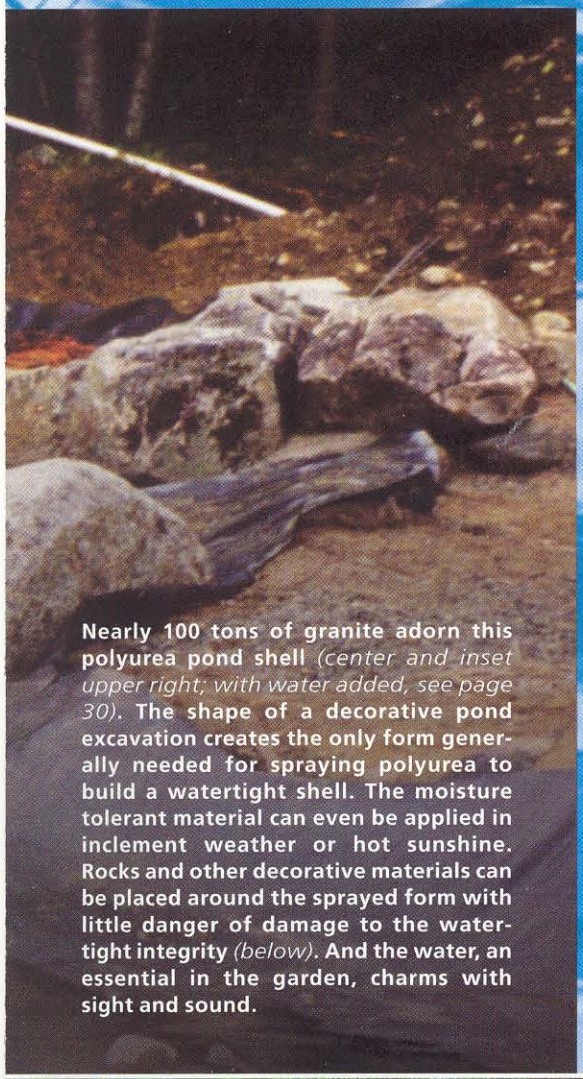
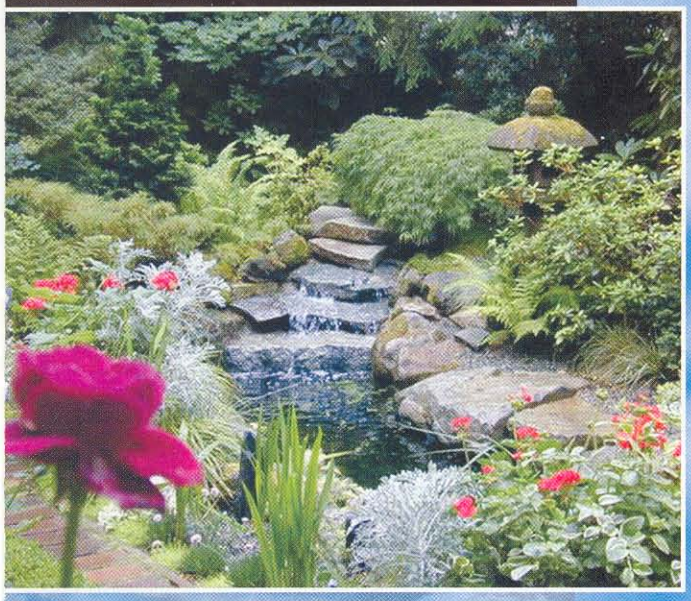


Nearly 100 tons of granite adorn this polyurea pond shell *(center and inset upper right; with water added, see page 30)*. **The shape of a decorative pond excavation creates the only form generally needed for spraying polyurea to build a watertight shell. The moisture tolerant material can even be applied in inclement weather or hot sunshine. Rocks and other decorative materials can be placed around the sprayed form with little danger of damage to the watertight integrity** *(below)*. **And the water, an essential in the garden, charms with sight and sound.**



"Wow!" It had been raining for a week. On the job, we are up to our ankles in mud. The rain had stopped on the edge of a cold snap and the project manager brought us in to build another section of a 700-foot series of springs, ponds, hidden watercourses, a stream and waterfall at the new Tacoma Dome Station just south of Seattle.

We were shoehorned into a revised schedule that pushed us behind the needs of the other trades. The original timeline had us building this water feature in August. Now it's winter in the Northwest. Working conditions are less than ideal. Actually, working conditions are really bad.

Mud cakes a large pipe emerging from the ground. It is scraped clear, judiciously dried with a propane torch, then hit with a grinder to clean and create a bonding profile. The pipe is sprayed. A thick coating is applied and the material sets in seconds. Work continues and within minutes the pipe is integrally connected to the shell liner built over the soupy pond excavation. It is now leak-proof.

"Wow!" That's what the supervisor with the white hard hat and the clipboard said. "I've never seen anything like it. That stuff is amazing!" That's what they all say, guys on these projects, people with a lot of experience with building materials. "Wow."

This is the first time he is seeing polyurea spray elastomer being applied, and I've got to say, he ain't seen nothin' yet.

This construction effort has one purpose: to bring the landscape architect's vision to life. By his design, rainwater secretly flows from a large roof, through downspouts, then underground. It wells up as a spring into a small pond within moss covered granite boulders. Disappearing, it flows underground to emerge again into another upwelling pond. Then it slips into a stream that meanders among more large granite boulders. The water slides under a foot-bridge, ducks beneath a promenade, then spills over several sharp waterfall drops as it makes its way to the sea... Enchanting!

We continue to build, literally spraying a liner into the excavation. The freshly sprayed material sets up enough to handle in moments and we rapidly progress section by section.

"That stuff goes from liquid to solid so quickly, even in this cold and wet weather," comes another enthusiastic assessment from the white hat. Then more thoughtfully, "That's just amazing."

I agree.

It starts to snow.

Encapsulated pipes become an integral part of the liner system. Beach sand is adhesively bonded to polyurea to naturalize and camouflage. Proper preparation of the included items is important but not difficult, and changes during or even after construction are seamless and simple.

I have one word to say to you: polyurea.

It hasn't always been this way. Our early water features were built with polyester resins. Fiberglass offered distinct advantages over concrete and liner ponds but moisture and temperature sensitivity caused challenging application problems in the field. We had used tons of polyesters on commercial, industrial, and marine projects over the years in the Northwest and Alaska so we had a handle on the challenges. And we always look for a better way to work. My brother found the better way on the North Slope of Alaska. In the early 1990s he was working QA on an oil-pipeline project that used polyurea coatings. Given his experience, we were convinced that this material could solve a multitude of problems.

It has solved all of those problems and experience has proven that for pond building, polyurea offers even more than we hoped for. Some of the many advantages to the applicator are: short gel time; quick initial cure which allows handling within minutes; the speed with which large sections can be built; the ability to spray a seamless

membrane of any thickness in one application with its cure relatively unaffected by damp or cold conditions. These advantages are in addition to those offered by other resin systems.

The biggest advantage, however, is this: durability. The added toughness which polyurea affords makes it more than worth the added cost over a sheet liner pond and the cost compares very favorably with well built cement ponds. With polyurea there are no seams to fail and no protective site preparation is generally necessary. It doesn't have to be handled gingerly during installation as sheet liners do to prevent tears on sticks and stones and other jobsite snags.

Landscapers that we build for report greater confidence: "When the water goes in, I don't get that tight feeling, wondering if we inadvertently damaged the liner while tugging it into place, setting the rocks, walking on the bottom, or installing the plumbing. That twenty-year guarantee on an easily punctured inexpensive liner does me no good when I have to find a leak somewhere, who knows where, under a $20,000 waterfall rockery. I've seen enough problems with sheet liners to last a lifetime." On the other hand, a pond built with polyurea, with its remarkably high physical strength and elongation, is far less susceptible to damage.

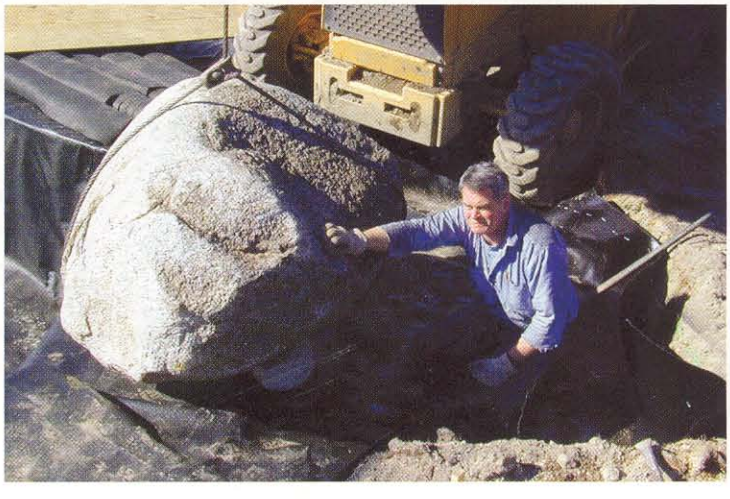
A spray polyurea elastomer pond liner can be built using geotextile materials. The pond's edges can be gently feathered, or a concrete form can be created to provide weight-bearing stability in a specifically defined shape.

Over the years, we've refined the process of polyurea pond building. The scope of this article precludes including essential construction details for closed loop, circulating water containment systems. However, an excavation is

"Did I mention the time we dropped the 7,480-lb rock?"

typically used as the final form, and the containment is built in place. The flexible shell is sprayed section by section — pond, stream, waterfall — to fit the excavation like a glove. Constructed in this manner, a fully integrated, seamless membrane that closely matches the contours is created.

Spray application allows ancillary apparatus, such as PVC pipe penetrations, skimmers, and bottom drains to be encapsulated. All the pipes and "stuff" become an integral part of the pond shell. Encapsulation goes well beyond the usual mechanical connection or gasket or bead of sealant, and is therefore many times more reliable. This also aids in concealment and/or camouflage of the unsightly appliances. Aesthetic enhancements have been developed and are routinely implemented which would be very difficult or impossible to achieve with other pond building materials. Also, the high strength of polyurea allows a thinner final shell, compared to concrete, which typically requires at least a 4" to 6" thick cross section to achieve the minimum strength required for pond building. Polyurea shells



During an unplanned durability test, a 7480-pound rock fell nine feet during placement, driving a deep depression into the hardpan substrate, but the elasticity of the polyurea absorbed the abuse and was still watertight *(above)*. **In a more controlled placement** *(right)*, **Tim Zuber guides placement of a decorative rock directly onto the surface of the polyurea pond shell. The toughness of polyurea has earned confidence and assures a long lasting crack free water containment system.**

achieve required strength at a fraction of an inch in thickness. So, the hole you dig is the pond you get. Volume of water is not traded for volume of concrete.

The added durability which polyurea affords makes it more than worth the added cost over a sheet liner pond and the cost compares very favorably with well-built cement ponds. With polyurea, there are no seams to fail. We've found no need for protective carpet laying, no sand bedding.

Over the years, there have been rare occasions when our polyurea liners have been damaged. In each case, the misuse of heavy equipment caused the problem. Generally, such damage involves an errant move of a trackhoe bucket while placing a large rock, causing a tooth to penetrate the shell. It is notable that the force exerted by these machines is used in building demolition. The good news is that the repair is simple, rapid, and sure.

Did I mention the time we dropped the rock? We routinely build ponds and waterfalls with hundreds of tons of natural stone. Generally, the plan allows us to anticipate the load and spray thicker sections where large rocks are going to be placed. That's all well and good. The fact is, real life is not always so orderly.

It happened like this. We were placing a sizeable chunk of granite. It was to be part of a waterfall. The rock weighed 7480 lbs. We knew this. Stone is sold by the ton. It was proving to be a tough move for the machine operator, when suddenly the rigging failed. The rock fell better than nine feet. It dropped violently on a rounded end approximately 12" x 18". Do the math. Compute the foot pounds generated. Anyway you figure, that liner took a smashing hit! The magnitude of that impact was well within the parameters of a Wile E. Coyote and Road Runner cartoon. It punched a crater into the substrate, the hardpan beneath the liner, more than a foot deep. The liner was unharmed! The extreme elongation of the polyurea elastomer allowed it to deflect but not break. Imagine what the outcome would have been if that pond had been built of concrete or any of the sheet liners on the market. This was an unplanned, real-life test of those esoteric technical data sheet numbers.

■ CONSIDERING THAT CEMENT POND

Cement has been the material of choice for pond building. Until recently it has been the best available technology. But in its many varied forms, it has serious limitations. The nature of its cure begets crack-producing tension and permeability issues. It has low tensile strength, a brittle matrix, and its elongation is nil. This is axiomatic: There are two kinds of concrete, that which is cracked and that which is going to crack. The brittle

The Art of the Pond

Pond building must be approached as Artwork.

Author Kurt Vonnegut says that artists do two things. First, they see a universe which in good part is pretty negative and admit they can't straighten the whole thing out. Second (now this is the good part), they make one small part of it exactly as it should be.

Their medium may be a lump of clay, a piece of canvas, a sheet of paper, or—for coatings applicators—a set of polyurea. Our goal may be to fashion a sanctuary, which includes in its form, a pond...watergarden...stream... waterfall.

We create a retreat from a harsh world environment. We craft that one small part of our world with intentions, the depth of which we may not even realize. Perhaps the water-garden is a reflection, somehow recollected in our genetics, of the place where our now fossilized ancestors found drink. That collective spot must have lent great comfort. Just look how our human species seeks the proximity of water for recreation, reflection, relaxation and rejuvenation.

Water, its mere proximity revitalizes the soul! So we shape our garden around the pond. We build in order to bring some ordered completion to our existence. As artists, we attempt to re-create that archetypal pond: the idealized water-body that transmits us to another dimension, within which we feel at ease.

Word of advice: Find your passion. Then grab your spray-gun and let fly. Tend to your self by living artfully.

—Tim Zuber

cementious matrix is problematic. But what if we took the cement and combined it with the useful characteristics of a practical elastomer to overcome the cracking and permeability issues? Consider coating cement with a waterproof elastomer whose adhesion typically exceeds concrete's cohesion, and that has an extreme elongation potential with very high tensile strength.

Too often, when called in to repair a liner or a concrete water feature, we hear, "We just love the water, but it's so frustrating looking at it when it leaks." The designer and the builder create the magic, but the spell is broken by faulty water containment. The charm is diminished when you see a minus tide replicated in the pond.

Spraying polyurea elastomer to build a membrane on the surface of a cracked concrete pond can breathe new life into the structure. We see the process as building a flexible shell within a brittle form. This ends the crack-fix-crack-fix cycle permanently. Often we will spray a membrane thick enough to build a bladder which, if removed from the concrete form, could stand alone.

Polyurea can be used in so many different ways and can solve so many water-related construction problems one might just imagine this material is magic. Polyurea is not magic, but it is among today's cutting edge technologies. Those who follow sound design and construction practices and the best application procedures find polyurea spray elastomer a panacea for water containment construction and repair.

Look. They say about 70% of the earth's surface is covered with water; by my way of thinkin', that ain't nearly enough. So I hope to take the position of advocate to advance the craft of pond, waterfall, and stream building, fish keeping, aquaculture and water gardening by promoting polyurea spray elastomer. As you read this, architects, designers, landscapers, aqua culturists, and homeowners are in need of a better way to build and repair their ponds, etc. Help them. Introduce them to the toughest, most adaptable water containment material available. When your customers get their hands on this tough, durable, elastic material, I predict that they too will say:

"Wow!" CP

Tim Zuber *is Vice President of Applied Resin Technology, Inc., in Woodinville, Washington. He has studied and built ponds since he was a kid, and has developed his fascination with resins since the early 1960s. Planning his next pond for his home, he promises this: there will be some elaborate design surprises and lots of big, fat, friendly Chagoi koi. He can be reached at (425) 488-2699 or e-mail artinc@hotmail.com.*