,” says Horwood. “Then we used the same tile on the deck, which was put on those brackets to create the lid construction to provide a continuous look.”

The controls compromise

With two independent covers travelling different distances, there was no way around dual controls: two touchpads operated separately. Before a swim,

the homeowners open the large cover from one touchpad, then walk to the second and open the small cover. Closing up follows the same two-step routine in reverse.

For clients accustomed to whole-home integration, that came as an unwelcome surprise. “They weren’t thrilled with how the touchpads looked compared to the rest of the house, and they were a little taken aback that the covers couldn’t run off the smart-home system,” Horwood admits.

In a home where every switch and finish had been curated by the design team, two utilitarian touchpads stood out. Horwood notes that it is a reminder that finish-level expectations extend to every panel on the wall—and that setting those expectations early is far easier than explaining the limitations after the fact. “The touchpad control on these covers is designed for safety, not necessarily for esthetics,” notes Horwood.

Quadruple the installation time

A typical automatic cover installation is a one-person job for the company. This one took a three-person crew, largely because the pool’s tight placement left almost no room to work. The deck along the far wall is barely wide enough to walk, let alone to stage materials, run tools, and manoeuvre a 6.7-m (22-ft) cover system into position. All told,

On this spread:

Left: To create a visually consistent meeting point at the middle of the pool, the smaller cover received the same oversized leading-edge bar as the main cover.

Middle: Each cover’s track ends at a rope pulley, the small roller around which the drive rope travels; on this pool, two pulleys meet head-to-head along the same long wall.

Right: Since the pool’s 6.7-m (22-ft) main section exceeds the width most cover systems are designed to span, a standard leading edge would deflect; Pool Patrol installed an oversized leading-edge bar to prevent it.



This sculptural pool begins inside the home and was designed by the architect rather than a pool professional.

Horwood estimates the project consumed roughly four times as many hours as a standard installation.

"I had three guys on that job scratching their heads," he laughs.

However, the finished result is hard to argue with. The architect and homeowner selected a tan cover fabric that blends seamlessly with the limestone decking and coping and complements the home's modern colour palette. Closed, the two covers read as a single clean plane over the water—exactly the kind of invisible practicality the project demanded. The homeowners got what luxury clients ultimately want from an automatic cover: safety, energy savings, and convenience, delivered without visually intruding on the architecture.

The lesson for the industry

For Horwood, the job crystallized a lesson to pass along to anyone in the industry: on architecturally driven projects, design teams and trade specialists typically work in sequence rather than in conversation. The coping profile, the 6.7-m (22-ft) width, the corner placement, and the indoor entry—each was made in service of a remarkable piece of architecture, and each carried implications that surfaced only when the cover crew arrived.

"The pool builder's job was to execute the design, and ours was to make the cover work within it," Horwood says. "That's the nature of these high-end jobs. The earlier the cover installer joins the conversation, the more options everyone has—the architect, the builder, and especially the homeowner."

None of it makes the pool any less remarkable—if anything, the finished installation is a case study in what visionary design and skilled trades can produce together. For builders and cover professionals alike, the takeaway from West Vancouver is simple: on architecturally ambitious projects, get to the table early. And when you can't, be ready to solve one thing after another—and to rise to the level of the design. 🦋



Mike Shadoan has more than 25 years of experience working as a service tech in the field. In 2013, he worked his way up to vice president of sales at Automatic Pool Covers in Westfield, Ind.

Shadoan has been an integral part of the company's rapid growth. He can be reached via email at mshadoan@apc-mfg.com.



DEYS FABRICATING & SWIMWERX WELCOME INDUSTRY VETERAN DAVID AITKEN AS BUSINESS DEVELOPMENT MANAGER

40+ years of industry experience strengthens the growing sales team

Deys Fabricating and Swimwerx are pleased to announce the appointment of David Aitken as Business Development Manager. With more than 40 years of industry experience, David brings extensive knowledge, valuable relationships, and a proven track record of supporting business growth.

His addition marks an exciting step for both companies as they continue to expand their market presence, strengthen customer partnerships, and pursue new opportunities across the industry.

Throughout his career, David has built a strong network and developed a deep understanding of the people, products, and companies that drive the pool and spa sector. His relationship-focused approach and industry expertise will be a tremendous asset to both organizations.

Working closely with the sales teams at Deys Fabricating and Swimwerx, David will focus on developing new business opportunities, supporting existing customers, and building even stronger partnerships throughout the industry.

"We're thrilled to welcome David to the team," said Jada Denis, Managing Partner of Swimwerx. "His experience, industry knowledge, and relationships are exceptional. David understands this business and, most importantly, the value of strong partnerships. We know he will make a significant contribution as we continue to grow."

David joins Deys Fabricating and Swimwerx at a time of continued growth and investment, as both companies remain focused on delivering exceptional service and value to customers and industry partners.

Please join the entire team at Deys Fabricating and Swimwerx in welcoming David Aitken to his new role as Business Development Manager.



The AHI Dealership in Action

Seven Use Cases That Build Your Competitive Moat

By Dennis Gray

AI-GENERATED IMAGES

Bluewater Pool & Spa is a fictional dealership.

The scenarios that follow are not. Every situation in this article is drawn from real challenges facing independent dealers across Canada—the staffing gaps, the knowledge drain, the customers lost to convenience, and the service calls that required three visits when only one was needed.

What is different in each scenario is one variable: the team at Bluewater has suited up. They have invested in paid AI tools and learned the four skills—prompt engineering, concept engineering, context window management, and the discipline to use AI as a collaborator rather than a search engine.

Three team members will be followed throughout a single day to explore what the Intelligent Dealership experience looks like when they are fully engaged in their roles.

Lisa owns Bluewater and has 22 years in the business. She built it from a single service van to a full retail location with a team of 11. She is strategic, time-pressed, and tired of fighting fires instead of building the business.

James is Bluewater's lead service technician. He has seven years of experience and is reliable and thorough. But with two senior techs retired in the past 18 months, he is now fielding questions from junior techs that used to go to people with decades more experience.

Priya started on the retail floor three months ago. She is sharp, customer-focused, and eager to learn—but came from outside the industry. She does not have the product knowledge or the water chemistry intuition that takes years to develop—or did not.



Use case 1: Priya diagnoses combined chloramines with AI confidence—three months on the job, performing like a veteran.

Moat this builds

Every associate on the floor operates at an expert level regardless of tenure. Customers get consistent, accurate guidance no matter who is on shift. The big box down the road has shelf-stockers, while Bluewater has augmented experts.

The retail floor

Use case 1: The always-on expert

(7:45 a.m.)—Priya arrives early to prepare for the day. She reviews her AI assistant's "morning briefing"—a concept she learned in her first week. She has loaded the assistant with Bluewater's product playbook, the regional water profile for their service area, and the seasonal context. It is early June: pools are opening, and customers are coming in with green water, winterized equipment, and a season's worth of questions.

(9:15 a.m.)—A customer walks in with a water sample and a problem. Her hot tub water has a chemical smell, and her skin is irritated after use. She has been using the same products for three years, but nothing has changed.

Three months ago, Priya would have fumbled this. She might have recommended a shock treatment—the default answer for "something smells wrong." But her AI assistant, briefed on the situation in 30 seconds using a prompt template, identifies the real issue: combined chloramines in

an enclosed hot tub. The smell is not too much chlorine—it is not enough free chlorine, combined with inadequate ventilation and organic load from regular use. The AI recommends a specific oxidation treatment from a specific product line, with dosing, timing, and a follow-up protocol.

The service van

Use case 2: The veteran in every truck

(10:30 a.m.)—James is at a customer's home facing an equipment problem. The pool's variable-speed pump is cycling on and off erratically—running for four minutes, shutting down for several minutes, and then restarting. The display shows no error code. The homeowner has already called another service company, which replaced the capacitor. However, the problem persists.

Two years ago, James would have called Dave, their senior tech with 28 years of experience. Dave would have recognized the symptom pattern immediately: thermal overload protection cycling, likely caused by restricted water flow that creates



Use case 2: James diagnoses a thermal overload hands-free—his former colleague Dave’s 28 years of intuition rides in every truck.

Moat this builds

Dave’s 28 years of diagnostic intuition did not retire with him. It rides in every service truck. Because of this, first-call resolution rates climb, callbacks drop, and customer confidence compounds.

excessive back pressure. Check the impeller for debris, then plumbing for a partially closed valve. The problem is: Dave retired eight months ago.

James activates his AI assistant using voice mode—allowing him to be hands-free and eyes on the equipment. He describes the symptoms: the cycling pattern, the lack of error codes, and the failed capacitor replacement. The AI, loaded with equipment diagnostic knowledge, reaches the same conclusion Dave would have: thermal overload and restricted flow. It walks James

through a diagnostic confirmation sequence—check the pressure gauge reading against the pump curve, inspect the impeller, and verify all valves are fully open. Then, James finds the issue: a partially closed return-side valve that the homeowner’s landscaper accidentally bumped into two weeks ago.

First-call resolution. Problem solved. The customer does not need a third visit from a third company. James’s diagnostic capability just grew, and he will recognize thermal cycling patterns for the rest of his career.

Moat this builds

The owner shifts from firefighter to strategist. Data-informed decisions replace gut instinct. Inventory optimization reduces waste and captures previously missed revenue. The business operates on intelligence, not inertia.

The back office

Use case 3: The strategic analyst

(12:15 p.m.)—Lisa spends her lunch reviewing inventory for the upcoming peak season. Historically, this has been a gut-feel exercise—order what was

ordered last year, adjust for what is expected to happen, and hope it is close.

This year, Lisa uses her AI assistant to analyze three years of data exported from her point-of-sale (POS) system. She has provided the data in a structured format and asked for a seasonal demand analysis by product category, cross-referenced with weather patterns and her service call records.

The AI identifies a pattern Lisa had not seen: a consistent spike in oxidizer product sales 10 to 14 days after the first heat wave of the season, correlated with a corresponding spike in service calls for cloudy water. Her current ordering pattern has her restocking these products two weeks too late. She has been losing sales to competitors when her shelves are empty during the exact window when demand peaks.

Lisa adjusts her purchase orders. She also creates a targeted marketing campaign—drafted by AI, refined by her—to send to customers in her database five days after the first forecast of a heat wave,

proactively offering water chemistry checks and seasonal treatment packages.

The training room

Use case 4: The accelerated apprentice

(1:30 p.m.)—Bluewater has a new hire starting next week—a second technician to support James in the field. Under the old model, onboarding took eight to 12 weeks of ride-alongs, shadowing, and gradual progression to solo calls. That timeline assumed a senior technician was available to mentor the new hire. With Dave retired and James stretched across a full-service schedule, the old model is broken.

Lisa has built an AI-assisted onboarding program. It is not a replacement for hands-on experience—the new hire will still ride with James for the first two

Moat this builds

Faster onboarding means faster revenue capacity. In a market where finding skilled technicians is the constraint, compressing onboarding from months to weeks is a structural advantage.

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Use case 3: Lisa shifts from firefighter to strategist—AI-powered analytics reveal patterns hidden in three years of data.

weeks. But between ride-alongs, the new tech works through scenario-based training with the AI assistant: diagnostic simulations, product knowledge challenges, equipment identification exercises, and customer communication practice.

The AI presents realistic scenarios drawn from Bluewater's actual service history. In one example, a homeowner reports a persistent foam problem in their hot tub. They have drained and refilled twice. The new tech must decide what questions to ask, what tests to run, and what the diagnosis is. The new tech works through the problem. The AI coaches in real time, nudging when the tech goes off track, confirming when they are right, and explaining the reasoning behind each diagnostic step.

Traditional onboarding takes about 12 weeks to reach basic competence. With Augmented Human Intelligence (AHI)-assisted onboarding, the new tech is handling routine solo calls by week three. Not because corners were cut—because the learning was

concentrated, scenario-based, and available 24 hours a day instead of only when a senior tech was free.

The marketing desk

Use case 5: The ghost home recovery engine

(2:45 p.m.)—Lisa's database contains 4,200 addresses with pools or hot tubs. Of those, 1,750 have not purchased anything in more than 18 months. These are ghost homes with dormant revenue—families who moved away, customers who drifted to Amazon, and relationships that went cold.

Historically, recovering these addresses meant mass mailings—generic postcards that generated a 2 per cent response rate on a good day. Expensive, impersonal, and inefficient.

Lisa uses her AI assistant to segment the dormant addresses into clusters based on their purchase-history patterns, equipment age, and neighbourhood characteristics. The AI drafts personalized reactivation messages for each segment—not generic “we miss you” notes, but contextually relevant outreach. Addresses with aging heaters get maintenance reminders. Addresses with salt systems get cell inspection offers. Addresses that go dormant after a move receive “welcome to the neighbourhood” introductions and complimentary water testing.

Moat this builds

Systematic, AI-powered customer recovery at scale. Every dormant address becomes a recoverable asset. The database transforms from a list into an intelligent growth engine.

Early results from the pilot show an 11 per cent response rate on the first wave—more than five times the old approach. Sixty-three dormant addresses were reactivated in the first month. At an average annual customer value of \$450, that is more than \$28,000 in recovered annual revenue from a single campaign.

The owner's office

Use case 6: The strategic advisor

(4:00 p.m.)—Lisa is preparing for a quarterly review with her team. She needs to assess performance, identify emerging issues, and set priorities for the upcoming peak season. Under the old model, this meant hours of spreadsheet analysis, gut-feel assessments, and a meeting that often devolved into operational firefighting.

Lisa spends 30 minutes with her AI assistant, feeding it the quarter's data: revenue by category, service call volume and resolution rates, customer acquisition and retention numbers, inventory turn rates, and staff productivity metrics. She asks for a

Moat this builds

The owner operates as a strategist with an AI-powered analytical capability that would normally require a management consultant. Decisions are data-driven, priorities are constraint-focused, and the business moves faster because the owner sees further.

strategic analysis focused on one question: "What's the biggest constraint limiting our growth this quarter, and what's the highest-leverage action we can take to address it?"

The AI identifies the constraint: service capacity. Bluewater's retail performance is up 12 per cent year-over-year. But service revenue remains flat despite growing demand because James can handle only six calls per day. The backlog is growing. Customers are waiting four to seven days for service. Some are calling competitors. The bottleneck is not demand—it is throughput.

The AI recommends three prioritized actions: accelerate the onboarding of new technicians using the AI-assisted program (already underway),

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Use case 7: The digital extension—expert guidance in the customer’s backyard at 6:30 p.m., with zero staff involvement.

Moat this builds

The dealer relationship extends into the customer’s home, is available on their schedule, and recommends the dealer’s products, driving revenue through the dealer’s channel. This is the digital extension of the expertise advantage—the thing Amazon structurally cannot replicate.

implement AI-guided triage to route simple calls to junior staff while James handles complex diagnostics, and introduces a proactive maintenance subscription that smooths demand across the season instead of concentrating it in peak weeks.

The customer’s backyard

Use case 7: The digital extension

(6:30 p.m.)—After hours, a homeowner sits beside her pool with her phone. The water looks slightly hazy—not bad enough to call the dealership, but noticeable. Under the old model, she would ignore it until it became a visible problem, then drive to the store—or, increasingly, search Amazon for whatever chlorine had the best reviews.

But this homeowner is a Bluewater subscriber. She opens the consumer-facing AI advisor on her phone, a tool provided through her relationship with the dealership. She describes what she sees and enters her latest test strip results. The AI, configured with Bluewater’s product line and regional water profile, identifies early-stage chloramine buildup and recommends a simple oxidation treatment, along with a specific product line with exact dosing for her pool size.

The product recommendation links directly to an order, and she places it. It will be ready for pickup tomorrow morning—or, in the subscription model, it is already included in her monthly package.

The dealership just made a sale at 6:30 p.m. on a Tuesday, with zero staff involvement. The customer got expert-level guidance from her backyard. The product recommendation was brand-specific, dosing-accurate, and dealer-linked. Amazon was never under consideration.

Seven use cases, one moat

Each of these scenarios adds a layer to the competitive moat. In the first, the retail floor delivers expert-level guidance regardless of who is on shift. In the second, the service van carries the veteran’s knowledge in every truck. In the third, the back office runs on intelligence instead of inertia. In the fourth, training compresses from months to weeks. In the fifth, marketing recovers dormant revenue at scale. In the sixth, the owner operates as a strategist rather than a firefighter. In the final and seventh case, the customer relationship extends into the backyard.

To the customer watching Priya diagnose their hot tub with the confidence of a veteran, it looks like magic. But behind the counter, it is four skills, a configured AI assistant, and a dealership that decided to suit up.

None of this requires science fiction. It requires a decision to invest in capability rather than wait for conditions to improve. The tools exist, the skills are learnable, and the competitive window is open.

The final article in this series, “Sage, Rocky, and the Knowledge Harvest,” will introduce two purpose-built applications that take everything described and embed it into platforms designed specifically for backyard leisure. These articles have shown what the Intelligent Dealership can do with general-purpose AI tools, configured by skilled humans. Now imagine what it can do with AI tools purpose-built for this industry from day one—with 53 years of domain expertise already built in. The suit gets an upgrade. 🦋



Dennis Gray is president of Backyard Brands Inc., serving independent Canadian pool and spa dealers across a national network. He has more than 40 years of experience developing and marketing advanced water-care technologies. He is the architect of the Augmented Human Intelligence (AHI) platform, currently deployed across more than 260 dealerships. This is the third in a four-part series for *Pool & Spa Marketing*.



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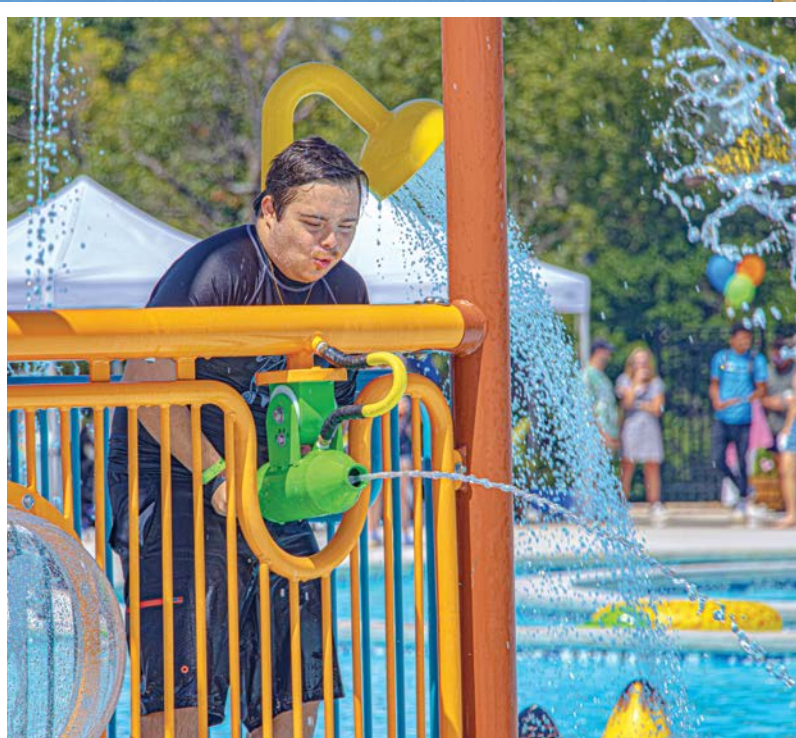
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Access for All

A Practical Guide to Inclusive Aquatic Design

Disabilities and neurodivergent markers are not always visible. Pursuing improvements to access can feel difficult to navigate at times, so how can aquatic spaces be designed to excite and engage people of all ability types? And how can the industry respectfully inquire about access needs while building amenities that will continue to adapt over time? This involves first understanding guest usage, then asking questions in an inclusive way that does not limit how someone may experience life. The good news is that equipment updates do not have to happen overnight.

Phasing projects is a fantastic way to stagger the budget while staying focused on progress.

The aquatics industry changes often to adopt new regulations and cater to community needs. Water quality, chemicals, safety services, products, toys, lifeguards, cleaning schedules, surfaces; the list seems unending, and that is a good thing. Communities need to be flexible to meet these needs while supporting generational wellness.

Canada's approach to accessible equipment is divided into federal and provincial rulings. At the federal level, the *Accessible Canada Act (ACA)* focuses on areas under federal jurisdiction beyond built environments, including employment, communication, and programming. One example of provincial legislation is Ontario's *Accessibility for Ontarians with Disabilities Act (AODA)*, which precedes the *ACA* by almost 15 years. *AODA* covers many of the same concepts as *ACA*, but its goal is to achieve a fully accessible province. Overall, regardless of the approach, accessibility acts aim to promote inclusion. The question to ask is, how

can this mindset be taken a step further and make people truly feel welcome at amenities, even while checking all the basic boxes for codes and standards?

Considering access

Physical and neurological disabilities are equally important to consider when building a new facility or when retrofitting an existing one.

Sydney Pederson, partner communications manager at the International Board of Credentialing and Continuing Education Standards (IBCCES), shares, "[IBCCES'] president often shows this cartoon of a snowy day with kids waiting to get into school. There's a ramp, and there's a set of stairs, and the adult is shovelling the stairs. All the kids are waiting, and there's one little child in a wheelchair who says, 'Well, if you just shovel the ramp, then all of us can go.'"

Shovelling the stairs and then shovelling the ramp takes extra time. Both need to happen, but dealing with the ramp first means the kids can reach their destination faster, regardless of ability, and no one is left waiting. Pederson continues, "When you design a park around being able to accommodate and support every guest where everyone feels welcome, then everyone can benefit."

Often, the first step toward improving access is an open mindset. During the exploration phase, when determining which questions to ask and whom to ask, it is important to understand the different types of mobility from an authentic perspective. Follow someone who uses a mobility aid, such as a wheelchair or crutches, from the parking lot to the amenity and

By Briana Valente

PHOTO COURTESY
LIFE FLOOR

Opposite page:

Bottom left: A baby crawls across a cushioned splash pad surface themed with blue squares.

PHOTO COURTESY
LIFE FLOOR

Bottom right: A guest engages with an interactive water feature at an aquatic play structure, illustrating how varied play experiences can help create welcoming spaces for people with diverse needs and preferences.

PHOTO COURTESY
SPLASHTACULAR



Two children run across a splash pad surfaced with a bright blue and white square design at a camp dedicated to accessibility.

PHOTO COURTESY
SPLASHTACULAR

back, and ask for their perspective. Also, purchase or borrow mobility aids to realistically traverse the same space from a similar physical perspective. With the latter, commit to parameters and try the route in several ways: vary arm strength, tactile motor control, solo vs. assisted journeys, and timed speed between touchpoints (e.g. does the door close too early, or do you have ample time to pass through?).

When asking questions about experience, keep inclusive language at the forefront. For example, rather than saying “when you walk in, what’s the first thing you see?” instead say “when you enter, what’s the first thing you notice?” This language change is subtle, but it opens the conversation to all possibilities rather than limiting it. “Walk in” becomes “enter” to account for mobility differences, and “see” becomes “notice” because not all guests may have full vision and may rely on tactile methods for navigation.

Sample case study: using mobility aids

Imagine an existing aquatic centre received a grant to improve accessibility. The team is excited and wants to implement changes, but does not know where to begin.

- Step 1: Understand the grant budget and start framing questions to ask community users. These questions will vary depending on specific centre and amenity types, but some high-level options may include:
 - “When you enter the parking lot, are there sufficient parking spaces if arriving by car? Is there enough space on each side of the vehicle to exit safely?”
 - If the facility has door opener buttons: “When entering the building, is there enough time to trigger the door opener and safely enter? Were there any obstacles or pressures you faced at this point?”
 - “When entering the locker rooms, are touchpoints such as sinks, lockers, and hand dryers at proper heights? Is there enough clearance to



6 Steps to Assess Accessibility at an Existing Aquatic Facility

- 1. Define the budget and goals.**
Understand available funding, including grant requirements, before identifying potential improvements.
- 2. Ask community members about their experience.**
Seek feedback on parking, entrances, door openers, locker rooms, clearances, surfaces, and amenity access.
- 3. Include people with firsthand experience.**
Invite staff members, community users, or local advocates who use mobility aids to share their perspectives.
- 4. Test the guest journey.**
When appropriate, use mobility aids such as wheelchairs or crutches to navigate the facility—from the parking lot to water features—and document any barriers encountered and successes achieved.
- 5. Prioritize the findings.**
Focus first on issues that create the greatest frustration or limit participation, while recognizing what already works well.
- 6. Research solutions and phase the work.**
Identify equipment and design updates that fit the facility's needs, develop a proposal and plan improvements over time as budgets allow. 🌊

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Left: A participant enjoys the splash pad during an aquatic program for adults with disabilities.

PHOTO COURTESY LIFE FLOOR



Right: A family enjoys a splash pad as an adult accompanies a wheelchair user toward a water-umbrella feature.

PHOTO COURTESY LIFE FLOOR

comfortably move around the space? Do mats/surfaces allow for easy navigation, or were there traction issues?"

o "Within the amenity itself, what were you able to engage with? Was there anything you wanted to experience and couldn't?"

- Step 2: Identify whether anyone on staff or closely connected to staff uses a mobility aid. For this case study, assume this connection does not exist.
- Step 3: If no one is available to understand their firsthand experience, either buy a wheelchair and crutches from a local store or see if a local health-care clinic has one available for borrowing.
- Step 4: Use the mobility aid to interact with the facility with specific goals in mind. Collaborate with a co-worker and ask them to document the experience by taking detailed notes. Try to use everything available to guests, from locker rooms and service desks to the water features themselves. If it is not intuitive or accessible, add it to the consideration list.
- Step 5: Compile findings and prioritize aspects based on how frustrating or limiting the experience

was. For example, if the front door does not have a button to open it, that could be a solid way to improve a visitor's initial experience with the facility. Also, document the successes.

If there was a fantastic experience, be sure to celebrate that with the team too.

- Step 6: Research access equipment that fits the facility's needs and begin preparing a proposal to submit for the grant.

In some cases, it is easier to look at physical structures and point out where there should be a ramp rather than stairs, or whether a hand dryer should be lower on a wall, but not all disabilities and special needs are visible.

Sensory experiences

Neurological disabilities are often more difficult to assess and predict because the range of sensory needs is vast. Autism is just one type of neurodivergence, but it is a spectrum with low and high sensory seeking behaviours common for different individuals with varied needs. Signs of low sensation seeking can include appearing



unbothered by loud noises and seeming unresponsive to external stimuli such as touch or sight. This response display does not mean disinterest; it shows a different way of experiencing a space. They may have a greater focus on a single task and prefer to stay on the same feature for an entire play period.

On the other end of the spectrum, high sensation seeking can look like constant movement and an intense desire for strong sensory experiences through touch, sight, smell, or hearing. These people can often become overstimulated by this drive, and providing intentionally balanced, well-paced activities can help regulate their experience and extend the fun for longer periods.

In general, dynamic products that enable visitors to self-select engagement are powerful when paired with zoning. Zones use visual and tactile signals to give guests greater confidence and let them know their environment is changing, without requiring obvious signage to detail it every time.

Common zoning tools include surface textures (e.g. safety surfaces for play zones and non-skid coatings for walkways), surface colours, guardrails,

Inclusive Questions, Better Insights

The way aquatic-facility teams ask about guest experiences can either expand or limit the feedback they receive. Use language that recognizes the different ways people move, perceive, and interact with space.

Instead of asking, "When you walk in, what's the first thing you see?" try: "When you enter, what's the first thing you notice?"

This small shift avoids assuming that every guest walks or relies on sight to navigate. Similar wording can help teams gather more useful input as they plan improvements—from parking and entryways to locker rooms, pool decks, and water features. 🌊

and uniquely themed spaces, among others. Physical boundary markers, such as planters or half-walls, may serve as both decorative and navigational tools. Caregivers can use a variety of visual signals to provide direction and help keep individuals within sightlines, using cues such as "stay on this side of the bright green planter" or "let's play within the blue circle." Regardless of how they communicate, zoning signals are a beneficial tool to employ thoughtfully throughout a space.

When considering access, remember to have fun throughout the process. If the team loves the space and the updated ideas are exciting, the community will likely appreciate them too. If stuck at any point, industry consultants are a fantastic resource for advice, and many suppliers can help conduct free site walks and identify opportunities for improvement when they cannot be done in-house. If budget is a barrier, remember to seek out and apply for grants from both government and private sources. Some suppliers offer matching-fund grants; all that needs to be done is to ask. Stay positive and remember that choices to improve a space mean more people can play fearlessly and without limits, regardless of ability. 🌊



Briana Valente serves as a marketing manager for Life Floor. She has been with Life Floor since 2018. She works extensively with industry publications, conferences, and workshops that bring meaningful education to individuals spanning municipalities, resorts, waterparks, and more. She holds a bachelor's degree in marketing from the Carlson School of Management at the University of Minnesota.

Structure Before Sanitation

A Hierarchical Model for Pool Water Chemistry

By John Bereza

AI-GENERATED IMAGES

Pool water chemistry instruction has long been

structured around pH. Over the past several seasons, however, some professionals, including this author, have shifted to a different framework—one that places chlorine at the top of a hierarchy rather than treating pH as the central variable.

In this model, chlorine occupies the apex, since sanitation is ultimately its primary purpose. Beneath it are three supporting layers: pH, total alkalinity, and borates. When these supporting layers are properly maintained, the top-layer sanitizer performs as intended. When they are neglected, operators must compensate for a system working against itself.

This article examines each layer in turn, along with the practical consequences of getting the hierarchy wrong.

A framework with more than one dimension

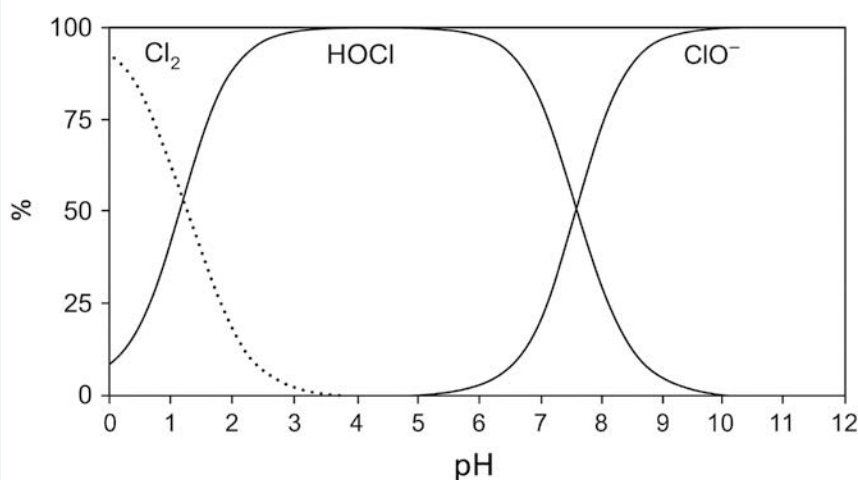
Chlorine sits at the top of this pyramid structure because it is the component directly responsible for

eliminating pathogens and algae. Immediately beneath it is pH, which determines how efficiently that sanitation occurs. Below pH is the total alkalinity, which helps stabilize pH. The fourth layer, borates, serves as a secondary buffer that reinforces alkalinity and adds further stability to the system. The recommended dosage of 30–50 ppm is consistent for residential, commercial, and salt-chlorine generator (SCG) pools. Since most spas rarely encounter algae at the level of pools, a slightly lower maximum concentration is tolerated.

Note that this structure is multi-dimensional. The same variables that govern water and sanitation also influence corrosion potential and the Langelier Saturation Index (LSI), a separate but related measure of water balance. Adjusting one variable to improve sanitation can have downstream effects on equipment protection and surface chemistry. Pool water chemistry is not a linear checklist but an interconnected system where every adjustment has secondary consequences.



FIGURE 1



Top: Maintaining pH in the recommended range helps chlorine remain in its more effective sanitizing form and supports clear water.

Figure 1: The effect of pH on distribution and type of chlorine species present in solutions at 25 C (77 F). At a weakly acidic pH (3.0–6.5), HOCl is the dominant chlorine species, with minimal OCl⁻ (expressed here as ClO⁻) and no free chlorine gas. Cl₂ is represented by a dashed line (---), HOCl is represented by a bold solid line (—), and OCl⁻/ClO⁻ is represented by a solid line (—).

THIS FIGURE HAS BEEN REPRODUCED FROM DEBORDE AND VON GUNTEN (2008) WITH PERMISSION FROM ELSEVIER UNDER LICENCE NUMBER 5384750686333.

Lowering the pH is an obvious method to maintain a higher level of free available chlorine (FAC). Still, a lower pH lowers the Langelier Saturation Index (LSI), prompting other chemical adjustments to maintain balance within the specific target range.

The chemistry behind sanitizer efficacy

Chlorine is a registered pest control product with Health Canada's Pest Management Regulatory Agency (PMRA; in the U.S., the Environmental Protection Agency [EPA]), used to kill organisms that make swimmers ill and algae that cloud the water. However, its effectiveness is highly dependent on pH. The generally accepted operating range is 7.2 to 7.6, with 7.4 treated as the target. As pH moves to the lower end of that range, chlorine's killing efficiency increases; as it rises, that efficiency declines.

Cyanuric acid (CYA) has been widely studied since its introduction to the pool industry in the mid-to-late 1950s, but its relationship with pH and disinfection performance has produced seemingly contradictory

findings. In a 1974 review, Edmondo Canelli reported that pH has a negligible effect on the efficacy of stabilized chlorine—chlorine used in the presence of CYA. By contrast, pH is a primary factor affecting the sanitizing power of unstabilized chlorine. In laboratory testing, pH values as high as 9 showed little to no effect on chlorine efficacy when 50 ppm CYA was present, which was twice the 20–25 ppm CYA concentration recommended in the paper. Field findings were less consistent. Canelli cited a study by Donohue and Mulligan in which disinfection was unsatisfactory in eight pools operated for nine weeks at pH 7.7–9.0, with 1.0–1.5 mg/L of FAC and 15–50 mg/L of CYA. In that case, the relatively high pH may have contributed to the poor disinfection results. The review also noted that other substances in pool water may interfere with chlorine's bactericidal activity, potentially helping to explain inconsistent field results.¹

The underlying mechanism is straightforward. When chlorine is introduced to water, it forms hypochlorous acid, the compound responsible for



Selecting the right adjustment product allows technicians to raise both pH and alkalinity when necessary or target alkalinity with minimal pH change.



Properly maintained alkalinity and borates help resist pH swings caused by rainfall, bather load, and debris.

disinfection. As pH increases, more of that chlorine instead exists as a hypochlorite ion, a substantially weaker form. At a pH of 7.2, roughly 68 per cent of available chlorine is present as hypochlorous acid. At the upper end of the acceptable range, that figure drops to approximately 45 per cent. At a pH of 8.0, only about 25 per cent remains in its active form.

In practical terms, 1 ppm of chlorine at pH 7.0 provides roughly the same disinfecting power as 3 ppm at pH 8.0. An operator running a pool at pH 8.0 is, in effect, using three times as much chlorine as needed to achieve the same result. When a customer reports adding chlorine steadily without achieving clear water, elevated pH is frequently the explanation: the chlorine being added is not in a form capable of doing the work.

Maintaining a residual of 1 to 3 ppm free chlorine, at the correct pH, is sufficient to keep water properly sanitized. The priority should always be to correct pH before increasing the chlorine dose.

pH and total alkalinity as an interdependent pair

Treating pH and total alkalinity independently is not ideal. Adjusting one reliably shifts the other; technicians who chase pH without accounting for alkalinity—or the reverse—may find themselves repeatedly correcting the same imbalance. The two should be managed together, with a target pH of 7.2 to 7.6 and total alkalinity near 100 ppm treated as a paired objective rather than two separate line items on a test sheet. Since real-world water contains so many variables, targeting alkalinity with finer accuracy would be both impractical and unnecessary.

Selecting the correct adjustment tool

Because pH and alkalinity move together, the choice of chemicals matters. Standard pH increaser has a pH near 10.5 and will raise both pH and alkalinity simultaneously—a broad, non-selective

adjustment. By contrast, an alkalinity increaser has a pH closer to 8.5, much nearer neutral, and typically raises alkalinity by adding carbonates without significantly shifting pH. When both values need to rise, the pH increaser is the appropriate product. When only alkalinity needs correction, an alkalinity increaser allows for a more targeted adjustment.

Buffering capacity and environmental stability

Total alkalinity and borates function as buffers, resisting pH swings caused by rainfall, bather load, and incidental debris. Without adequate buffering capacity, chlorine's effectiveness fluctuates as pH shifts, and the cost of continually correcting these shifts with acid and base additions adds up quickly.

A second, less obvious factor is also constantly acting on pH: Henry's Law of solubility, which holds that water seeks equilibrium with the surrounding atmosphere. Because pool water typically holds more dissolved carbon dioxide than the air above it, CO₂ is continuously released from the water. Since CO₂ lowers pH, this off-gassing causes pH to drift upward over time. It is important to note that indoor pools with poor air exchange are a notable exception, where trapped CO₂ can instead pull pH downward.

Atlas Scientific explains that carbon dioxide is influential in regulating pH in water. Measuring the CO₂ concentration in a solution is one way to assess its effect on pH. For example, the more CO₂ in water (H₂O), the lower the pH will generally be. When CO₂ is dissolved in water, part of it reacts with water to become carbonic acid (H₂CO₃). It is the hydrogen ions present in carbonic acid that make water acidic, lowering the pH.

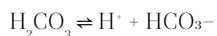
The following equation shows the formation of carbonic acid:



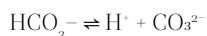


Supplemental products and effective filtration can reduce the incidental organic load that would otherwise consume chlorine.

Carbonic acid can also break up, or “dissociate,” into hydrogen ions (H^+) and bicarbonate ions (HCO_3^-), as shown in the following equation:



Bicarbonate can further dissociate into hydrogen ions (H^+) and carbonate ions (CO_3^{2-}):



When this happens, hydrogen ions form in the water, increasing acidity and lowering the pH.

If CO_2 is reduced in water, the pH will increase. Atlas Scientific identifies the addition of high-pH additives, such as non-stabilized chlorine or a pH adjuster—for example, sodium carbonate or sodium bicarbonate—as one way to raise pH. A salt chlorine generator (SCG) may also contribute to a rising pH.

Another way to raise the pH in water is to allow it to increase naturally through off-gassing. Off-gassing is the release of dissolved gas, in this case, CO_2 . Aeration features, such as jets, can be added to systems such as swimming pools to release CO_2 from the water and naturally raise the pH.

Other forms of decarbonation—the release of CO_2 from water—include turbulence from SCG activity, agitation from water fountains, or water added forcefully through a hose.

This is the primary reason why borates are a non-negotiable part of the hierarchy. Layering 50 ppm of borates on top of properly maintained alkalinity can substantially blunt the pH swing associated with a rain event. This swing might otherwise range from 0.2 to 0.6; borates significantly reduce or eliminate that movement. If pH governs chlorine performance, then borates serve as a safeguard against pH fluctuations. Follow the maximum

concentration on the PMRA-registered product label (in the U.S., the EPA sets a maximum of 50 ppm in recreational water). Testing is performed using available test strips and test discs.

Managing chlorine demand from non-target contaminants

Chlorine does not distinguish between the pathogens it is meant to eliminate and the incidental organic load introduced by bathers: ammonia via sweat and urine, body oils, lotions, sunscreen, and trace metals.

Industry studies indicate that only 10 per cent of applied unstabilized chlorine in pools goes toward actual sanitation; the rest is consumed via UV photodegradation along with this incidental load of contaminants.

When chlorine reacts with ammonia from sweat and urine, it forms chloramines in stages: monochloramine first, then dichloramine, and finally trichloramine, which becomes airborne. The sharp chemical odour associated with poorly maintained indoor pools is trichloramine. Because trichloramine is heavier than air, it does not readily disperse in spaces with limited ventilation; instead, it settles and re-dissolves into the water, compounding the combined chlorine problem. Adequate air exchange is therefore a critical, and frequently overlooked, component of indoor pool operation.

Air quality standards for indoor pools and natatoriums

Several organizations, including the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the World Health Organization (WHO), have established guidelines to support safe indoor air quality in swimming facilities.

The primary concern is the presence of chloramines, which form when chlorine reacts with organic substances in the water, such as sweat and urine. High levels of chloramines can lead to respiratory and eye irritation, as well as other health concerns.

ASHRAE Standard 62.1-2019 specifies ventilation rates for indoor pools based on factors such as pool area, occupancy, and water-surface area. The standard emphasizes the importance of effective ventilation to remove contaminants and maintain acceptable indoor air quality (IAQ). Maintaining proper water chemistry, including chlorine levels and pH, is also important in minimizing chloramine formation.

ASHRAE recommends:

- Four to six volumetric air changes per hour in a regular natatorium
- Six to eight volumetric air changes per hour in spectator areas

A quick calculation can determine the supply-air requirement:

- Supply air required (L/s) = Room volume (m^3) × Desired air changes per hour ÷ 3.6 (supply air [CFM] = room volume [ft^3] × desired air changes ÷ 60)
- The room volume determines the amount of supply air a space requires



Regular testing helps maintain a free-chlorine residual of 1 to 3 ppm while keeping pH within the recommended 7.2-to-7.6 range.



Consistent circulation and filtration improve water clarity independently of chemistry and reduce the workload placed on chlorine.



Routine testing and measured adjustment are essential after disturbances such as rain, while avoiding the tendency to overcorrect.

Supplemental sanitation: reducing the burden on chlorine

Given how easily chlorine's capacity is diverted, pairing it with at least one supplemental product is good practice. Each of the following reduces the incidental load chlorine would otherwise have to process:

- Algaecides are PMRA-registered products (EPA-registered in the U.S.), effective against algae independent of chlorine residual.
- Clarifiers coagulate fine particulate matter so that it can be removed by filtration instead of oxidation.
- Enzymes naturally break down oils and long-chain organic molecules into forms that filter out quickly rather than persisting in the water. They are ideal for use in essentially every body of water, particularly in hot tubs.
- Borates not only serve as buffers but also provide meaningful algae suppression, which is part of why they should be considered close to essential.
- Supplemental equipment, such as UV, mineral, and ozone systems, all reduce or eliminate pathogens without generating combined chlorine byproducts. UV disinfection operates through a distinct mechanism; mineral systems typically use trace metals such as silver and copper to control bacteria and algae. Ozone is highly effective as an oxidizing supplement. While UV and ozone systems are very effective killers of pathogens, they provide no residual effect and only work when the systems are operating and water is circulating.

No operation needs every product on this list. The core recommendations are a properly balanced pool, a well-maintained chlorine residual, and at least one supplemental product that shares the oxidation load. A common and preferred combination is enzymes and borates. Though supplements support chlorine's function, they do not replace it. With a fixed ceiling for chlorine residual (1–3 ppm), water with higher bather loads, warmer water, and recurring algae would take greater advantage of supplemental additives and equipment to help defend against outside contamination.

Stabilizers: extending chlorine's working life

Outside of extreme northern climates, ultraviolet light steadily degrades unstabilized chlorine. Roughly 50 per cent of an unstabilized dose is lost within 17 minutes of sun exposure, and 90 per cent within two hours.²

Cyanuric acid (CYA), commonly called a stabilizer, addresses this. CYA is present in the water and reversibly binds with free chlorine, helping protect it from degradation by ultraviolet light while maintaining a reserve of chlorine available for disinfection. Unstabilized chlorine sources—such as liquid chlorine and calcium hypochlorite—add chlorine to the water without adding CYA. Stabilized chlorine products add both chlorine and CYA.

The Recreational Water Quality Committee of the Association of Pool & Spa Professionals (APSP, now the Pool & Hot Tub Alliance [PHTA]) recommends maintaining CYA within a defined range, generally 25–50 ppm, to provide meaningful protection from sunlight without allowing CYA to accumulate unnecessarily. As CYA rises, the free-chlorine target must also rise to maintain an appropriate level of active chlorine. CYA levels above 50 ppm generally provide limited additional stabilization benefit and can make effective chlorine management more difficult.³

Trichlor tablets (52 per cent CYA) and dichlor granules (54 per cent CYA) both build chlorine around a cyanuric acid core, meaning every application of stabilized chlorine adds further CYA to the water. Trichlor's low pH, in the range of 2.8 to 3.5, has the secondary benefit of offsetting the gradual upward drift in pH caused by CO₂ off-gassing. Tablet quality is also worth verifying: a properly manufactured trichlor tablet should be dense and resistant to breaking by hand. Tablet hardness typically leads to slower dissolution rates and is a good sign of lower moisture levels. A 227-g (0.5-lb) trichlor tablet and 227 g (0.5 lb) of sodium dichlor each contain approximately 120 g (0.25 lb) of cyanuric acid.

The operational cost of over-stabilization

Consider a fecal contamination event, a standard scenario in certified pool operator training. With no CYA present, 20 ppm of chlorine neutralizes the contamination in approximately 12.75 hours. With just 15 ppm of CYA in the water—a modest, unremarkable level—the same task takes 28 hours. The chlorine dose and the eventual outcome are identical; only the time required more than doubles because stabilized chlorine releases too slowly to overcome the contamination promptly.

This is where the hierarchy reinforces itself: operating at elevated pH requires roughly three times the chlorine dose, and if that chlorine is a stabilized product, three times the CYA accompanies it. Maintaining pH within the correct range is therefore one of the most effective ways to limit long-term stabilizer accumulation. By maintaining pH at an optimal level and removing barriers to proper sanitation, stabilized chlorine usage can be greatly reduced, and the resulting decrease in CYA accumulation benefits the entire sanitation environment.

Prevention is the only practical strategy here. If 90 per cent of chlorine is consumed during UV degradation and contamination oxidation, this presents an opportunity. Much of that oxidative burden can be shifted to digestion through enzymes, a non-chlorine oxidizer, or additional filtration. Increasing filtration time is often the simplest lever available—filtering 24 hours a day rather than 12 measurably improves water clarity independent of chemistry. Therefore, filtration remains one of the most underused tools in the industry.

Once CYA levels are excessive, there is no chemical remedy. The only correction is partial or full water replacement, an outcome

operators should avoid rather than manage after the fact, since draining and refilling can be costly. Maintaining attention to pH is the least expensive form of prevention available, since it prevents stabilizer accumulation from tripling in the first place.

Consistency through automation

The objective for water balance should be a flat line: consistent conditions from one day to the next, without new problems emerging over the course of the season. Achieving that consistency starts with automation.

Automating sanitizer delivery, either through a chlorine feeder or a salt chlorine generator, removes the variability from manual dosing, particularly for those who are inconsistent about adding chlorine on a fixed schedule. Automated dosing depends on regular circulation; a consistent filtration schedule, whether eight, 12, or ideally 24 hours daily, matters more than the specific number chosen. The only disadvantage of increased filtration is cost (electrical and equipment lifespan).

The same principle applies to pH: proper buffering, through maintained alkalinity and borates, keeps it anchored near its target with minimal manual intervention. Automated cleaning equipment applies the same logic to debris management, keeping the pool clean continuously rather than through periodic manual effort.

Mitigating what automation cannot prevent

In practice, water balance is not a flat line. External factors outside an operator's control will continue to move it. Once automation is in place, the remaining work is managing the disturbances that automation cannot anticipate.

The most effective mitigation strategy is bathing hygiene. Encouraging swimmers to rinse off before entering the water, removing shampoo and conditioner residue in particular, along with basic sanitary practices, meaningfully reduces incidental organic load. Pool covers provide a similar benefit: an automatic cover largely eliminates overnight contamination. Even a standard cover reduces incoming debris by roughly a third relative to an uncovered pool—a pool covered for eight hours a day avoids eight hours' worth of debris that would otherwise accumulate in an uncovered pool. A cover would expect to collect an even greater percentage of debris if closed during a significant weather event that typically carries a higher concentration of debris—e.g. wind and rain. This is particularly significant during extended pollen seasons, which vary by region.

On the chemistry side, mitigation requires regular testing and adjustment, with particular attention following rain events—while avoiding the tendency to overcorrect.

Season transitions: why closing determines opening

The final area worth addressing is the transition between seasons. A poor pool opening is rarely something that can be corrected in



A successful winter closing begins with balanced water, proper sealing, and a supplemental sanitizer to help the pool open clear in spring.

the moment; by the time a pool is opened for the season, the window for prevention has already closed. The condition of an opening is determined almost entirely by the quality of the preceding closing, which is why early opening—ideally while temperatures are still cool—and a properly executed closing are both priorities. Where budget allows only one professional service per year, a closing generally provides greater value than an opening, since a poorly executed closing creates problems that compound over the winter. Early openings are not always an option—especially in volatile climates. Pools should not be opened if a significant freeze is still anticipated.

A successful closing depends on three elements: correct water chemistry at the time of closing, proper sealing of the pool, and a supplemental sanitizer to carry the water through winter, since chlorine alone typically lasts only 10 to 14 days under a winter cover. For pools with elevated metal content, also consider a metal sequestrant for the off-season. Borates are the preferred winter supplement, given their algae-suppressing properties—a significant factor in whether a pool opens clear when a mesh cover is in place. Since borates are not consumed or lost, they continue to work throughout the extended winter months, unlike chlorine, which has a finite lifespan.

A system with more than one face

Chlorine is at the top of the chemical pyramid, with pH governing its efficiency, alkalinity and borates providing structural support, and a supplemental product reducing chlorine's workload from the hierarchy. These same variables also govern the LSI and, by extension, corrosion risk and equipment longevity. Adjustments made for one purpose inevitably affect the other, and maintaining both sanitation and LSI within acceptable ranges simultaneously is an ongoing balancing exercise—one to be addressed in more detail in a



Automated sanitizer delivery, regular circulation, and cleaning equipment help maintain more consistent pool conditions throughout the season.

subsequent article. As proper water sanitation remains the key health indicator for commercial and home pools, testing and sanitation controls must be the focus of water testing and maintenance. All other water parameters must remain in service of sanitation to their own proper degree of support.

That follow-up discussion will focus on calcium, a variable deliberately excluded from this article. As temperatures fall through autumn and winter, calcium behaves differently in solution, introducing a separate set of considerations for both sanitation and LSI management. 🌊

Notes

¹ Edmondo Canelli, "Chemical, Bacteriological, and Toxicological Properties of Cyanuric Acid and Chlorinated Isocyanurates as Applied to Swimming Pool Disinfection: A Review," *American Journal of Public Health* 64, no. 2 (1974): 155–162, especially 157, doi.org/10.2105/AJPH.64.2.155.

² Lisa H. Nowell and Jürg Hoigné, "Photolysis of Aqueous Chlorine at Sunlight and Ultraviolet Wavelengths—I. Degradation Rates," *Water Research* 26, no. 5 (1992): 593–598.

³ Association of Pool & Spa Professionals (APSP) Recreational Water Quality Committee, "Cyanuric Acid," revised September 2011.



John Bereza is the Great Lakes regional sales manager for Haviland Pool & Spa Products, a manufacturer of water treatment products based in Grand Rapids, Mich. He has worked at Haviland since 2003 in a range of roles, including decorative coatings technical support and marketing. He has held his current sales position, with a primary focus on technical training, since 2020. He can be reached at johnb@havilandusa.com.



Beyond the Box

Mastering Sauna Ventilation

To many pool and backyard recreation contractors, a sauna is frequently viewed as a straightforward construction project: an insulated box, a vapour barrier, some softwood cladding, and a heat source, either electric or wood-burning. However, this simplistic view overlooks the most critical element of a functional thermal environment: fluid dynamics.

A sauna is not merely a heated storage unit; it is a dynamic respiratory system. Yet, for decades, an old myth has persisted in the North American market: that a sauna should be built as a perfectly sealed room. The logic behind this outdated practice seemed intuitive: avoid heat loss at all costs, lock the thermal energy inside, and keep energy bills low by preventing hot air from escaping.

This approach is completely wrong. It misinterprets how a sauna functions and creates a

stagnant, low-oxygen environment that ruins the bathing experience. Further, sealing a sauna tightly poses an active threat to the building envelope.

When ventilation is treated as an afterthought or intentionally blocked to save pennies on heating costs, the consequences are immediate. Bathers experience rapid oxygen depletion, elevated carbon dioxide (CO₂) levels, and a stifling, heavy heat that shortens sessions and often causes post-sauna headaches. For the structure itself, trapping moisture inside triggers catastrophic interstitial condensation, moisture that gets locked inside wall cavities, leading to mould growth, structural wood rot, and costly callback liabilities for the builder.

As the consumer demand for authentic, high-end wellness spaces intensifies across Canada,

By Alan Jalsajaa

PHOTOS COURTESY
LEISURECRAFT



mastering the physics of sauna ventilation is no longer optional. It is the defining line between a premium, high-performance thermal suite and a dysfunctional hot box.

The thermodynamics of air in a thermal suite

Understanding sauna ventilation requires a fundamental look at the physics of air behaviour at extreme temperatures. In a standard Finnish-style sauna, the ambient air temperature at the ceiling can reach 90 C to 100 C (194 F to 212 F), while the floor may remain cool at 20 C (68 F).

This extreme thermal stratification creates intense pressure differentials.

When water is poured over hot rocks to create steam (löyly), the humidity spikes instantly. This hot, humid air rapidly rises to the ceiling, expands, and exerts downward pressure on the rest of the room. Without a deliberate, engineered path for fresh air to enter and stale air to escape, air stagnation occurs.

In an unventilated or sealed room, the air splits into distinct, stagnant layers. Oxygen stays trapped near the floor, while the carbon dioxide and exhaled moisture pool directly around the upper benches—the exact zone where occupants breathe.

To combat this, builders must abandon the “sealed box” mentality and use one of two primary ventilation methods: natural passive (gravity-fed) ventilation or mechanical ventilation. While insulation remains critical to the room reaching target temperatures efficiently, standard continuous heating insulation regulations do not apply in the same way to saunas, because these structures are heated intermittently on demand. The goal is not to trap stagnant air forever, but to continuously condition a moving stream of fresh air.

Natural gravity-fed ventilation

This ventilation relies entirely on the principle of thermal convection: hot air rises, creating a natural vacuum that draws colder, denser air in from below. This system requires no electrical moving parts, making it a reliable choice for outdoor, wood-burning saunas where utility connections may be limited.

To execute a functional gravity-fed loop, placement of the intake and exhaust vents must be mathematically precise:



- The fresh air inlet—This vent must be placed directly beneath or immediately behind the main heating unit, as close to the floor as structural parameters allow. By placing the inlet here, incoming cold outdoor air is immediately drawn into the heater's convective currents. The air passes over the hot elements or stones, expands, rises rapidly, and circulates through the room before it can chill the bathers' feet.
- The exhaust vent—It must be located on the wall farthest from the heater. Vertically, it should be positioned between the upper bench level and the ceiling.

A common industry mistake is placing the exhaust vent directly in the ceiling of a gravity-vented sauna. Doing so creates a short-circuit effect: the fresh, hot air escapes immediately out the top before circulating through the seating area. This skyrockets energy costs while leaving the bottom half of the room cold, drafty, and oxygen-deprived.

Mechanical downdraft ventilation: the modern gold standard

While gravity-fed systems work well outdoors, modern indoor custom residential rooms and premium outdoor electric saunas often experience poor convection due to tight building envelopes or surrounding structural barriers. For these installations, mechanical downdraft ventilation is the gold standard.

Instead of relying on weak natural pressure differences to push air out, a mechanical system uses an exhaust fan to actively pull stale air out of the

room, forcing a complete air turnover multiple times per hour. The layout of a mechanical downdraft system flips traditional gravity design on its head:

- The high-wall inlet—In a mechanical setup, the fresh-air intake vent is placed above the heater, typically 500 mm to 700 mm (19.7 in. to 27.6 in.) above the rock core. As the exhaust fan pulls air out of the room, fresh air is sucked through this high inlet. It is immediately caught by the rising column of intense heat coming off the heater, mixing beautifully and pushing the fresh, hot air down toward the bathers.
- The low-wall mechanical exhaust—The exhaust vent is placed low on the opposite wall, usually under the lower bench, at a height of roughly 200 mm to 300 mm (7.9 in. to 11.8 in.) above the floor. An inline, heat-rated fan pulls the heavy, carbon-dioxide-rich air down past the bathers' bodies and out of the building.

This mechanical pull eliminates the classic "cold feet" phenomenon that plagues poorly designed North American saunas. Forcing the hot air downward before it exits creates a remarkably uniform temperature profile from head to toe, drastically increasing comfort and bather endurance.

Environmental realities: indoor vs. outdoor Canadian installations

With the current market trend in Canada shifting heavily toward custom, freestanding outdoor backyard saunas, builders must adapt their ventilation strategies to handle extreme Canadian climate variations.

On this spread:

Left: Understanding sauna ventilation requires a fundamental look at the physics of air behaviour at extreme temperatures.

Middle left: By treating the sauna as a breathing system that balances thermodynamics with bather physiology, pool professionals can deliver spaces that are healthier for the occupant and safer for the structure.

Middle right: When water is poured over hot rocks to create steam (löyly), the humidity spikes instantly.

Right: Without a deliberate, engineered path for fresh air to enter and stale air to escape, air stagnation occurs.

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TABLE 1

Sauna Volume Range (m ³)	Recommended Vent Sizing (Diameter)	Minimum Air Changes per Hour (ACH)	Primary Venting Recommendation
Under 8 m³ (283 cu ft) (Small residential)	100 mm (4 in.)	4–6 ACH	Gravity-fed (outdoor) or mechanical (indoor)
8 m³ to 15 m³ (283 cu ft to 530 cu ft) (Medium mid-size)	125 mm (5 in.)	6 ACH	Mechanical downdraft preferred
15 m³ to 25 m³ (530 cu ft to 883 cu ft) (Large /Multi-Tier)	150 mm (6 in.)	6–8 ACH	Mechanical downdraft required

Indoor custom saunas

Indoor saunas operate in a moderated ambient environment (about 20 C [68 F] house temperature) but present a different challenge: where to exhaust the air.

- Air source and destination—An indoor sauna should ideally draw fresh, conditioned air from an open indoor living space or a dedicated mechanical duct, and exhaust to the home's exterior or to a highly ventilated HVAC return. Exhausting hot, high-humidity sauna air directly into a standard indoor basement or bathroom will quickly overload drywall and trigger mould growth.

Sizing and air exchange guide for builders

To assist design professionals and framing crews, the following reference table provides baseline guidelines for sizing ductwork and managing air change rates based on total room volume. (Table 1)

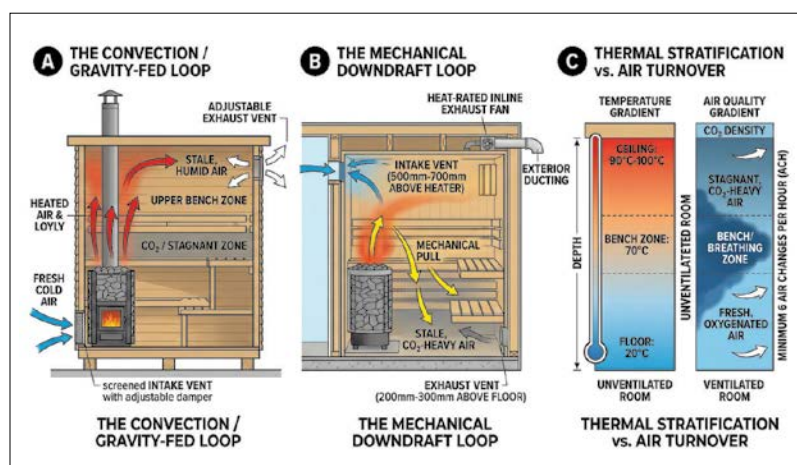
Tech Tip: When calculating mechanical fan sizing, select a remote inline fan rated for high temperatures (up to 60 C [140 F] for exhaust air zones) and ensure the fan's cubic feet per minute (CFM) rating can cycle the total room volume at the air change rate shown in Table 1 against the static pressure of the duct run.

Elevating the Canadian industry

Building a sauna that delivers an exceptional wellness experience requires moving past the outdated mentality of the “sealed hot box.” By treating the sauna as a breathing system that balances thermodynamics with bather physiology, Canadian pool and spa professionals can deliver spaces that are healthier for the occupant and safer for the structure. Properly engineered ventilation doesn't waste energy; it ensures the longevity of the build and keeps clients returning to the heat, session after session. 🌿



Alan Jalasjää is a specialist in thermal wellness and a dedicated advocate for authentic sauna culture. As the Sauna Ambassador for Sauna from Finland, he bridges the gap between traditional Nordic rituals and modern North American wellness infrastructure. Jalasjää is the co-host of the podcast *Kivia: The Spirit of Sauna*, where he explores the intersection of design, heritage, and the human experience.



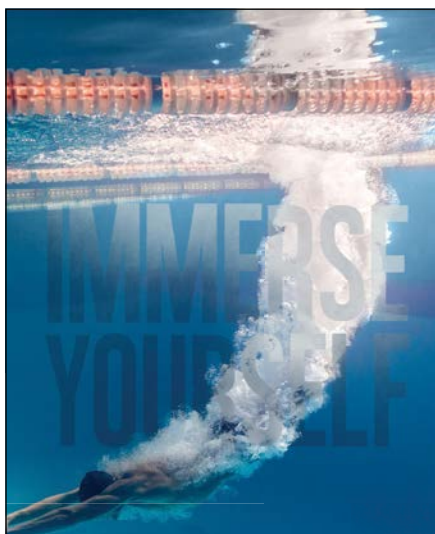
Properly designed gravity-fed and mechanical downdraft ventilation systems continuously move fresh air through a sauna, preventing stagnant CO₂-rich air around upper benches while supporting a more uniform and comfortable temperature profile.

TABLE AND ILLUSTRATION
COURTESY ALAN JALASJÄÄ

Outdoor standalone builds

Outdoor installations face massive ambient temperature differentials, moving from a frigid -20 C (-4 F) Canadian winter morning to a 90 C (194 F) operational environment within an hour or two.

- Intake management—Direct outdoor air intakes must be screened to prevent pest entry and also feature an adjustable sliding damper. In the depths of winter, a completely wide-open gravity intake can introduce a rush of cold air that overpowers the heater's recovery rate.
- Vapour management—Because outdoor saunas are heated on demand, they undergo rapid freeze-thaw cycles. The aluminum vapour barrier must be taped flawlessly with high-heat-rated foil tape. Any gap allows moisture-laden steam to penetrate the wall cavity, where it instantly hits the freezing outer wood cladding, condenses into liquid water, and becomes trapped, causing rot during the spring thaw.



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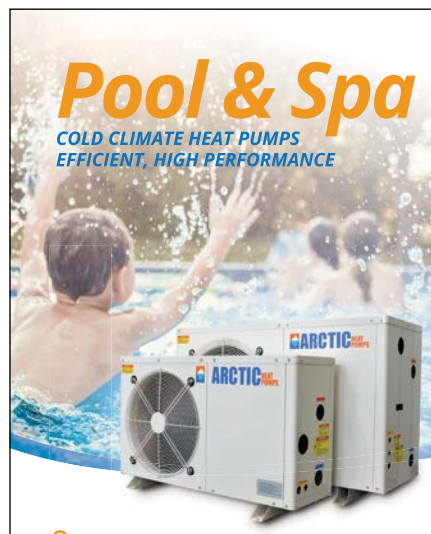
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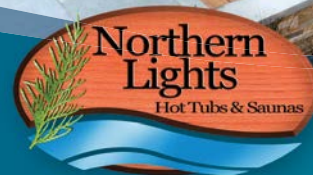
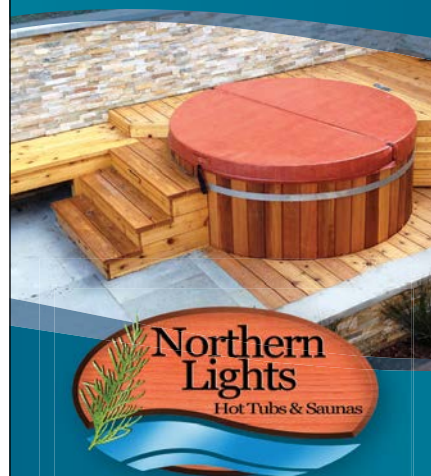
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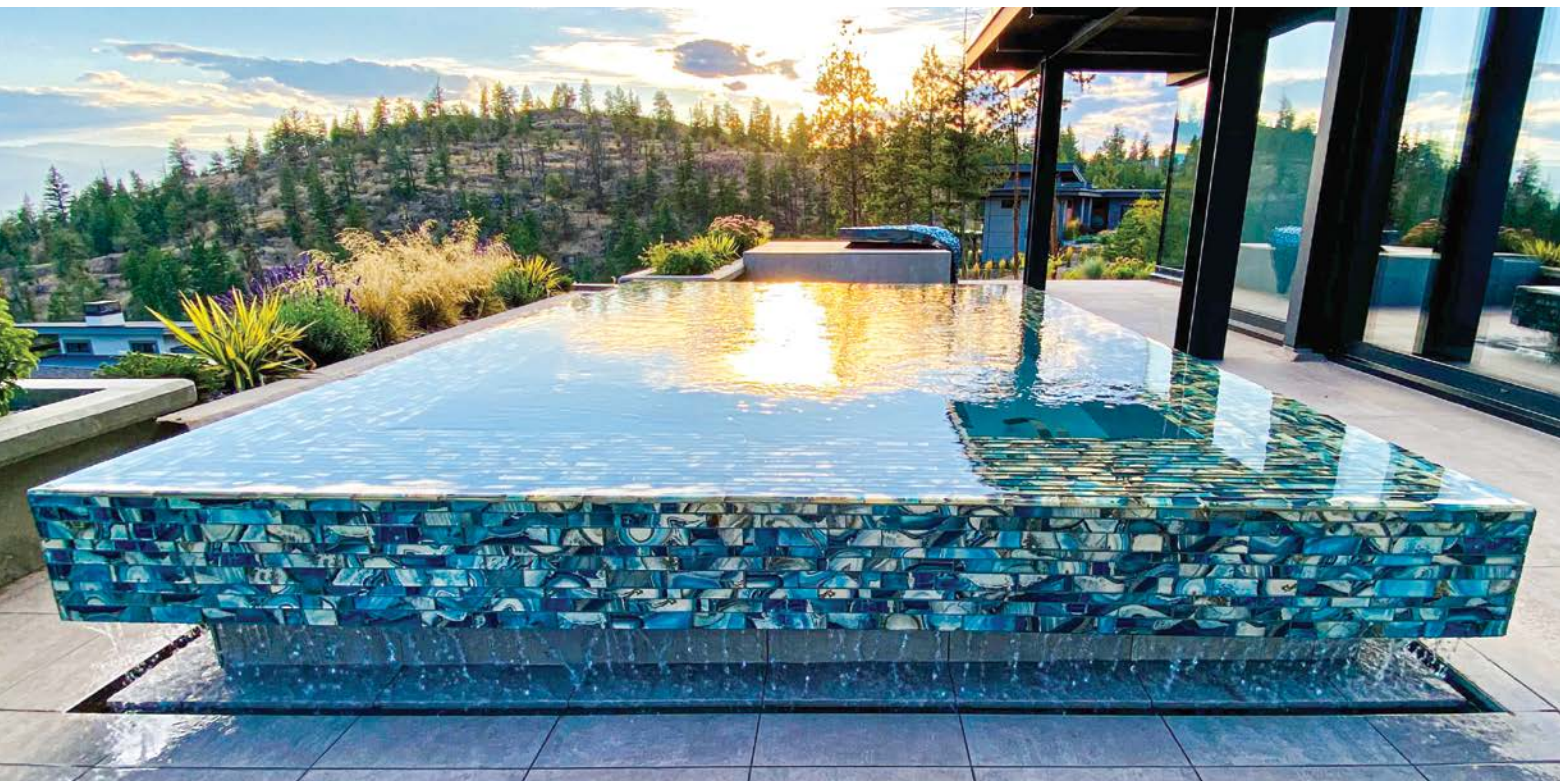


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Perched above the surrounding landscape, this

luxurious outdoor retreat balances expansive views with the privacy sought by its owners. At its centre, a custom 3 x 4.9-m (10 x 16-ft) concrete spa by Hampton Pools and Landscape of Kelowna, B.C., appears to float above the terrace, creating a dramatic focal point that complements the home's contemporary architecture.

The raised spa is finished in richly varied blue tile that reflects the sky and surrounding scenery across the water's surface. Water spills over its edges into a recessed catch basin, while arcing water features add movement and sound to the setting.

Hampton Pools and Landscape also designed and completed the landscaping, using layered planting beds to soften the hardscape and provide privacy without obstructing the hilltop view. A custom sculptural fire feature positioned beside the spa adds a warm, artistic touch to the space. Together, the spa, water features, fire element, and tailored landscape create a secluded setting for relaxation and enjoying the view. 

—Jason Cramp

PHOTOS BY TIM VALERIOT/COURTESY
HAMPTON POOLS AND LANDSCAPE

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